No. 830,477. PATENTED SEPT. 4, 1906.

J. W. FORSTER.

INCANDESCENT LAMP.

APPLICATION FILED MAR. 24, 1905.

Fig. 4.

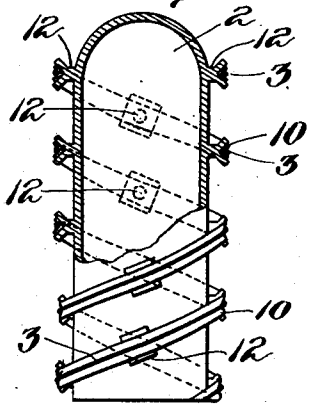


Fig. 5.

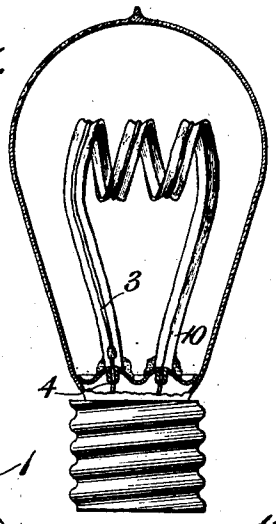


Fig. 1.

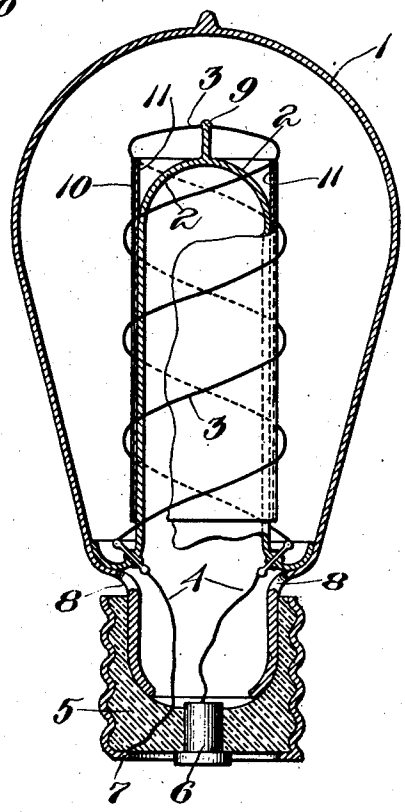


Fig. 2.

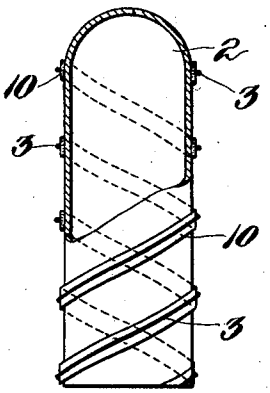
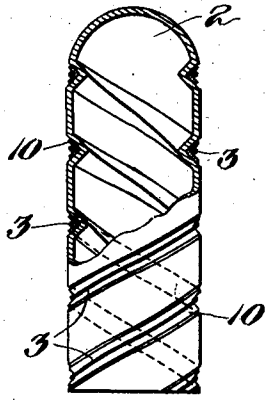


Fig. 3.



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UNITED STATES PATENT OFFICE.

JAMES WRIGHT FORSTER, OF CHICAGO, ILLINOIS.

INCANDESCENT LAMP.

No. 830,477. Specification of Letters Patent. Patented Sept. 4, 1906.

Application filed March 24, 1905. Serial No. 251,725.

To all whom it may concern:

Be it known that I, JAMES WRIGHT FORSTER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Incandescent Lamps, of which the following is a specification.

This invention relates to incandescent lamps.

The object of the invention is to increase the power and efficiency of incandescent lamps operated by electricity and to reduce the expense of this method of illumination.

In incandescent electric lamps at present used a filament of carbon is arranged in a vacuum, and when a current of electricity is passed through the filament the heat resulting from the resistance of the carbon raises said carbon to a state of incandescence. The heat thus generated radiates from the filament and is dissipated and wasted.

It is one object of the present invention to provide a heat-absorbing surface closely adjacent to the incandescent filament to receive and absorb heat therefrom, said surface becoming heated thereby to a state of independent incandescence.

In one form of the invention a vacuum-bulb is provided, into which an axial pole projects, bearing the material which is to be rendered incandescent by heat received from the filament, and a filament of high resistance to serve as a conductor for the electric current is coiled around the pole closely adjacent to said heat-absorbing surface. Heat from the filament is radiated to said surface and raises the temperature thereof, and some heat is radiated back from said surface to the filament, thus serving to conserve the heat of the filament.

In order to support the polar incandescent surface suitably, the invention also comprises means to allow for expansion and contraction of the pole and the contents thereof by providing a chamber within the pole and a passage therefrom to the external air.

Other objects of the invention appear hereinafter.

In the accompanying drawings, Figure 1 represents one of my improved lamps, partly in longitudinal section. Fig. 2 represents, partly in section, a detail of another form of the invention. Figs. 3, 4, and 5 represent, partly in section, details of still other forms.

Referring to the drawings, 1 is a glass bulb similar to those ordinarily used for incandescent electric lamps containing a vacuum. Within the bulb is a filament 3, having high electrical resistance, connected to terminals of an outside electrical current through leading-in wires 4. It is shown in the drawings as it may be arranged in connection with an Edison base 5 of the type now in use, in which one electrical terminal 6 is at the axis and the other terminal 7 is at the screw circumference of the base. The interior of the bulb also contains within the vacuum and adjacent to the filament 3 a suitable substance 10, which is arranged to absorb heat from the filament and which becomes luminiferous from the heat thus absorbed. This is hereinafter referred to as the "luminiferous" material. While the use of a refractory non-conductor of electricity for this material is preferred—such as magnesia, alumina, or thoria—it is not necessary that the material be non-combustible, because it is surrounded by the vacuum. The luminiferous material need not under all circumstances be a non-conductor of electricity. The advantage of employing a non-conductive material is that if such material be used less pains need be taken to keep the filament out of contact therewith, while if a conductive material be employed it is desirable to mount the filament so that it will be closely adjacent but not in contact with such material.

The luminiferous material may be mounted within the vacuum and adjacent to the filament in any suitable way. A convenient way is illustrated in the drawings and consists of a central pole or support 2, which projects into the bulb from the base thereof. The luminiferous material may be supported by this pole and the filament 3 coiled spirally around the same adjacent thereto, and the filament may be anchored to the pole at one or more places, as indicated at 9. In Figs. 2 and 3 the luminiferous material 10 is mounted directly on the glass of the pole. In Fig. 1 it is separated from direct contact with the pole by an intermediate casing or sack 11, of asbestos or other non-conductor of heat, and in Fig. 4 it is separated by the vacuum, being carried on a series of small piers 12. In Fig. 1 the material is mounted on the outside of the asbestos sack, and the latter is mounted on the pole. If a casing be employed, as is indicated in Fig. 1, the same may be either permanently or removably affixed to the pole and may consist of a tube or sack, of a suitable non-conducting fabric or substance,

which may incase the pole and at the same time bear the luminiferous material on its outer surface, thus protecting the glass of the pole from the intense heat. The filament 3 is preferably arranged close to the surface of the luminiferous material. When a current of electricity passes through a filament, the same becomes heated and becomes incandescent in the ordinary and well-known manner. In addition to becoming incandescent the filament radiates heat to the adjacent layer of luminiferous material 10, which in turn becomes incandescent because of the heat thus received. This is additional to the incandescence of the filament, and the operation of producing it does not detract from the incandescence of the filament itself. On the contrary, it conserves heat, and heat is radiated from it back again to the filament. The interior of the pole 2 may be hollow, and openings 8 afford free communication between said interior and the outside air. The expansion and contraction of the pole, due to the changes of temperature at its surface, are thus prevented from injuring the remainder of the lamp. When the pole expands, air may enter through these openings, and when the air within expands from the heat of the pole it may pass out without increasing the pressure within.

In the form of the invention in Fig. 1, in which asbestos or other opaque material incases the pole, the light from one side of the pole is obscured from the observer, only the side near him being visible. In the form shown in Fig. 2 the luminiferous material is mounted directly on the glass pole and is in the form of a spiral strip. The glass being transparent, it follows that when the strip becomes luminous practically all parts of it are visible from all sides of the lamp.

In Fig. 3 a form is shown having higher efficiency for conservation of heat. In this form the pole has a spiral groove in its exterior surface, which groove is coated with the secondarily luminous strip, with a V-shaped exterior, the filament lying close thereto within the V, either in contact or nearly in contact, as may be desired. In this form the filament being half surrounded by the secondarily luminous material, half of the heat-rays which radiate from it strike said substance, and for the same reason a larger proportion are radiated back in turn to the filament.

Inasmuch as the luminous strip is always in a vacuum it may be made of any material which can be rendered incandescent by heat. Preferably it is made of a material which becomes incandescent at a low temperature, and it may be mounted directly upon the glass, or there may be an intervening refractory substance or non-conductor of heat to protect the pole from the effects of its heat.

In the form indicated in Fig. 4 the pole is protected by carrying the filament and secondarily luminous material upon a series of small supports, both being entirely surrounded by the vacuum, and the vacuum thus protects the central pole. It is obvious also that by suitably modifying the construction the central pole might be dispensed with altogether and the secondarily luminous material supported by its own strength or in some other way—for example, as filaments in the ordinary electric incandescent lamps now in use are supported. One such modification is shown in Fig. 5, in which a V-shaped strip of material is arranged in spiral form, the filament lying within the V. This material is strong enough to sustain its own weight, and, as in the other forms, the strip may be arranged with the side toward the filament a ready absorbent of heat and the side remote from the filament provided with a non-conducting or non-radiating surface to retard the emission of heat from the strip except in the direction of the filament.

The luminiferous substance may be made in any suitable way and may be either in the form of a continuous strip or may be a fabric rendered refractory by thoria or otherwise, while if same be kept out of contact with the filament the side nearest the filament may be coated with lampblack or other ready absorbent of heat, while the other side may be left with a white surface, which radiates heat less rapidly.

I claim—

1. In an incandescent lamp, a bulb with a vacuum and filament therein, and connections for an electrical current, in combination with a heat-absorbing substance arranged close to the filament, and means to retard the emission of heat from the side of said heat-absorbing substance which is remote from the filament.

2. In an incandescent lamp, a bulb with a vacuum and filament therein, and connections for an electrical current, in combination with a heat-absorbing substance arranged close to the filament, means to retard the emission of heat from the side of said heat-absorbing substance which is remote from the filament, and a support for said substance within the bulb.

3. In an incandescent lamp, a bulb with a vacuum and filament therein, and connections for an electrical current, in combination with a heat-absorbing substance arranged close to the filament, means to retard the emission of heat from the side of said heat-absorbing substance which is remote from the filament, and a transparent support for said substance within the bulb.

4. In an incandescent lamp, a bulb with a vacuum and filament therein, and connections for an electrical current, in combination with a heat-absorbing substance arranged within the vacuum and close to the filament,

a support for said substance within the bulb, there being a non-conductor of heat between said substance and its support.

5. In an incandescent lamp, a bulb with a vacuum and filament therein, and connections for an electrical current, in combination with a heat-absorbing substance arranged close to the filament, means to retard the emission of heat from said substance on the side remote from said filament, and a support projecting within the bulb and attached to said substance at intervals.

6. In an incandescent lamp, a bulb with a vacuum and filament therein, and connections for an electrical current, in combination with a heat-absorbing substance arranged in the form of a strip close to the filament, and means to retard the emission of heat from the side of said strip which is remote from the filament.

7. In an incandescent lamp, a bulb with a vacuum and filament therein, and connections for an electrical current, in combination with a heat-absorbing substance arranged in the form of a strip close to the filament and, to some extent, surrounding the same and approximately parallel therewith, and means to retard the emission of heat from the side of said strip which is remote from the filament.

8. In an incandescent lamp, a bulb with a vacuum and filament therein, and connections for an electrical current, in combination with a support projecting centrally within the bulb, and a heat-absorbing substance arranged with the filament in spiral form around said support and supported thereby, and means to retard the emission of heat from the side of said heat-absorbing substance which is remote from the filament.

9. In an incandescent lamp, a bulb with a vacuum and filament therein, and connections for an electrical current, in combination with a support projecting within the bulb and a heat-absorbing substance arranged with the filament around the support, and means to retard the emission of heat from the side of said heat-absorbing substance which is remote from the filament, said interior support being hollow, with a passageway communicating between the interior thereof and the outside air.

In testimony whereof I affix my signature in presence of the subscribing witnesses.

JAMES WRIGHT FORSTER.

Witnesses:
JOHN CHESKA,
WILLIAM H. WALTKING,
J. ELIZABETH TICHLOFEN.