O. M. THOWLESS.

ILLUMINANT FOR ELECTRICAL INCANDESCENT LAMPS.

APPLICATION FILED MAY 13, 1909..

985,474. Patented Feb. 28, 1911.

Fig. 1.

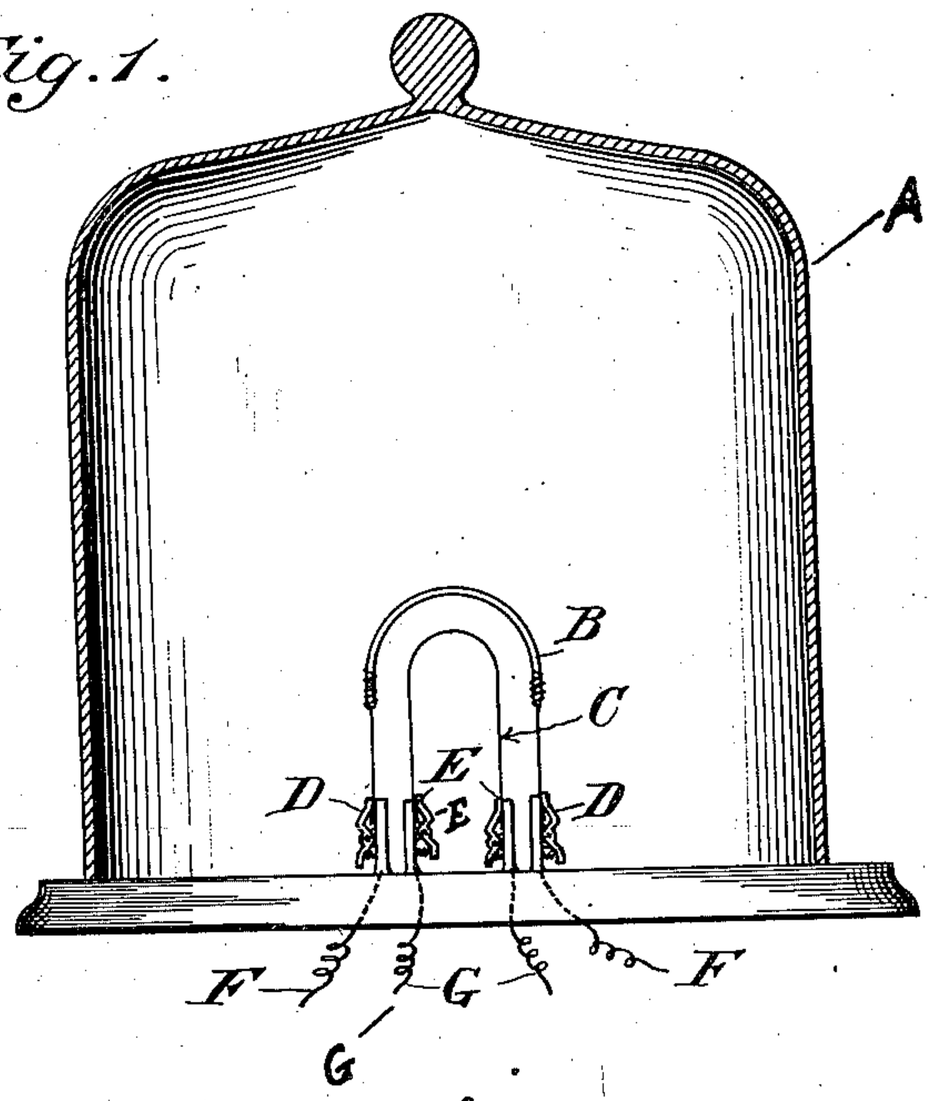
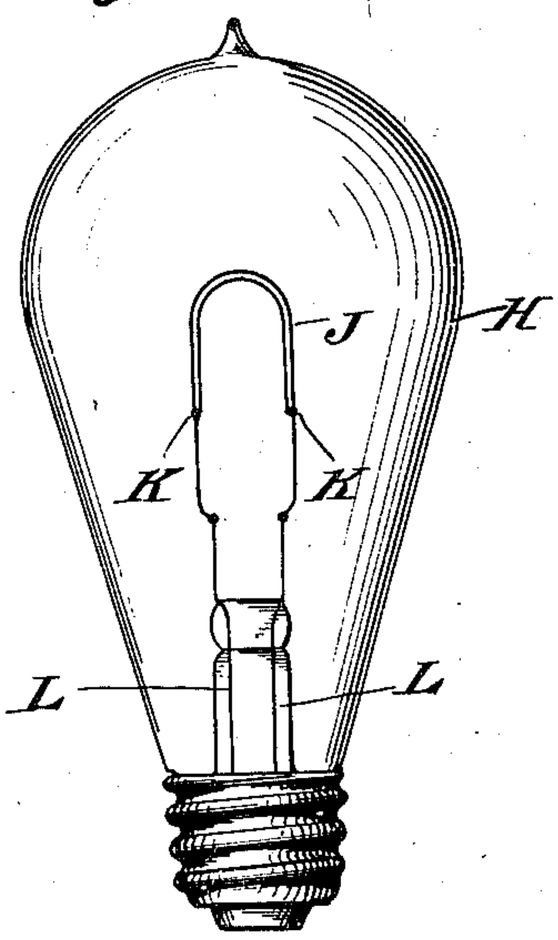


Fig 2.



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ILLUMINANT FOR ELECTRICAL INCANDESCENT LAMPS.

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To all whom it may concern:

Be it known that I, ORLANDO M. THOWLESS, a subject of the King of Great Britain, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Illuminants for Electrical Incandescent Lamps, of which the following is a specification.

My invention relates to a new and improved illuminant for electrical incandescent lamps.

The object of my invention is to provide an electrical incandescent lamp with an illuminant consisting of a body of material which is highly refractory, capable of giving a proper incandescent lighting effect in an economical manner and not expensive in its construction. To attain this object I form a rod or filament of the shape and size required, made chiefly of oxids of refractory metals, and by the method hereinafter set forth I cause a change to take place in the composition of the rod or filament so that refractory conductive material is reduced from the oxid and incorporated with it to such an extent that a good conducting illuminant is obtained.

As an illustration of the method of making my illuminant, I form a rod or filament (which for future reference I will term "the glower") of a mixture of powdered oxids of refractory metals or of refractory metallic oxids or a mixture of one or more such oxids with a small quantity of flux and after properly shaping it I subject it to a very high temperature, such as the oxy-hydrogen flame until the particles forming the glower are fritted together into a vitrified condition. A mere mixing and baking will not produce a glower capable of carrying current when heated until its particles have been sweated or fused together so that the glower will present a vitrified appearance and be very closely united into a solid structure.

The method, above described, will produce a glower which is normally a non-conductor of electricity, but possesses the quality of becoming a good conductor when properly heated. It is then mounted and is ready for further operation. The next step is to reduce part of the metal, contained in the glower as oxid, into metallic form, and this may be accomplished by placing the glower in a bell-jar or in a lamp-bulb, and then transferring conductive material onto the glower from a filament or rod placed near it, which has already received a deposit of conducting material by the "flashing process," or a suitable conductive substance may be used, capable of giving off minute particles under the action of an electric current in an exhausted receptacle. For instance, if conductive material such as carbid of silicon or carbid of boron be deposited, by flashing, on an electric-arc pencil, or on an electrical incandescent filament, or if rods or strips of such substances are placed in a flashing-jar or in a lamp-bulb near to an oxid glower such as herein described, and an electric current caused to traverse the pencil or filament, raising it to a rather high temperature in an exhausted chamber, the conductive material of the pencil or filament will be decomposed, and part of it will be ionized or vaporized into a mist of very minute particles, which will be deposited on the glower. In case either carbid of silicon or carbid of boron is selected for the material to be ionized, a deposit of silicon or boron or both, if both carbids are used, will be formed upon the glower, and this deposit serves as a conducting and heating medium, and as a reducer of metal held in oxid form in the glower. The glower may then be mounted between terminals in the well-known way, excepting that great care must be taken in making a joint between the leading-in-wires and the glower. Carbon cement is not a very good material to use for this purpose, so it is better to make the immediate connections between the glower and the leading-in-wires by means of tantalum wire, on account of its high melting point, but the leading-in-wires should be of platinum where they are sealed to the glass stem of the lamp.

When the glower is properly connected in the lamp-bulb, the latter is exhausted of air, and while still under the pump's action the glower is raised to quite a high temperature by means of an electric current traversing it. It will be found that the silicon deposit will act upon the oxid of the glower and cause a reduction of metal therein, and by reason of the heat and the fineness of the silicon ions or particles, the reduced metal will be uniformly dissolved into, what is known as, "solid solution," for the oxid metal will not only be reduced on the sur-

face, but it will be found that all through the glower a reduction and incorporation of metal takes place, so that an even distribution is held in solid solution throughout, in such a manner, that the metal and oxid are as closely united as though melted together. This glower is therefore not an ordinary mixture of metal and oxid, but is a closely-united, structurally-solid, vitrified glower holding in solid solution sufficient conductive material to make it a proper conductor at normal temperatures.

Another way of making my illuminant is to prepare the oxid glower as previously described, then mount it in a bell-jar or lamp-bulb and, after exhausting the air therefrom, bring into connection with the terminals an alternating current of say 500 volts pressure, when a cathodic discharge will occur in the receptacle, appearing first around each connecting wire and then gradually creeping along the glower from each terminal until the two glows meet, when the glower will become a conductor of electricity and be raised to a high temperature, the voltage will fall, and in this heated state oxygen will be given off which is pumped out as it forms, so that metal will be reduced from the oxid.

The oxygen may in some instances be removed by mixing red phosphorus with wood alcohol, and placing it in the stem of the lamp-bulb or in the bell-jar, as the case may be, and heating it, which causes it to change to yellow phosphorus. This latter takes up oxygen as rapidly as it is given off.

The oxid used for the glower may be such as thoria, zirconia, yttria, or one or more of these may be mixed with one or more of oxid of titanium, tantalum, tungsten, molybdenum, chromium, manganese, niobium or others, or these latter may be used in any suitable combination.

Instead of a solid glower a hollow one may be used, or one filled with a refractory non-conductive core, or with some similar substance.

A direct deposit may be made upon the oxid glower by flashing the reducing material without the intervention of the flashed pencil or filament, for instance, silicon may be so flashed from a halogen salt of silicon, such as the tetrachlorid, in the presence of a reducing gas, which may be hydrogen. The receptacle containing the glower may then be pumped out and the method proceeded with as hereinbefore described.

In the accompanying drawings I show in Figure 1, a bell-jar, A, containing an oxid glower, B, having near it a filament, C, to be used for the ionizing of the glower, B, holding-clamps for the glower are shown at D, D, while E, E, are similar clamps for holding the filament, C. The connecting wires leading to the clamps of the glower, B, are shown as F, F, while those for the ionizing filament, C, are shown as G, G.

I show in Fig. 2, a completed lamp, wherein the lamp-bulb is shown as H, the finished illuminant as J, the immediate connecting wires as K, K, and the leading-in-wires as L, L.

What I claim is:

1. In an electrical incandescent lamp a current-carrying illuminant vitrified throughout and conductive at ordinary temperatures.

2. In an electrical incandescent lamp an illuminant composed essentially of refractory conductive material and refractory oxid vitrified throughout.

3. In an electrical incandescent lamp an illuminant vitrified throughout and composed essentially of refractory metal and refractory oxid.

4. The method of making an illuminant for an electrical incandescent lamp which consists in forming a glower of oxids of refractory metals, raising the glower to a fritting temperature, exhausting the air, taking up the oxygen given off and reducing oxid material to produce sufficient conductive material therein to allow a current to pass at ordinary temperatures.

5. The method of converting a vitrified normally non-conductive oxid glower into a conducting illuminant at ordinary temperatures which consists in reducing sufficient material within the glower to make it normally conductive.

6. The method of making an illuminant for an electrical incandescent lamp which consists in forming a vitrified refractory oxid glower and thereafter reducing oxid therein to metal.

7. The method of making an illuminant for an electrical incandescent lamp which consists in forming a vitrified glower of oxid of refractory metals and then causing oxygen to be given off therefrom and oxid reduced therein to metal.

8. The method of making an illuminant for an electrical incandescent lamp which consists in heating a vitrified glower by means of a cathodic discharge and, when the glower becomes conductive, reducing oxid material therein to metal, thereby forming a normally conductive illuminant.

9. The method of making an illuminant for an electrical incandescent lamp which consists in heating a vitrified glower, formed of a mixture of oxids of refractory metals, maintaining the heat while the glower is under an air-exhausting action, reducing part of the material forming the glower and producing metal therein.

10. The method of transforming normal electrical non-conductive vitrified glowers into conductors at ordinary temperatures suitable for illuminating purposes which consists in reducing part of the material

forming the glowers and to produce sufficient conductive material therein to allow a current to pass at ordinary temperatures.

11. The method of making an illuminant for an electrical incandescent lamp which consists in heating a normally non-conductive vitrified glower to a conductive temperature, maintaining the heat under an air-exhausting action, reducing material therein to metal throughout all parts of the glower and causing the reduced metal to unite in solid solution with the unreduced material.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

ORLANDO M. THOWLESS.

Witnesses:
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ARTHUR J. THOWLESS.