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PATENTED FEB. 19, 1907.

F. M. F. CAZIN.
LUMINANT IN ELECTRIC INCANDESCENT LAMPS.
APPLICATION FILED JULY 27, 1899.

Fig. 1.

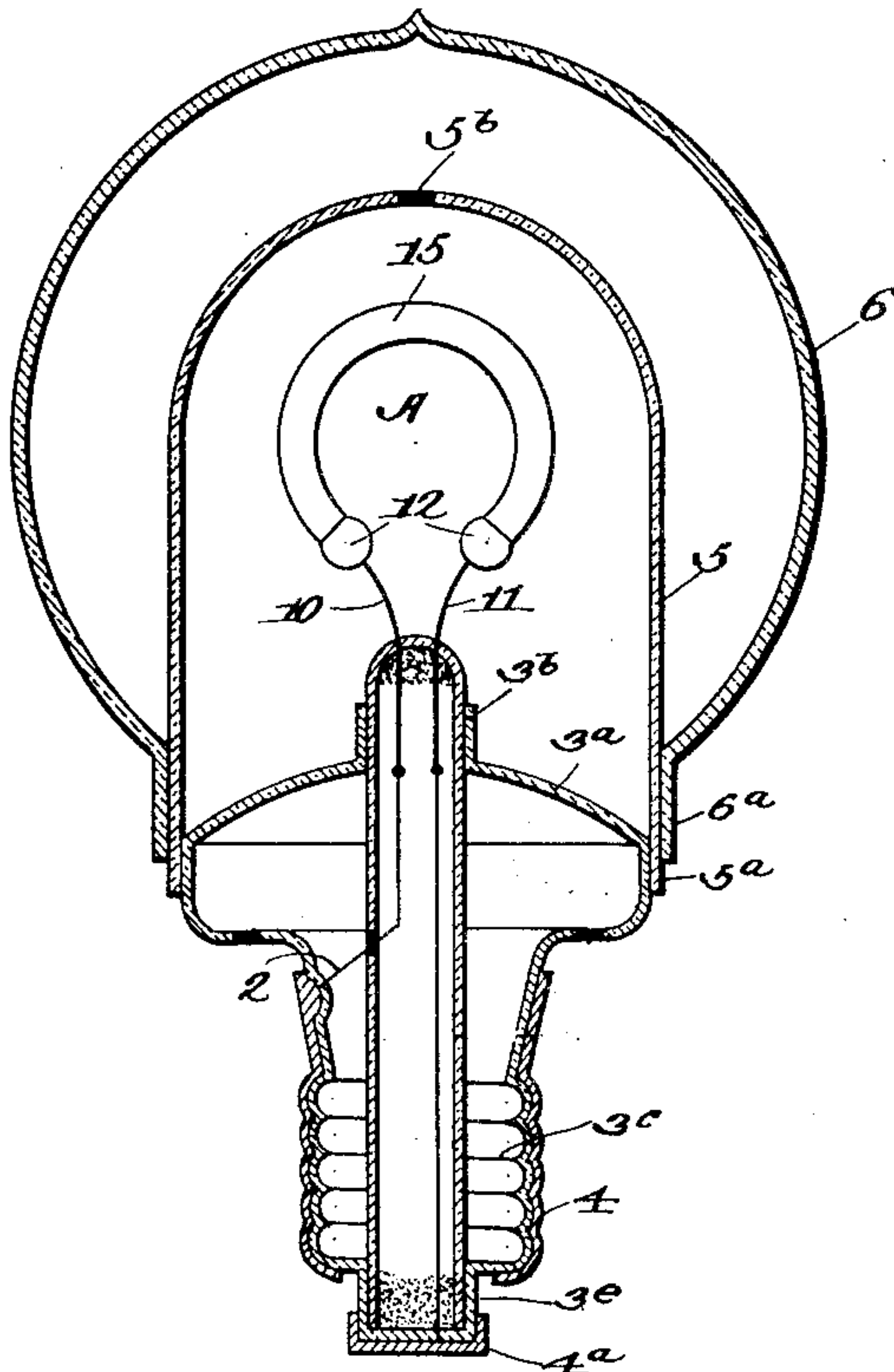
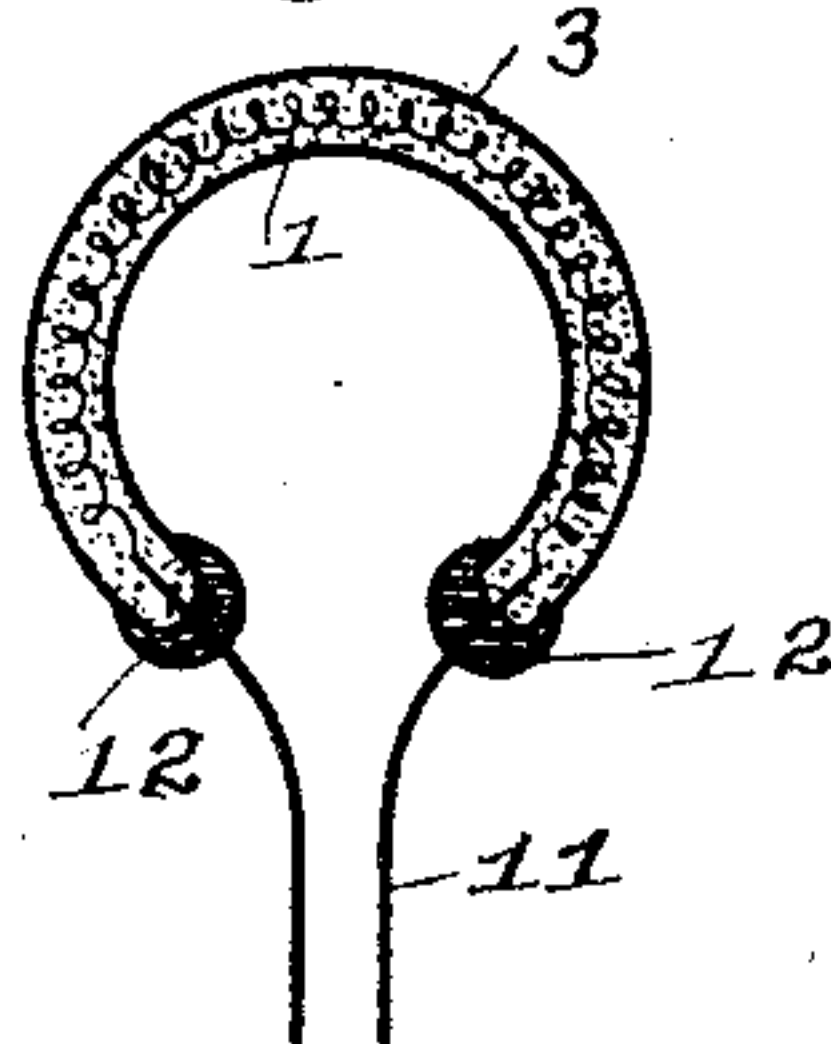


Fig. 2.



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

LUMINANT IN ELECTRIC INCANDESCENT LAMPS.

No. 844,778.

Specification of Letters Patent.

Patented Feb. 19, 1907.

Application filed July 27, 1899. Serial No. 725,283.

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 the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in for Luminants 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. 523,460, of July 24, 1894, and No. 523,461, of same date, and No. 566,285, of August 18, 1896; No. 620,640, of March 7, and Nos. 621,291 and 621,292, of March 14, 1899, and No. 640,620, of January 2, 1900, and to all the applications therefor, 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, and, as conditioned on such identity of purpose and similarity of subject-matter, as well as to facilitate a clear and full understanding of the improvement claimed by this application, I have selected from these my prior applications a few parts to recite, and in special does applicant propose to congregate all matter herein which has been objected to as new in his application Serial No. 704,218, in order to preserve the continuity as between this application and its predecessors by the same applicant.

In my prior application, Serial No. 704,218, filed February 2, 1899, and since renewed on April 15, 1902, as Serial No. 102,993, and on which Patent No. 835,938 was issued on November 13, 1906, I have described certain improvements in the luminant for incandescent electric lamps consisting of a metal core covered with a film of metal having less affinity for oxygen than the metal of the core embedded in rare-metal oxids, which under the influence of heat generated by the passage of electric current become luminous.

This, my present invention, relates to certain improvements upon the structure dis-

closed in said previous application in that I now prefer to construct the core of metal or metals of the ruthenium-osmium class and preferably of an alloy of two or more such metals, the same to be coated with alloy of metal of less affinity for oxygen than the core metal.

It is my intention, therefore, to secure patent for using, in combination with a filament proper, an accessory conducting part or layer such as mentioned in my Patent No. 621,291 in the statement, page 3, lines 111, &c., where the statement is made that "the essential conditions for practical light increase" are "that between these" (surface) oxids and the filament" (proper) "there be intercohesiveness and that filament and oxids be insulated" by an intermediate stratum "as not to deteriorate one another," and the selection of material for the intermediate layer is limited only by functional requirements, as often explained, the base metals of the oxids of the surface layer being functionally fit and adapted.

I have used hereabove the word "alloy" in its older sense, specifying a metallic compound in portions of the single metals entirely independent of their proportional atomic weight.

My invention further consists in the construction, arrangement, and combination of the several parts of which it is composed, and which will be hereinafter more fully described and claimed.

In the matter of visible form of my improved luminant I have disclosed different forms of luminous bodies, according to the functions assigned thereto and to the parts thereof, any one of which forms may be selected. All and every form which adapts itself to the functional conditions assigned to the different improved parts is embraced in my improvements.

The figure represents a view of the luminant as claimed inclosed in glass parts and equipped for current connection in a similar manner as by me shown in my prior applications.

The symbols marked on said figure indicate parts as follows, namely:

1 and 2 indicate the inleading and outleading wires.

3 indicates the main all-glass base part, with the following subparts, namely: 3^a, the reflecting top face of such base; 3^b, the open tubular collar, intended to hold hermetically

the upper part; 3^e, the inverted test-tube, sealed hermetically at both ends, though perforated by an in or out leading wire, or by both, by means of fused glass-powder, held in place at both ends by collars of the base 3; 3^c, the smaller and screw-shaped end of the main all-glass base 3; 3^d, the openings in the all-glass base 3 for air circulation and the differential cooling of 3^a.

4 indicates one and 4^a the other pole-cap of the lamp.

5 and 6 indicate an inner and an outer hermetically-sealed air-exhausted glass bulbs, with 5^b a perforation of 5 for the purpose of simultaneous air evacuation.

10 11 indicate the exposed parts of the in and out leading wires.

12 indicates the terminals of the luminant 15.

15 15 indicates in exaggerated size and in an exterior view the luminant, the composition and construction of which is described in this specification.

In regard to the luminant thus shown I refer to my general statements in my Patent No. 620,640, in line 96, on page 1, describing the same in the matter of general structure as follows: "The luminous body as such is an integrally-compound body or an integral structure of different materials, though of different composition chemically, physically in immediate and permanent contact with one another"; and in lines 88, &c., on page 2: "The dimensions that I am dealing with in making up the luminous body or structure are altogether extremely minute, and its component parts or elements or materials can in consequence not be otherwise than of extremely minute dimensions and cannot be of thicknesses that can by common means be measured, though in still so minute thicknesses they by their chemical and distinct nature perform the function to them assigned;" and in regard to the state that I use metals in when they enter into the construction or composition of my improved luminants I refer to my Patent No. 640,620, issued on January 2, 1900, or to my application of March 21, 1899, (forty-eight days prior to this application,) viz., to the fifty-fourth line on second page of the said patent, which reads as follows: "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—as occurs in nature (iridiosmine) or artificially produced, with suitable proportions of all or of some," and "when in my prior applications I disclosed the selection of a metal for making therewith a filament of the highest practicable fusion-point, or of a metal of the ruthenium-osmium class, I intended to use the metals of this class indiscriminately, singly or together, viz., as alloys; and in one of my methods

I alloyed with one or more of these metals another metal of a lower point of fusion;" and the general inner structure of my improved electric incandescent lamp as herein claimed has been by me disclosed in my Patent No. 620,640 and illustrated as Fig. 8 to the said patent, such figure being described, (page 4, line 2): "Fig. 8 represents the luminous body in my improved lamp with a filament of curvatures" (longitudinally, such as loops, &c.) "as now commonly used and with successive layers of material adapted to such filament and curvatures."

Fig. 2, representing a luminant exclusively, illustrates the same as consisting of a spiral-formed metallic current-conducting core, of a layer or layers of metals, be they plated singly or as alloys unto the said core, and modifying the spiral form of the metal core as such into a simple cylindrical form for the luminant as a whole, and a surface coating, which may consist of metal of less affinity for oxygen than that of the core metal or metals and may have an oxidized surface or not.

I do not wish to be understood as limiting it in any way to the theoretical statement that the rare-metal oxids become in themselves conductive by heat and subsequently accessory conductors, as the nature of my invention is entirely independent of whether or not such be the case, it being based merely upon the construction employed whereby the rare-metal oxids, from whatever cause it may be, become luminous when the main conductive element is connected in circuit with the proper voltage; nor do I wish it to be understood, contrary to my conception of my invention, that the application of an embedding coat or of a surface coating of rare-metal oxids be limited to any kind of my infusible-metal filaments exclusively, but that such coat or coating is applied by me as well to a metallic core as well as to such a core protected by a metallic chemical insulating coat, since, as fully explained in my Patent No. 620,640, page 2, lines 99 and following, there is under current applied an automatic reaction between a conducting-core which has affinity for oxygen, on the one hand, and rare-metal oxids, on the other hand, both being in adequate proportion, by which reaction a part of the oxids is reduced to metal and as such then forms a chemical insulating metallic stratum or intermediate coating.

The filament as proposed in this application consists of metal of the ruthenium-osmium class or of an alloy of said metals, the metals of the said class being confined to those combining a high point of fusion with affinity for oxygen and including wolfram, uranium, manganum, rhodium, iridium, and thorium, as well as others of like characteristics.

A further characteristic quality of these

metals is their brittleness or their capability of being powdered in their normal pure or native state; but it should not be overlooked that while I have divided out of this application as now amended all reference to a primary conductive element other than of metal and as hereabove specified I have originally designed and disclosed the utilization of and the combining with a body or stratum or film of oxygenated rare metal of precisely-specified qualities, in connection with the conductive element of an electric lamp, as conditioned exclusively on the quality of the conductive element to conduct, be it by its natural qualities or by artificial preparation thereof, such as reducing excessive conductivity by powdering such as may be powdered by mechanical means or by making compounds or alloys thereof with matter of less conductivity, or be it by reducing the transverse section to cause the solid linear mass to become incandescent and to so produce light. (Compare my Patent No. 523,460, page 2, lines 128, &c.)

In the matter of form I declared, among other things and as in special applicable to the lamp as illustrated herewith, as follows: "The form of a spiral serpentine curve * * * is simply one of the innumerable shapes which might be chosen," (compare my Patent No. 523,461, page 2, lines 54, &c.) and I described the functional purposes of the oxid-body stratum or film in the luminant-body as "a solid bearing in or on its face and integral therewith lines of matter adapted to heat the solid body by means of the dark heat-rays produced by the electric current under adequate resistance." (Compare my Patent No. 566,285, page 3, lines 14, &c.)

In the matter of material selected applicant has never waived his declaration in his Patent No. 621,291, lines 55, &c., namely: "I have in all of my preceding applications qualified the current passing and resisting filament by function and not by material." (Compare my patent No. 621,291, page 1, lines 55, &c.) In corroboration of this my declaration the Board of Examiners-in-Chief in an appeal in the matter of the last-mentioned patent or of the application therefor of October 29, 1895, decided as follows: "The use of a metal filament was not specifically mentioned, although the language used was such as to indicate that applicant's invention was broad enough to include any material the equivalent of carbon and having the properties indicated."

In relation to the rare-metal oxids used in some of my improved electric lamps it should be stated that they have by me been qualified mainly as follows: "My improved lamp has a body of solid material, which body consists of dielectric or non-conductive materials, which will not fuse at the temperature pro-

duced in the lamp and which all or in part are peculiarly adapted to become luminous," (compare my Patent No. 620,640, page 1, lines 66, &c.) and in the matter of using or not using a stratum of chemical insulation between the primary conductive element and the rare-metal oxids in my improved electrical luminants I have adhered to my declaration as contained in my Patent No. 621,291, page 1, lines 74, &c., namely: "I may or may not use an intermediate film that insulates the filament from the coat both electrically and chemically or to one" (only) "of these purposes."

The fact that metals of the above class have affinity for oxygen precludes their use in the eventual presence of oxygen without some means of protecting them against oxygenation, and for this I provide a chemical insulation consisting of a fine metal having virtually no affinity for oxygen—namely, gold, silver, platinum, &c.—which is applied in the form of a thin coating 2. Such main conducting element consisting of a core and eventual chemical insulation, such as herein described, may then be embedded in a body 3, constituting the accessory conductive element above referred to, which element may consist of rare-metal oxids, the words "rare-metal oxid" being used in contradistinction to the oxids—such as magnesia, lime, and silica—of metal having virtually no affinity for oxygen or having, as above indicated, materially less affinity for oxygen than those of which the core is mainly made—viz., of metals which form solid oxids or such as form oxids as may be used as surface coating to my luminants, and which metals then in themselves form the rare-metal-oxid body in which the luminant is embedded, becoming, under the influence of heat generated by the electric current, highly luminous.

As the metals selected by me to form the core are preferably of high fusion-point, difficulty is encountered in shaping them into the filaments or core of the proper dimensions, and for overcoming this I have devised a method which also forms the subject-matter of this invention. In carrying this out I alloy with the selected metal or metals of the ruthenium-osmium class another metal, such as copper or some other one of lower fusion-point than the point of fusion of the ruthenium-osmium metal or alloy, and from such composite alloy of metals of low and high fusion-point metals shape the core or filament. This having been reduced to the desired shape, I eliminate the low-fusion-point metal. This may be done either by subjecting the core mounted upon a porous base-plate to a temperature sufficient to fuse the metal of lower fusion-point which is absorbed by the base-plate, or I eliminate the copper or equivalent metal by a chemical reaction in

a suitable solvent removing the metal by a suitable diluted acid which leaves the high-fusion metal or metals unaffected, due to the chemically-resisting nature of the metals of the ruthenium-osmium class.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A luminant for an electric incandescent lamp, being a combination of alloys of metals in layers of higher and lower affinity to oxygen, the latter coated on their exposed surface with their own oxids.

2. A luminant for an electric incandescent lamp, being a combination of an alloy of metals, having a high point of fusion, brittleness in their native state and affinity for oxygen, and of a covering of an alloy of rare metals, which have less affinity for oxygen, which is coated with their own oxids.

3. A luminant for electric incandescent lamps, being a combination of the alloys of metals of higher and of lower affinity to oxygen, the former being an alloy of metals of the ruthenium-osmium class, which have a high point of fusion, brittleness in their native state, and affinity for oxygen, and the latter being concentric with but on the outside of the former being an alloy of so-called rare metals and of less affinity for oxygen and coated on their outside with their own oxids.

4. A luminant for an electric incandescent lamp, being a combination of concentric layers of alloys of metals, the metals of the outside layer having less affinity for oxygen than the metals of the inner layer and being in part of their thickness oxidized on the surface, a metallic, chemically-insulating contact with the inner layer being preserved.

5. A luminant for electric incandescent lamps, which consists of concentrically-adhering parts, the inner part being an alloy mainly of metals of the ruthenium-osmium class, which combine with a high point of fusion and brittleness in their native state, affinity for oxygen, and the outer part, which is exposed to the surrounding space on its entire filament-shaped surface, consisting of metals of mainly less affinity to oxygen, called rare metals coated with their own oxid.

6. The method of manufacturing luminants for electric incandescent lamps, which consists in preparing a filament of an alloy of metals of the ruthenium-osmium class and in completing a luminant, of filament shape and exposed to surrounding space with its entire surface, by coating the filament with other metal of less affinity for oxygen, called rare metals, and by coating these rare metals on their outer surface with their own oxids thereby forming a combination of con-

centric metal and oxid layers in filament shape.

7. The method of manufacturing luminants for electric incandescent lamps, which consists of primarily making a filament of mainly an alloy of metals of the ruthenium-osmium class, which combine with a high point of fusion and with brittleness in their native state, affinity for oxygen, and then covering the same with an alloy of metals of less affinity to oxygen, called rare metals, and by finally coating this alloy of rare metals with their own oxids, leaving the surface of the luminant exposed to the surrounding space on its entire exterior thereby forming a combination of concentric metal and oxid layers in filament shape.

8. A luminant in an electric incandescent lamp, which consists of a permanent metal alloy core, covered with a film of other metal of less affinity for oxygen than the metal of the core.

9. A luminant or filament in an electric incandescent lamp, which consists of a plurality of permanent layers of different metal alloys, composed of metals of a different degree of affinity for oxygen, the alloy composed of metals of least affinity for oxygen being upon the outside.

10. A luminant or filament in an electric incandescent lamp, which filament consists of a plurality of layers of different metal alloys, which alloys are composed of metals, that have different degrees of affinity for oxygen, the central alloy of which is composed of the more oxygenatable and more infusible metals.

11. In the luminant of an electric incandescent lamp a conductive element or filament, which consists of metal alloy, having affinity for oxygen and a high point of fusion, coated with metal of less affinity for oxygen.

12. A luminant for an electric incandescent lamp, which consists of a conductive filament of layers of different metal alloys, and of a coating thereon of rare-metal oxids.

13. In a luminant for an electric incandescent lamp a filament, which filament consists of a metallic core having a high point of fusion and affinity for oxygen, and of an electrolytic plating thereon of a metal alloy, having little affinity for oxygen, the whole being embedded in rare-metal oxids.

14. The combination in a luminant for an electric incandescent lamp, of a core of metal alloy, the component metals of which alloy have affinity for oxygen and high points of fusion, and of an insulating coat therefor, and of a surrounding light-emitting body.

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