H. E. DAVIES.

ARC LAMP.

APPLICATION FILED OCT. 1, 1907.

934,796. Patented Sept. 21, 1909.

Fig. 1

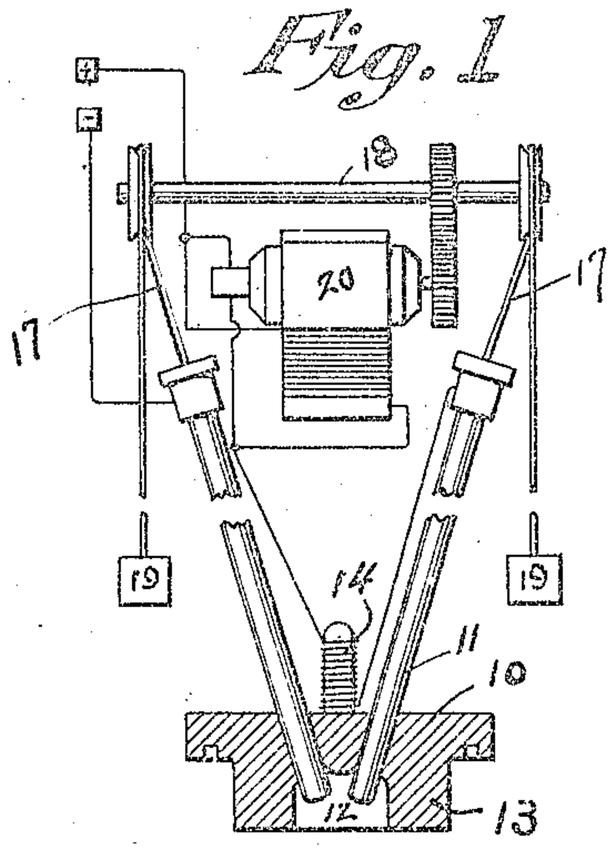


Fig. 2

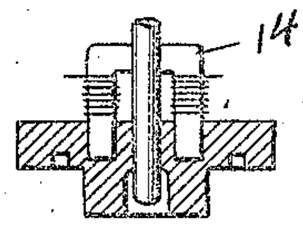


Fig. 4

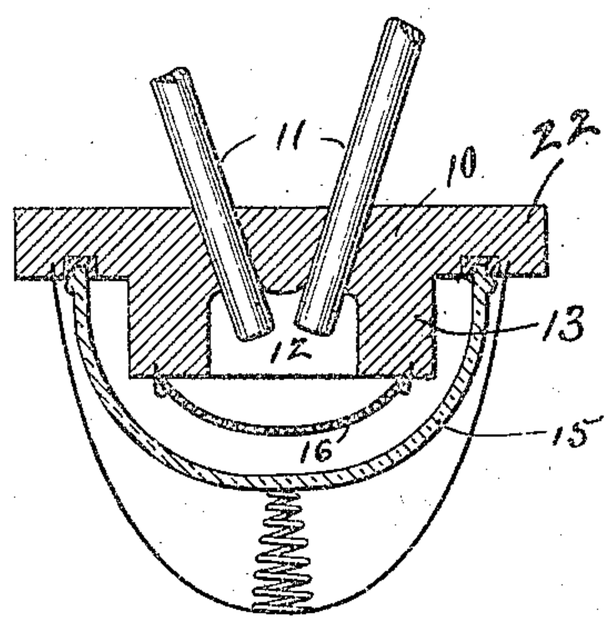


Fig. 3

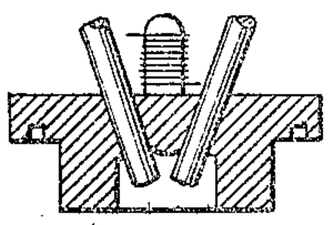
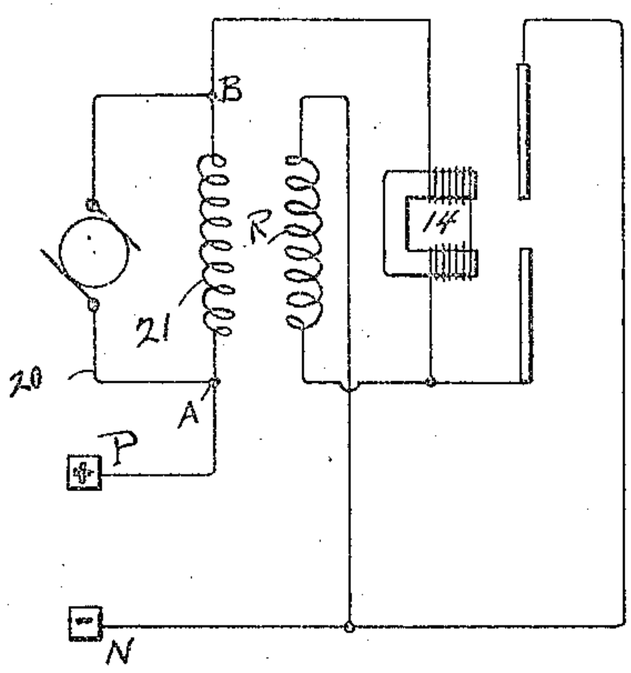


Fig. 5



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ARC-LAMP.

934,796. Specification of Letters Patent. Patented Sept. 21, 1909.

Application filed October 1, 1907. Serial No. 395,412.

To all whom it may concern:

Be it known that I, HENRY E. DAVIES, a citizen of the United States of America, residing at Weehawken Heights, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Arc-Lamps, of which the following is a specification.

My invention relates to arc lamps and particularly to arc lamps of the type having downwardly projecting electrodes, and consists in the features set forth in the following specification.

In the accompanying drawings in which my invention is illustrated, Figure 1 is a side elevation partly in section of my lamp; Fig. 2 is a cross section of the economizer portion of the same; Fig. 3 is a cross section at right angles thereto; Fig. 4 is a cross section of the same showing additional features, and Fig. 5 is a diagram of the lamp windings.

One of the principal objects of my invention is to provide for a lamp of the type illustrated, an efficient economizer.

Referring to the drawings it will be seen that I provide the lamp with an economizer 10 which is preferably made of material having low heat conductivity, and consists of a body portion 10 through which the tips of the electrodes 11 project into an elliptical chamber 12 formed by a depending skirt 13. This chamber is made as small as is practicably possible and preferably should not exceed in its greatest dimensions two and a half times the diameter of the electrodes. Its shortest diameter is preferably only slightly greater than the diameter of one of the electrodes. By making the chamber of this constricted size its sides are kept at a very high temperature by the arc, and the condensation of the vapors from the arc is thereby retarded. This is of especial advantage when the electrodes contain salts which tend to form a solid deposit. The retarding of the condensation of the vapors not only has this advantage but it also serves to keep the vapors longer at the arc and thus materially decreases the consumption of the electrode. When the electrode tips are at their most advantageous position in the chamber, it has been ascertained by actual experiment that an electrode life 35 per cent. greater than that obtained with the ordinary round economizer, is secured. It is found also that when using the ordinary carbon electrodes the light from the arc has an agreeable white color, the proportion of blue and violet rays not being so great as in arc lamps of the ordinary type. In connection with this economizer, I propose to use a blow magnet 14 by which the arc is depressed and spread so that it fills the entire chamber. It will be readily seen that the advantageous results above set forth may be considerably augmented by this means. If desired the economizer may be made of sufficient width and provided with recesses to receive the pole tips of the magnet which, as shown in Fig. 2 are thereby protected from the heat of the arc.

By reason of the narrowness of the arc chamber the gap between the pole tips of the magnet may be made very short, particularly when protected from the heat of the arc by the economizer. As the operation of the regulating mechanism for the electrodes is dependent upon the resistance of the arc and the resistance of the arc is governed by the blow magnet, the importance of this improvement is apparent. Through this magnetic regulation the arc is maintained in its most efficient position in the economizer.

While the constricted chamber below is highly efficient without additional features, I prefer to completely inclose the arc by adding a globe 15 which closely surrounds the same and is supported in the flange 22. The joint between the globe and the skirt is made as nearly air tight as possible allowing for the expansion and contraction of the materials employed. This globe adds another element of economy since the combustion of the electrodes is retarded by thus cutting off the oxygen supply.

The efficiency of the lamp is increased by making the economizer of a porous material for instance certain varieties of soapstone, faience, or special asbestos products, and

suitably impregnating the same with compounds, especially oxids, of the metallic group commonly spoken of as the rare earths, comprising cerium, erbium, thorium, yttrium, etc., either singly or in combination. When in operation the oxids in the economizer are influenced by the heat and actinic radiations from the arc and themselves emit light. This effect is of course increased if the electrodes are similarly impregnated, though the impregnation of either electrodes or economizer alone is advantageous.

In addition to impregnating the economizer, the electrodes or both as described, a shell 16 may be added below and around the arc, which is also impregnated with the materials mentioned. This shell may be used either with or without the surrounding globe 15. Of course the efficiency of the arc is still further increased by the light radiated from the oxids in the shell.

In combination with the economizer constructed as described, a novel operating mechanism for the electrodes is also provided.

As shown in Fig. 1, the electrodes 11 are suspended in any suitable manner at their upper ends, as by the cords 17 which are actuated in any suitable manner by the rotatable spindle 18, as by passing around a pulley on said spindle. In this case the cords carry a counterweight 19 attached to the ends opposite the electrodes. The spindle 18, is actuated by a rotary electro-motor 20, acting either directly on the spindle or through gears.

The motor, as employed by me, is at all times in the arc circuit, its action depending directly on the conditions therein, and it is connected so as to present at all times to the arc current a circuit including no loose contacts.

The winding of the stator 21 is connected in series with the arc, presenting a continuous path to the current, from one terminal P through the stator winding, the blow magnet 14, the arc, and back to the other terminal N. The rotor circuit 20 is tapped off from the stator winding at A, passes through the rotor coils, and returns to the main circuit at B.

When no voltage is impressed on the lamp, the electrodes fall by gravity until their tips come into contact, when they support each other.

When current is passed through the lamp, the motor is energized, and its rotor revolves so as to raise the electrodes. As they are drawn upward, gradually lengthening the arc, the current diminishes. Since the torque of the motor varies with the current, when this has reached a predetermined value, the torque becomes balanced by the effective weight of the electrodes and their supporting devices, and the rotor stops.

When the electrodes burn away so as to further lengthen the arc, or when for any other reason the resistance of the arc rises, the current, diminishing, reduces the torque of the rotor, and the weight of the electrodes causes it to rotate so as to lower the electrodes. This shortens the arc until the current again becomes normal, when the rotor again comes to rest. When the lamp is properly adjusted, this feeding action is practically continuous, giving a practically steady light.

When several lamps of this type are run in series, the collective weight of their electrodes may balance the collective torque of their motors, with the result that the total arc resistance of the series may be correct while the individual arcs may vary greatly in length, causing proportionate variation in light. To overcome this, a coil R, Fig. 5, is arranged in magnetic opposition to the series coil 21, and is connected in shunt across the arc. As the current in this coil varies with the voltage across the arc, when this voltage reaches its predetermined value, the influence of the coil R added to the weight of the electrodes balances the motor. Thus it will be seen that any arc of a series will maintain a definite length and consequently, by adjusting all lamps of a series to the same voltage, they may be made to emit the same amount of light.

While other mechanisms for holding the electrodes and raising the same may be employed, the device which I have described is considered the most satisfactory one.

I claim as my invention:

1. In an arc lamp having a plurality of downwardly pointing electrodes, an economizer of porous material having its walls impregnated with a compound of a rare earth adapted to be rendered incandescent by the continued presence of the arc.

2. In an arc lamp, a plurality of downwardly pointing electrodes impregnated with a compound of a rare earth, in combination with an economizer, the inner walls of which are similarly impregnated, adapted to be rendered incandescent by the continued presence of the arc.

3. In an arc lamp having a plurality of downwardly pointing electrodes, an economizer having the walls of the arc chamber impregnated with a metallic salt adapted to be rendered incandescent by the continued presence of the arc.

4. In an arc lamp having a plurality of downwardly pointing electrodes, an economizer having the walls of the arc chamber impregnated with a metallic salt adapted to be rendered incandescent by the heat and actinic radiations of the arc, in combination with electrodes impregnated with a metallic salt adapted to increase the actinic radiations of the arc.

5. In an arc lamp, an arc chamber the walls of which are impregnated with a metallic salt adapted to be rendered incandescent by the heat and actinic radiations of the arc in combination with electrodes impregnated with a metallic salt adapted to increase the actinic radiations of the arc.

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

HENRY E. DAVIES.

Witnesses:

WILLIAM ABBE,

L. H. GROTE.