No. 640,366. Patented Jan. 2, 1900.

F. M. F. CAZIN.

ELECTRIC INCANDESCENT LAMP.

(Application filed Mar. 21, 1899.)

(No Model.)

Fig. 1.

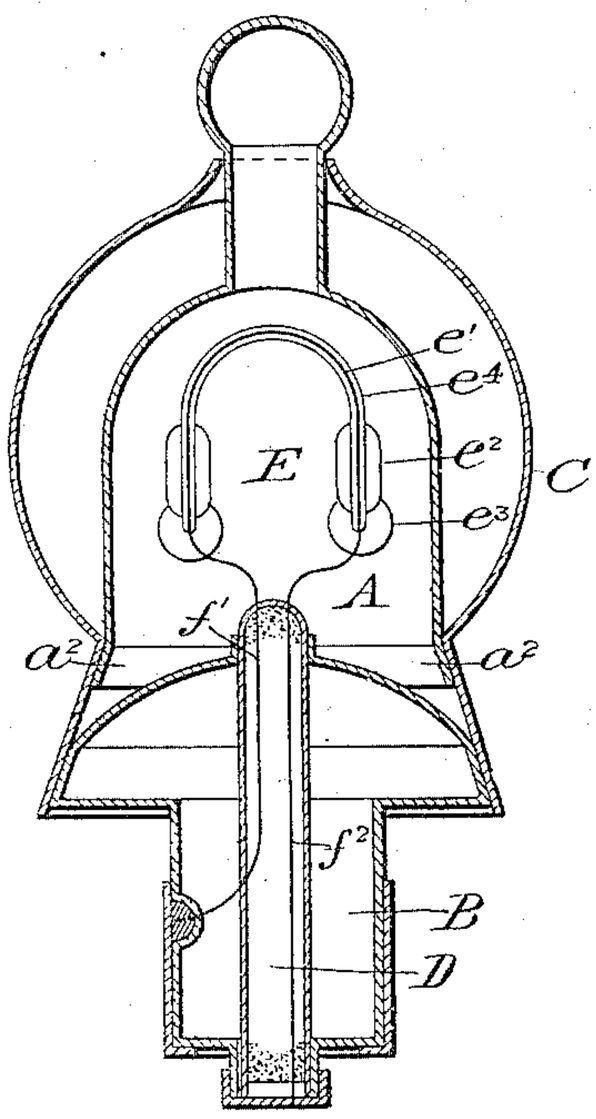


Fig. 3.

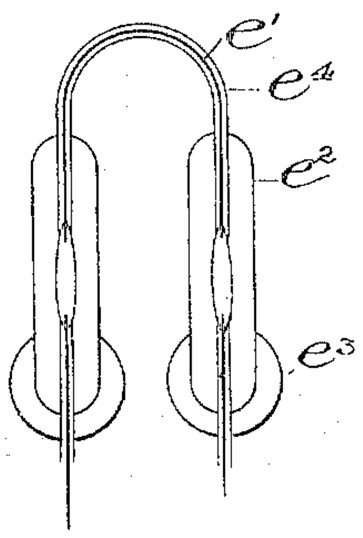


Fig. 2.

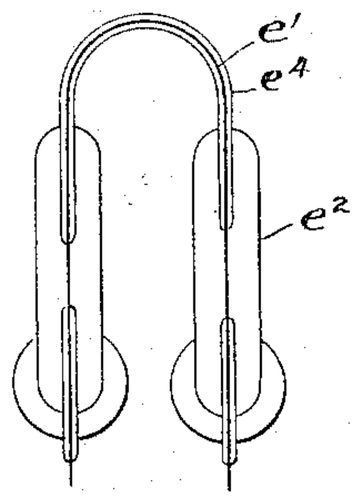


Fig. 5.

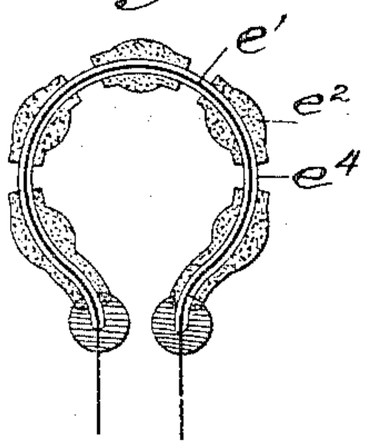
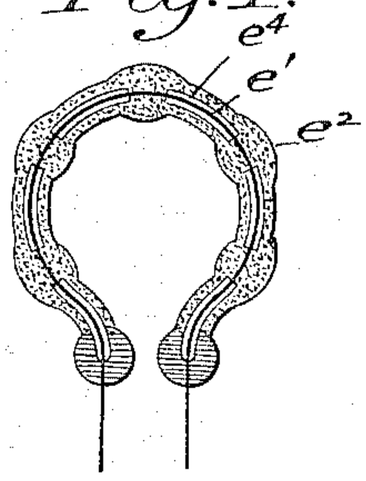


Fig. 4.



Witnesses:
Minna E. Cazin
O. K. Cazin.

Inventor:
Francis M. F. Cazin

UNITED STATES PATENT OFFICE.

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

ELECTRIC INCANDESCENT LAMP.

SPECIFICATION forming part of Letters Patent No. 640,366, dated January 2, 1900.

Application filed March 21, 1899. Serial No. 709,902. (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, in Hudson county and State of New Jersey, have invented an Improvement in Electric Incandescent Lamps, of which the following is a specification.

The purpose of this present application is of the same character and in the same relation to my Patents No. 620,640, of March 7, and Nos. 621,291 and 621,292, of March 14, 1899, as my application of February 2, 1899, Serial No. 704,218—namely, to obtain patent on certain modifications in the processes of manufacturing electric incandescent lamps invented by me and on the lamps that are the products of such manufacture, which processes and lamps were alluded to in these patents, but were not explicitly enough specified and not sufficiently disclosed for formulating on the said specifications and disclosures the proper claims for their protection by patent, though the invention as such or in its essential characteristics has then and there been set forth.

I desire in special now to refer to two important features, so disclosed—namely, first, the stated existence of and the remedy applied to "the destructive or detrimentary influence exercised by the material, which performs the function of being heated to luminosity by the heat that is produced by the current passing and resisting element," or vice versa, (compare lines 7 to 9 on page 2 of my Patent No. 620,640, and 101 to 111 on page 4 of the same patent;) second, the stated existence of and the remedy applied to the conductivity of oxids (lines 106 and 107 on page 4 of same patent) when heated to a high temperature, (compare line 40 on page 2 of same patent,) which remedy was found in electrical insulation, (compare line 103 on page 4 of same patent,) which conductivity, at high temperature constituted the deficiency, which left the oxids only "almost perfect." (Compare line 73 on page 2 of same patent.) The remedy in both cases consisted in insulation from one another of two elements of essentially different function, the insulation being chemical in character in the first-mentioned instance and electrical in the second-mentioned instance. (Compare line 103 on page 4 of same patent.) Such imperfections and the remedies applied in obviating their effects were the results of a long course of experimenting, and such experimenting demonstrated the further phenomenon that whenever the action in different parts of the longitudinal extension of the core or filament was not a uniform one, or whenever on part of the length the reaction resulted as specified in lines 99 to 112 on same page, and on another part of the length of the continuity of the core or filament, but not of the cover of oxids, was broken, the incandescence of the oxids was not only not eliminated, but was, in fact, increased in brilliancy. Although I was then well aware that by such break in the continuity of the core or filament the lamp became virtually an arc-lamp, I did not then think that in so far as the lamp remained an incandescent lamp there be any necessity to protect it by specific claims adapted to this action, and these conditions of my lamp, otherwise fully and correctly described, as in the course of its operation occurred, especially as they did no practical harm, but rather appeared to be a beneficial feature thereof, apt to occur in almost all of its described modifications—namely, that the core or filament but not the oxid-cover around the same at the specified place would break and the lamp nevertheless continue to be serviceable. I understood then, as a matter of course, that I had made an incandescent arc-lamp in the true sense of the word; but as I had done better than I knew in primarily making the lamp with a continuous core and as the one resulted from the other by its common use I believed that my invention be fully protected and secured by claiming that which I had primarily manufactured. I have now reason to believe that for the better protection of my invention I should further file this application, and thereby also specifically claim the lamp, such as it grew under my hands and out of its primary shape by the use that I had intended it for.

I now have developed my invention to new and further perfection in the following manner: Whenever I desire to make use of a break or arc in a conducting-core of carbon and to cause a tube of oxids to bridge over

the break and to preserve enough initial conductivity even after the break to raise the temperature of the oxid-tube to conductivity and incandescence, I cover the core with intermittent rings of a chemically-insulating stratum, and then I cover two successive rings with one tube of oxid, leaving at each end of each tube of oxids a part of the insulating-ring uncovered by the oxid. In about the middle of the tube length the insulation is wanting, and as a consequence a reaction takes place, such as by me described in the ninety-ninth to one hundred and sixteenth lines of page 2 in Patent No. 620,640, but with the modification that a complete interception or break be brought about; but a very minute coat of reduced metal is left on the inner face of the oxid-tube, which is, though of much less conductivity than the original core, yet of sufficient conductivity and resistance to heat the oxids to the point where they themselves become conductive and as a result of sufficient resistance to cause their continuous incandescence. The switching off of the current leaves the lamp in good shape for renewal of operation when the current is turned on again.

As another instance of a modification where a carbon core is selected, I provide such a core with a copper plating the same as an arc-pencil, only of very minute section. Where this copper plating is omitted and bare carbon face in ring shape is exposed, a break will occur and an arc is formed of so minute dimension that it reappears when the current is turned on and produces the heat which makes the oxid-tube semiconductive and luminous. It is evident that the conductivity of the original core in all instances must be less than that of the oxid tube or tubes when heated to their maximum conductivity.

That I have thus specified the method of manufacture and the produced lamp when a carbon core is used is not intended by me to indicate that I select carbon as core material exclusively. As often by me stated in my previous patents, not the material as such, but the possible adaptation in itself or by suitable means applied to the required functions determines in each concrete case the selection of the material for the core, and I may therefore make use of any other material for the core in the now-disclosed lamp.

As an instance where a metal core is used, I cite the use of an alloy of the metals of the platinum class—such as platinum, paladium, rhodium, ruthenium, osmium, and iridium—such as it occurs in nature or artificially produced with suitable proportions of all, or of some, or of any of these metals alloyed with gold or silver or copper or with all or any two of these three; but I prefer an alloy of nearly equal weights of osmium and gold to begin with, because osmium pure cannot be melted, while the stated compound can be melted by applying the proper means, and the product can be hammered and rolled into thin sheets, and the sheets can be cut into strips of suitable width and length. Such parts of such strip as in an unprotected state or without chemical insulation and when heated or under electric current are exposed to oxygen will have the osmium mainly consumed, only the gold remaining, which as such melts under adequate current and breaks, except that some of it will line the inner wall of an oxid-tube, which bridges over the break, and an action takes place which is analogous to that which is described hereinabove in regard to a carbon core. It is in fact irrelevant whether the break causes an arc or whether a residue of the core provides for a reduced conductivity and a consequently-produced heating of the oxid-tube to conductivity and incandescence, the desired effect being the same in either case.

Although I prefer to employ a series of oxid-tubes on the same core, I may occasionally use only one or only two tubes of comparatively larger dimensions, and I may make these tubes either of more or less solid or of porous rare-metal oxid, or I may prepare them with perforations, or I may make them of pseudo fiber, pseudo strands, or pseudo fabrics wound, braided, or woven as tubes or as beads with tubular central channel for the core, and I may provide specific perforations for the access or escape of gases, or I may rely on the porosity of the tube or bead as penetrable to the gases, as by me specified in the seventy-seventh to the eighty-fifth lines on page 3 of my Patent No. 620,640, and by suitable provision in the oxid tube or bead I may foster, limit, or regulate the escape or access of gases in regard to the core of the luminous body in my improved lamp, and in special in regard to that part of the core which is otherwise left unprotected against chemical reaction for the purpose of bringing about a change or modification in its contributory function to the main purpose of producing incandescence also or exclusively of the oxids, and of thereby increasing the light efficiency of my lamp. These provisions must adapt themselves to the different conditions of material selected as that of the core.

The specific purpose of the present application consists in this, that such features of the lamps may be further specified and be secured by specific claims as are connected with the doubt arising in some phases of its use as to its true and temporary nature or as to a continuous core or an intercepted core being utilized.

The drawings that constitute a part of this specification are again in this case, as in my preceding application, essentially the same as originally connected with older applications, but separated therefrom for the purpose of proper division of subject-matter, until finally attached to my Patent No. 621,292, with this one difference, that the luminous body is in specific form adapted to that which is specified in claim 5 of my Patent No. 621,291.

Figure 1 represents a vertical or longitudinal central section of the modification of my improved electric oxid-lamp as forms the subject-matter of this present application mainly. The general arrangement of the main parts of the lamp, such as base and glass bulbs, is the same as shown in my Patent No. 621,292, with the sole difference that the luminous body E being assumed rigid in this case the neck a^2 of the inner glass bulb is made sufficiently wide for admitting the luminant E in rigid or unbent form. The luminant E is shown with only one main interception of or in the oxid-cover, while a plurality of such interceptions is shown in Fig. 4. The intermediate stratum e^4, of chemical insulation, is shown as electrically connected and as electrically continuous, while in Figs. 2, 3, and 5 it is shown as non-continuous, and, in consequence, as electrically non-conductive as a whole, or, in fact, as non-connected. Fig. 2 represents the luminous body of the same lamp enlarged, with the stratum of insulation intercepted inside of the oxid-cover. Fig. 3 represents the same as Fig. 2, when by means of current or heat the original make-up has been modified in either the luminous body shown in Fig. 1 or in Fig. 2. Fig. 4 represents the luminant enlarged of precisely the same character as shown in Fig. 1, with the sole difference that the oxid-cover is intercepted by more than one annular uncovered space on the core. Fig. 5 is the same as Fig. 2, with the same difference as between Figs. 4 and 1.

A signifies the inner glass bulb; B, the base part; C, the outer glass housing; D, the tubular part in the center of the base; E, the luminant part of the lamp; e', the core part or parts of E; e^2, the oxid cover or covers; e^3, cups or suitable equivalents upholding the luminant and providing for connection with the inleading wires; e^4, the insulating stratum, and f' and f^2 the inleading wires.

Notwithstanding the fact that the drawings all relate to such specific modifications of form of luminous body, where the core part is entirely surrounded on parts of its longitudinal extension or on its full length, such complete surrounding is not at all an essential feature or condition in the construction of my improved lamp.

Having described my invention, I now claim—

1. In an electric incandescent lamp a luminant, which consists of two main or functional elements, each of which elements is longitudinally divided into parts, the function of the one element, where it has a gap, being assumed by the other element, which bridges over such gap, the one element being an electrical conductor at normal temperature but resisting to the electric current to the effect of producing heat and light or either within itself—and the other element being an electrical conductor only, when heated to a higher than normal temperature, and being so heated by the heat produced in and by the main conducting element, and without any heat other than such being thereto applied, the main conducting element being longitudinally intercepted into three or more longitudinal parts, as and for the purpose set forth.

2. In an incandescent electric lamp a luminous body which consists of three structural parts, namely an inner or core part, which with longitudinal interception performs the function mainly of conducting and resisting to the applied electric current to the effect of producing light and heat within the said luminous body and a second or intermediate part, which performs the function of insulating the core part from the third or outer part, and a third or outer part which performs the function of being made incandescent by the effect of the current, bridges over interception in the core part and mainly consists of rare-metal oxids, as and for the purpose set forth.

3. In an incandescent electric lamp a luminous body, which consists of two or more structural parts, namely, an inner core part which is longitudinally intercepted, but performs the function of conducting the applied electric current and of resisting thereto to the effect of producing light and heat within the said luminous body, and an outer part or parts, which bridge over interceptions in the core part, consist mainly of rare-metal oxids in the form of pseudo fiber, or fabric, and become incandescent under the influence of the electric current applied as and for the purpose set forth.

4. In an electric incandescent vacuum-lamp a linear current-conducting element, consisting of two or more linear parts longitudinally, all parts having one end positively and the other negatively connected to and within the same current, in combination with a stratum of oxids, covering the said element partly or completely, as and for the purpose set forth.

5. In an electric lamp a current-conducting element, suitably covered on its entire or main length with matter, that does not conduct at normal temperature, and which mainly current-conducting or inner element consists of three or more longitudinal parts or pencils, all of which parts or pencils, except the two end or pole connecting pencils or parts are inserted between the two end pencils and within the longitudinal extension of the main current-conducting element and have each a positive and a negative end, when under electric current.

6. In an electric incandescent vacuum-lamp, the combination with a pole-connecting base, and with an air-exhausted glass bulb, of a luminant, inclosed within the said glass bulb, which consists of two main or functional elements, each of which elements is longitudinally divided into parts, the function of the one element, where it has a gap, being assumed by the other element, which bridges over such gap, the one element being

an electric conductor at normal temperature but resisting to the electric current to the effect of producing heat, and the other element being an electrical conductor only, when heated to a higher temperature, the latter element covering the mainly conducting element, as a core, in part only, itself consisting longitudinally of more than two parts and the core part or mainly conducting element consisting of not less than three longitudinal parts, as and for the purpose set forth.

7. In an electric incandescent lamp a luminous body or structure which consists of two main or functional parts, namely an inner current-passing and current-resisting core or filament, which under current produces light and heat or either and a non-continuous cover, or a series of two or more outer concentrical parts, which leave annular spaces uncovered on the surface of the core part, and which cover or series of cover parts consist of rare-metal oxid mainly, as and for the purpose set forth.

8. In an electric incandescent lamp a luminous body or structure, which consists of three main or functional constituents, namely an inner current-passing and current-resisting core or filament, which under current produces light and heat or either, a non-continuous cover or a series of two or more outer concentrical parts, which leave annular spaces uncovered on the surface of the core part, and which outer parts consist mainly of rare-metal oxid, and a chemically-insulating stratum or strata between core and oxid, such stratum or strata of insulation being electrically non-connected or non-continuous, as and for the purpose set forth.

9. In an electric incandescent lamp a luminous body or structure, which consists of two functional main constituents, namely an inner core or filament, chemically insulated from the other or outer part or parts, such insulation being itself of electrically-conductive material, but longitudinally intercepted by annular non-insulated surface parts of the core, and an outer partial coating of rare-metal oxid, adapted in shape and dimension to be similar to the intermediate rings of insulating material, as and for the purpose set forth.

10. In an electric lamp a luminant, consisting of a conductor, divided into five or more parts, of which an odd number of parts, including the extreme end parts, are made of material of higher electric conductivity than the two or more serial even parts, the two or more serial even parts being heated by their resistance to the main current, which passes through them by means exclusively of the odd parts and which two or more even parts become luminous by means of such current.

11. In an electric incandescent lamp a light-producing part which is a compound conductor, consisting of two or more different cohesive conducting elements, namely a primary, in itself continuous-conducting element, which conducts at normal temperature, producing heat by resistance, which resistance is higher than that of the other or secondary conducting element, which secondary element is not continuous but longitudinally intercepted and conducts only, when heated to higher than normal temperature by the heat produced, as aforesaid, in the primary conducting element, and which secondary conducting element, when so heated and conducting offers less resistance to the applied current than the primary conducting element.

12. In an electric lamp a luminant, which consists of a main but intercepted conductor, which conducts at normal temperature, and of an accessory conductor, which conducts only, when heated by heat, that is produced in or by the main conductor, by means of adequate resistance offered to the applied current by the said main conductor, and which accessory conductor bridges over the interception in the main conductor and incandesces when under current, the contact between the two conductors being protected against corrosion by an intermediate film of chemically-insulating material.

FRANCIS M. F. CAZIN.

Witnesses:
O. S. BURR,
MINNA E. CAZIN.