

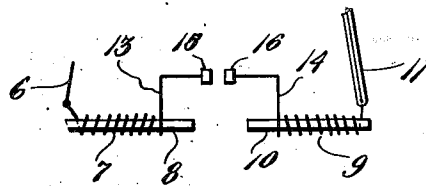
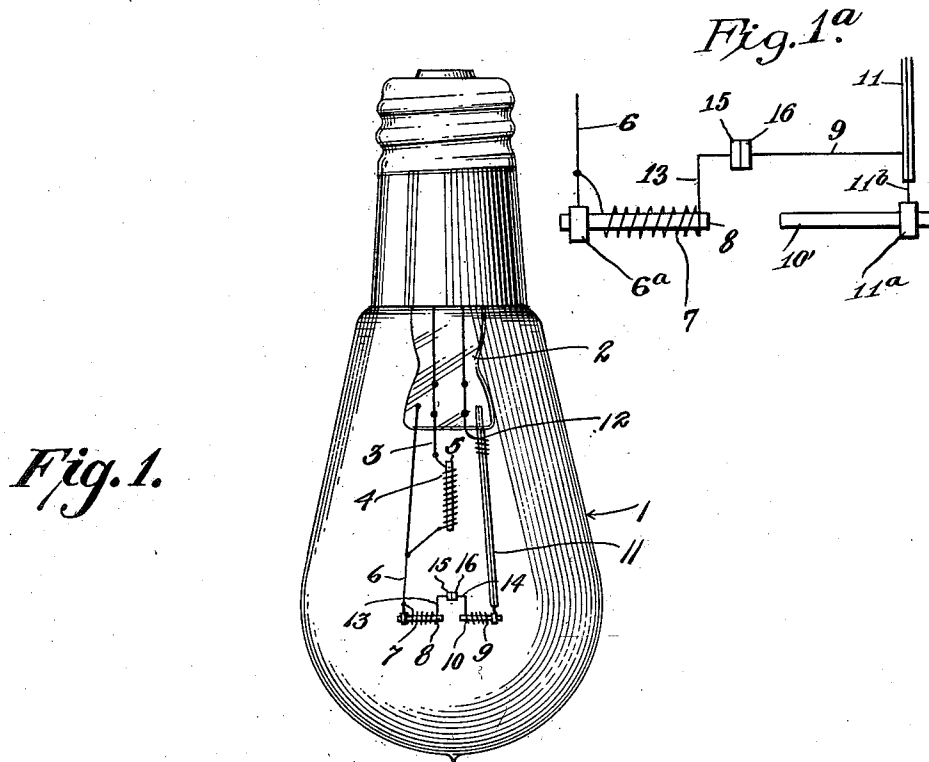
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**J. A. HEANY**

ELECTRIC ARC LAMP

Filed June 11, 1917



Inventor

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Attorneys

## UNITED STATES PATENT OFFICE.

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## ELECTRIC-ARC LAMP.

Application filed June 11, 1917. Serial No. 174,106.

*To all whom it may concern:*

Be it known that I, JOHN ALLEN HEANY, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Electric-Arc Lamps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to electric arc lamps operating on very low wattages and at ordinary commercial voltages and maintaining high efficiencies even in the smaller sizes ranging as low as ten or fifteen candle-power. To this end, the invention comprises a lamp, involving a container or envelope, preferably adapted for connection in the ordinary incandescent lamp socket, and containing an inert gas, preferably under diminished pressure, and two electrodes between which the arc is maintained, connected to suitable lead wires or conductors, at least one of which electrodes is formed of a conductor of the second class, which is non-conducting when cold, but becomes conductive when highly heated, one or both of said electrodes being associated with a coil or helix of highly refractory metallic wire, closely embracing or imbedded in said electrode, which serves to heat the electrode and render the same conductive, a separable shunt or by-pass connecting the coil or coils in the electric circuit, and means preferably in the form of a thermostat for separating the electrodes to proper arcing distance and breaking the shunt when the arc has been established.

In the accompanying drawings,

Fig. 1 illustrates a lamp embodying the invention.

Fig. 1<sup>a</sup> is a modified form of the invention.

Fig. 2 is an enlarged view of the electrode construction showing the parts in arcing relation.

Referring to the drawings, 1 indicates a bulb or container of the type usually employed in incandescent filament lamps, adapted for the usual socket connection, which is exhausted of air and supplied with an inert gas, such as nitrogen, argon, or the like, preferably under diminished pressure. The bulb is provided with the usual form of

glass neck 2 containing the supply leads and to which is attached a supporting wire 6 for one of the electrodes. Attached to one of the terminal wires of the lamp is a lead 3 connected to said supporting wire 6 and containing a ballast resistance 4 in the form of a coil of highly refractory metallic wire, such as tungsten, mounted upon a rod-like support 5 of refractory oxide, which wire and support become incandescent upon the passage of current. To the lower end of the support 6 is attached by means of a clamp 6<sup>a</sup> a rod-like electrode 8, which is closely surrounded by or has imbedded therein a helix 7 of highly refractory metallic wire, such as tungsten, and connected to the conducting support 6 at one end. Said electrode 8 consists of a conductor of the second class, which is non-conducting when cold, but becomes conductive and arc supporting when highly heated, and may consist of a mixture of highly refractory oxides, such as oxide of zirconium, oxide of thorium and oxide of yttrium. The opposite electrode 10 may be made of the same form and materials as electrode 8, but, on the other hand, it may comprise a suitably formed body 10' of highly refractory metal, such as tungsten or tungsten alloy, and is supported from a thermostat 11 by means of a clamp 11<sup>a</sup> carried by a wire 11<sup>b</sup> fused to the thermostat which is anchored at one end in the neck 2 and connected to the other lamp terminal by means of a conductor 12. When the second electrode is of metal the wire 9 runs directly to the thermostat from the contact 16. When the electrode 10 corresponds to the opposite electrode 8, it is surrounded by a coil 9 similar to coil 7, the outer end of said coil being in electrical connection with the thermostat 11.

Between the electrodes is disposed a separable shunt or by-pass comprising a wire 13 connected to the end of coil 7 having a contact 15, and a wire 14 connected to the other terminal and to the coil 9 when said terminal involves such coil, said wire 14 having a contact 16 normally in engagement with contact 15.

When current is turned into the lamp, it passes by lead 3 through coil 4 to supporting wire 6, thence through coil 7, by-pass 13, 15, 16, 14, coil 9, thermostat 11, lead 12, back to the other lamp terminal. The first effect

of the current is to raise the coil 4 and its refractory oxide support to incandescence and also to raise coils 7 and 9 to incandescence, the heat of the latter serving to convert the electrodes 8 and 10 into first class conductors, to ionize the gas surrounding the electrodes and establish the arc. The heat from coil 4, which coil also constitutes ballast resistance, together with heat generated by coils 7 and 9 actuates the thermostat 11 which withdraws electrode 10 away from electrode 8 to proper arcing distance, and at the same time breaks the shunt at contacts 15 and 16, so that the arc is maintained between the terminals of the electrodes 8 and 10 and the light of said arc is augmented by the light emitted from ballast resistance 4 and its associated incandescent core 5 and from coils 7 and 9.

By this arrangement a strong, steady light is produced, which closely approximates sunlight in color and quality, and practice has demonstrated that the illumination may be commercially effected in lamps from the smallest to the largest commercial sizes at a consumption of a fraction of a watt per candlepower.

The structure disclosed and claimed herein, constitutes another embodiment of the invention disclosed in my co-pending application for electric arc lamps, Serial No. 174,100, filed June 11, 1917, and said invention is claimed broadly in such pending application.

What I claim is:—

1. An arc lamp comprising a container, spaced electrodes therein, at least one of which is formed of a second class conductor, a heating element of highly refractory metal in intimate contact with said electrode, a normally closed shunt around the terminals of the electrodes and in series with the refractory heating element, and means to maintain said electrodes at proper arcing distance, said means being effective to break the shunt when the electrode is heated sufficiently to render the same conductive.

2. An arc lamp comprising a container, spaced electrodes therein, at least one of which is formed of a second class conductor, a heating element of highly refractory metal in intimate contact with said electrode, a normally closed shunt around the terminals of the electrodes and in series with the refractory heating element, and a thermostat adapted to maintain said electrodes at proper arcing distance, said thermostat being effective to break the circuit through the shunt

when the electrode is heated sufficiently to become conductive.

3. An arc lamp comprising a container, spaced electrodes therein, at least one of which is formed of a second class conductor, circuit connections for said electrodes, one of which connections includes a thermostat adapted to maintain the electrodes at proper arcing distance, a heating coil in parallel with and in intimate contact with said electrode to heat the latter to conductivity, a separable by-pass between the normally conductive members of the electrodes, said by-pass including contacts adapted to be separated by the movement of the thermostat when the arc has been established between the electrodes.

4. An arc lamp comprising a container, spaced electrodes therein which are formed of second-class conductors, heating elements of highly refractory metal in intimate contact with said electrodes, a normally closed shunt around the terminals of the electrodes and in series with the heating elements, and means to break the shunt when the electrode is sufficiently heated to render the same conductive.

5. An arc lamp comprising a container, spaced electrodes therein, at least one of which is formed of a second-class conductor, circuit connections for said electrodes including a ballast within the container which becomes incandescent, a normally-closed shunt around said electrodes including a heater coil in intimate contact with said second-class electrode, and means to maintain said electrode at proper arcing distance, said means being effective to break the shunt when the electrode is heated sufficiently to render the same conductive.

6. An arc lamp comprising a container, spaced electrodes therein, at least one of which is formed of a second-class conductor, circuit connections for said electrodes including a ballast within the container which becomes incandescent, a normally-closed shunt around said electrodes including a heater coil in intimate contact with said second-class electrode, and a thermostat adapted to maintain said electrodes at proper arcing distance, said thermostat being effective to break the circuit through the shunt when the electrode is heated sufficiently to become conductive, and a thermostat adapted to maintain said electrode at proper arcing distance.

In testimony whereof I affix my signature.  
JOHN ALLEN HEANY.