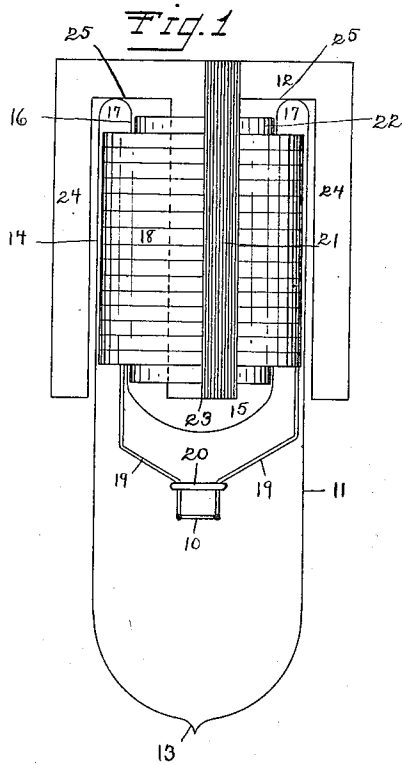
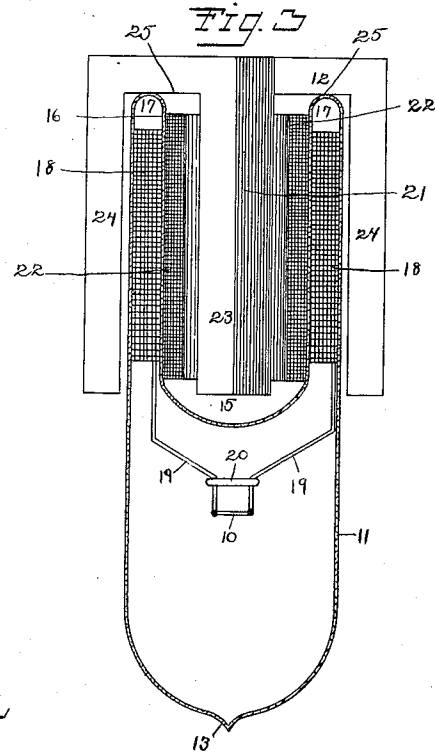
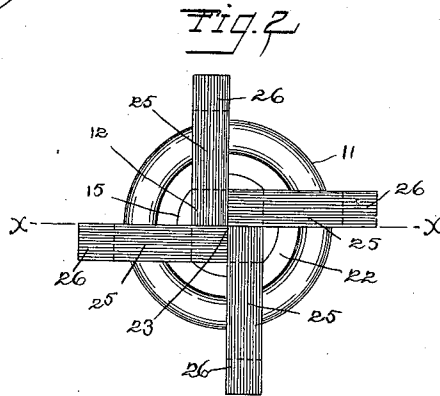


C. E. CAMPBELL.
ELECTRIC LIGHTING DEVICE.
APPLICATION FILED APR. 2, 1914.

1,161,840.

Patented Nov. 30, 1915.



WITNESSES:

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UNITED STATES PATENT OFFICE.

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FREDERICK R. CAMPBELL, OF LYNN, MASSACHUSETTS.

ELECTRIC-LIGHTING DEVICE.

1,161,840.

Specification of Letters Patent.

Patented Nov. 30, 1915.

Application filed April 2, 1914. Serial No. 829,001.

To all whom it may concern:

Be it known that I, CHARLES E. CAMPBELL, a citizen of the United States, residing at Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Electric-Lighting Devices, of which the following is a specification.

My invention relates to improvements in electric lighting devices and the object of my improvement is to provide means for supplying the lighting current to a filament inclosed in a hermetically sealed glass chamber or bulb without the use of leading in wires or conductors that pass through the glass wall and thereby obtain certain superior results that cannot be obtained when such leading in wires or conductors are used.

In the accompanying drawing, Figure 1 is a side elevation of my improved lighting device. Fig. 2 is a plan view of the same. Fig. 3 is a sectional view on the line $x-x$ of Fig. 2, the core being shown in side elevation.

My improved electric lighting device comprises a filament 10 of tungsten or other material suitable for incandescent lighting inclosed in a bulb 11 of special construction and with which there is incorporated in a special manner to be described a transformer 12. The lower part of the bulb 11 is of any form suitable for housing the filament 10. As shown the filament 10 is short and straight and extends laterally across the central part of the said lower portion and the tip 13 is just below the same. The upper portion of the bulb 11 is relatively extended for an appreciable distance, suitably to have the transformer 12 incorporated therewith and comprises a cylindrical peripheral wall 14 and an axially extending recess 15 having a cylindrical wall 16 concentric with the outer wall 14. Between the outer wall 14 and the inner wall 16 there is an annular space 17, within the bulb walls and constituting an extension of the bulb space in which the filament 10 is housed. The secondary winding 18 of the transformer 12 is housed in the annular space 17, and substantially fills the same. The conductors 19 extend directly from the secondary winding 18 to the filament 10, and they may be provided with a brace or bridge 20, preferably of glass, at some point intermediate the ends whereby they are cross-

connected mechanically and positively positioned relatively one to the other. The core 21 and the primary winding 22 are positioned in any suitable manner relatively to the secondary winding 18 to operate inductively therewith. Obviously, in order to do this, one leg of the core, shown as 23, must be positioned axially with reference to the secondary winding 18, and the primary winding 22 is conveniently positioned concentric with the said leg 23 and with the secondary winding 18.

I find it convenient to mount the primary winding 22 directly on the leg 23, as shown. The primary winding 22, mounted on the leg 23, as mentioned, substantially fills the recess 15. The return portion of the magnetic circuit of the core 21 may be formed in any suitable manner. For instance, it will be noted that the transformer shown is of the open core type. In special cases a transformer of the closed core type may be used. As shown there is a plurality of return legs 24 positioned along the outer side of the cylindrical wall 14 and connected at their upper ends to the leg 23 at the middle by a plurality of yokes 25. The core as shown is made up of four similar units 26, each of which is built up of U-shaped laminations of ordinary form to provide a square cross-section for the arms 24. The four individual arms 24 on one side of each of the units 26 are combined to build up the axial leg 23, and which has a square cross-section.

It is understood that the constructive details may be varied in various ways from those shown and described. It will be noted that the current supplied to the filament is delivered directly from the secondary of the transformer, and the current is accordingly delivered thereto by induction through the walls of the bulb, and without leading in wires penetrating the glass walls of the bulb.

While there are advantages in the use of the construction described with filaments of substantially ordinary type, the same is particularly desirable and advantageous in lamps having filaments that are relatively heavy, and of large diameter. In such case, even with low wattage, the current will be quite high, and if the filament is short, the voltage will be low. With such high currents the conductors must be heavy or large, and if they pass through the glass they

would be made of platinum, and correspond-
 ingly expensive. Furthermore, with low
 voltage, as mentioned, there would be exces-
 sive drop in voltage and also loss of energy
 5 due to the length of the leading in wires
 and the means of delivering the current
 thereto by such methods as are ordinarily
 used for this purpose. These difficulties are
 obviated by my invention. As an example,
 10 I have successfully used a primary winding
 for 110 volts and a filament for one volt.
 The air may be exhausted from the bulb 11
 so that the filament 10 will be operated in a
 vacuum or the said bulb may be supplied
 15 with a special arrangement of gases. With
 such a special arrangement of gases a fila-
 ment such as shown, that is short and of
 relatively large diameter, and of correspond-
 ingly large current capacity, gives the best
 20 efficiency, as if the filament is of small di-
 ameter and great length the percentage of
 loss by the heat being conducted through the
 gas, which usually amounts to three quarters
 of an atmosphere, is appreciably greater
 25 than if the filament is of only a fraction of
 the length and correspondingly heavier. In
 such cases the voltage drop due to leads and
 contacts under ordinary methods of con-
 struction is liable to be excessive and these
 30 conditions are avoided by my invention.

I claim as my invention:—

1. In combination, a hermetically sealed
 glass bulb, a secondary winding and a fila-
 ment housed in the said bulb, a primary
 winding, and a core having a plurality of
 35 legs, said bulb having a recess extending in-
 wardly along the axis of the said secondary
 winding, the said primary winding and one
 leg of the said core being housed in the
 said recess, and the other legs of the said
 40 core being distributed over the outer side of
 the said secondary and extending along the
 said bulb in parallel relation to the said first
 leg.

2. In combination a hermetically sealed
 45 glass bulb, a secondary winding and a fila-
 ment housed in the said bulb, a primary
 winding, and a core having an inner and an
 outer leg, the said bulb having a recess ex-
 tending inwardly along the axis of the
 50 secondary winding, the said primary and the
 said inner leg being housed in the said rec-
 cess, and the said outer leg of the said core
 being positioned on the outer side of the
 said secondary and extending along the said
 55 bulb in parallel relation to the said inner leg.

CHARLES E. CAMPBELL.

Witnesses:

JENNIE SCHWARTZ,
 MAE HAGAN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
 Washington, D. C."