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No. 638,430.

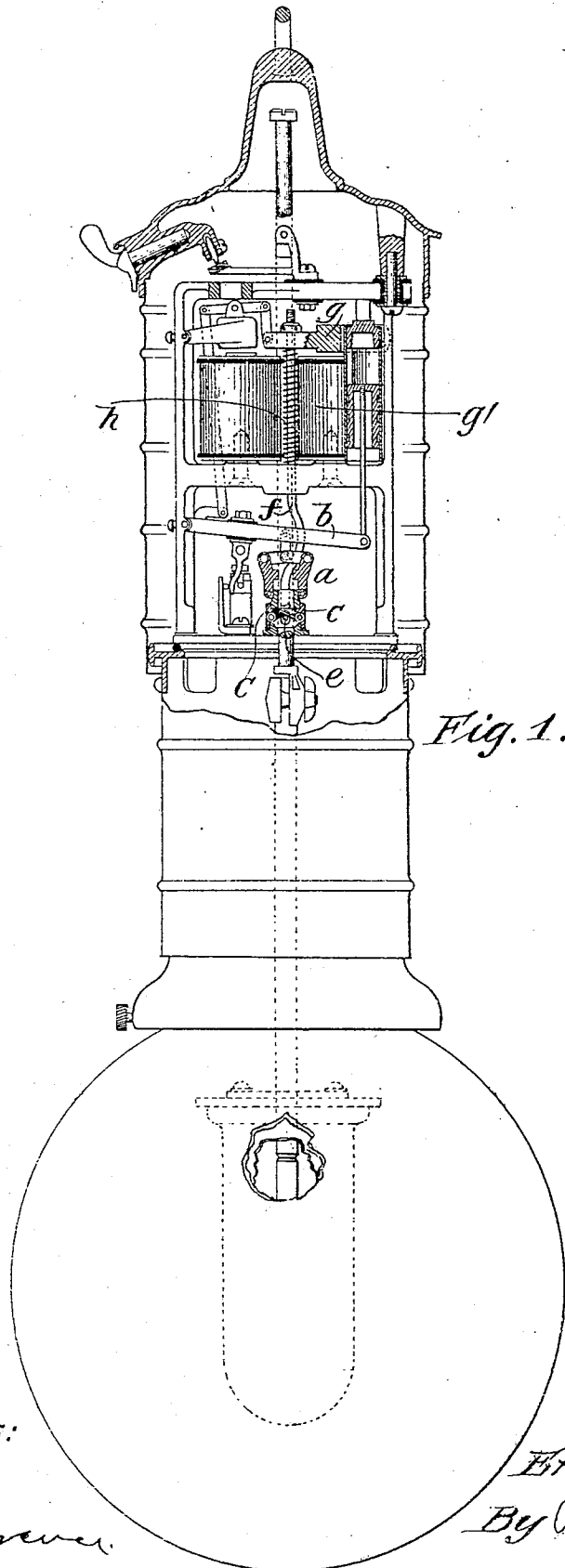
Patented Dec. 5, 1899.

E. P. WARNER.
ELECTRIC ARC LAMP.

(Application filed Aug. 6, 1898.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:

L. H. Sumner

A. H. Lawrence

Inventor,
Ernest P. Warner

By Barton & Brown
Attorneys

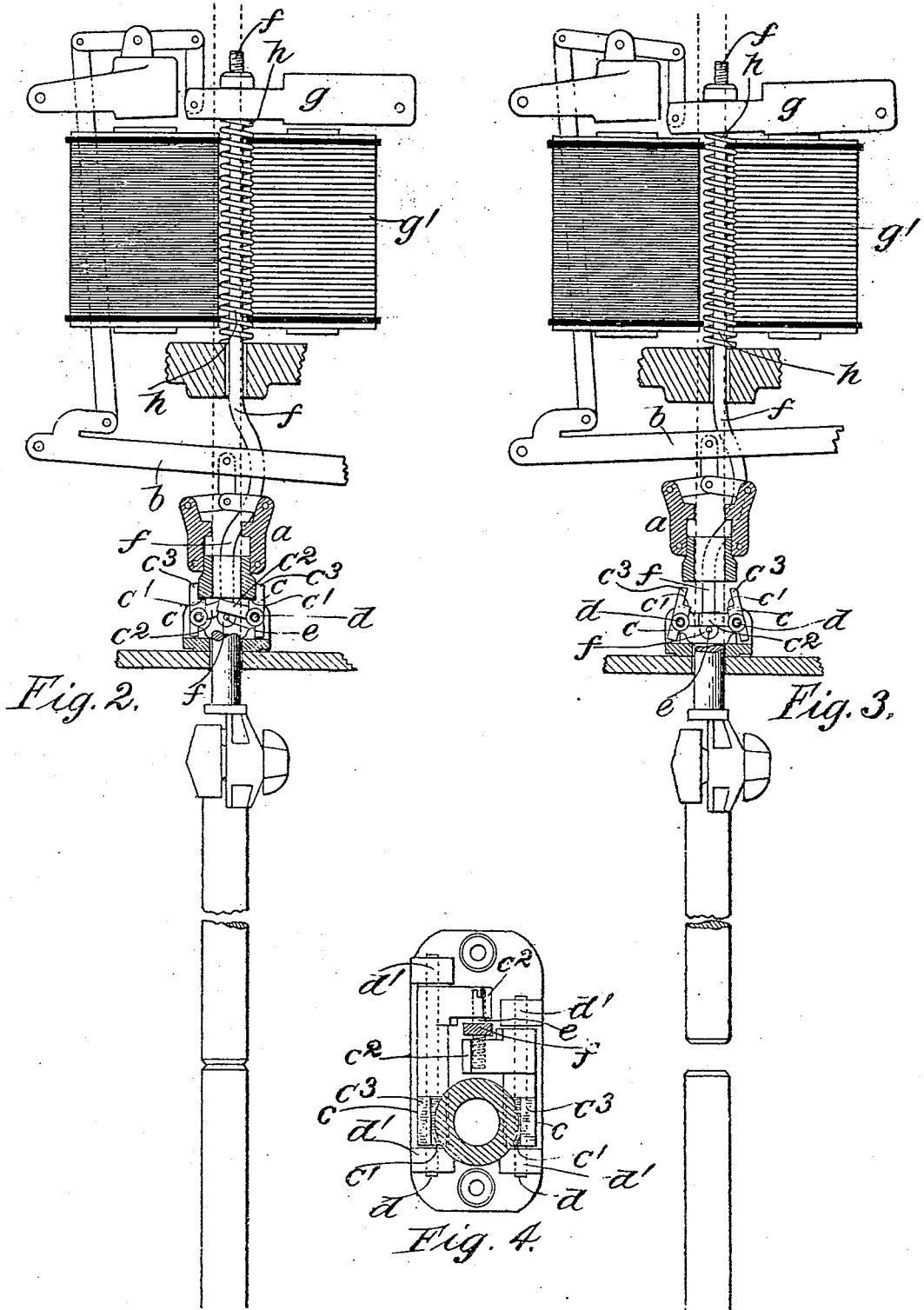
No. 638,430.

Patented Dec. 5, 1899.

E. P. WARNER.
ELECTRIC ARC LAMP.
(Application filed Aug. 9, 1898.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses,
S. A. C. Sanner.
S. A. C. Sanner.

Inventor,
Ernest P. Warner,
By Anton Brown
Attorney.

UNITED STATES PATENT OFFICE.

ERNEST P. WARNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN
ELECTRIC COMPANY, OF SAME PLACE.

ELECTRIC-ARC LAMP.

SP FICATION forming part of Letters Patent No. 638,430, dated December 5, 1899.

Application filed August 6, 1898. Serial No. 687,908. (No model.)

To all whom it may concern:

Be it known that I, ERNEST P. WARNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Inclosed-Arc Lamps, (Case No. 66,) of which the following is a full, clear, concise, and exact description.

My invention relates to electric-arc lamps, and more particularly to those wherein the arc is inclosed. Such lamps may be generally divided into two classes—those which are designed for connection in multiple arc in a constant potential circuit and those which are for connection in series in a high-tension circuit. The present invention was intended more especially for use in connection with lamps of the latter class. In the construction of such lamps it has heretofore been customary to employ substantially the same regulating mechanism as in ordinary series lamps in which the arc is not inclosed. When lamps thus constructed are put in operation, however, the results obtained have not been entirely satisfactory. It was found, in fact, that such regulating mechanism was not capable of readily adapting itself to meet the new conditions of operation. In the first place in order to obtain a stable light from an inclosed arc the tension at the arc should be considerably higher and the arc much longer than is usual with ordinary open-arc lamps. Again, one of the great advantages which the inclosed-arc lamp possesses is that the carbons are consumed very slowly. This of course requires the regulating or feeding mechanism to be sensitive to very slight changes in the electrical conditions of the arc-circuit in order that the downward feeding of the carbon as its end is consumed may be very gentle and gradual. In view of these facts it will be readily understood upon a moment's reflection why the ordinary balanced-lever regulating mechanism so well known and so largely used for series lamps will not of itself satisfactorily operate series inclosed-arc lamps, for if the mechanism be adjusted to strike the arc initially of the proper length sensitiveness to small variations is sacrificed, and after the arc has

been burning for a little time before the clutch will descend sufficiently to cause a downward feeding of the carbon the arc will have become attenuated greatly beyond the normal and a greater current will be flowing through the shunt-magnet, the electric energy whereof is dissipating itself in the form of heat, and since the carbon is so slowly consumed these undesirable conditions will be maintained for a considerable length of time before the stress is relieved by the release and downward feeding of the carbon. On the other hand, if the usual regulating mechanism be adjusted so that it will respond quickly to slight variations of electrical condition—that is, if the adjustment is such that the clutch will be lifted but a short distance—of course the arc which is struck will be considerably less than the proper normal length and it will be some time before the carbons will have been sufficiently burned away to leave the required gap between their ends.

My invention has for its object to provide a device which may be easily applied to regulating mechanism of the well-known balanced-lever type and which will perfectly adapt such regulating mechanism to meet the required conditions as set forth above.

In accordance with my invention the regulating mechanism of the lamp is adjusted to strike the arc at approximately the normal length, and an automatically-adjustable device is thereupon put into a condition to engage and release the clutch when the latter moves in a reverse direction but a fraction of the distance which it previously traversed in striking the arc. This construction enables me to strike the arc initially at approximately the normal length without sacrificing sensitiveness to small variations in electrical condition, so that the arc may be maintained at normal length and steadiness of light secured. This idea is capable of numerous modifications and applications to various lamp structures. I will describe one embodiment thereof by reference to the accompanying drawings, in which—

Figure 1 is a sectional elevation of an arc-lamp embodying my invention. Fig. 2 is a semidiagrammatic view illustrating the rela-

five positions occupied by the parts of the regulating mechanism before the lamp is started. Fig. 3 is a similar view showing the positions occupied by the parts during the operation of the lamp. Fig. 4 is a plan view of the automatically-operated stop which is interposed in the downward path of the clutch after the arc has been initially established.

The same letters of reference are used to designate the same parts wherever such parts are shown in the different figures of the drawings.

The balanced-lever regulating mechanism of the lamp, to which my invention is shown as applied, is very well known in the art and is illustrated in numerous Letters Patent granted to Charles E. Scribner—for instance, in Patent No. 415,571, of November 19, 1889.

When the lamp is not in operation, the clutch *a*, which is suspended from the lever *b* of such balanced-lever mechanism, rests upon shoulders *c' c'* of the adjustable stops *c c*, whose operation will be presently described, and while in this position the ends of the carbons will be in contact, as shown in Figs. 1 and 2. The adjustable stops *c c* are pivoted upon shafts *d d*, mounted in bearings or supports *d' d'*, carried by a portion of the framework of the lamp, and are provided with projecting arms *c² c²*, which rest upon and are supported by the pin *e*, mounted upon the end of the rod *f*. This rod is connected with the armature-lever *g* of the series-electromagnet *g'*. A compression-spring *h* is provided, which tends to lift the armature-lever *g*, at the same time tending, through the intermediate lever mechanism, to depress the lever *b* and the clutch *a*, dependent therefrom. When current is first passed through the lamp, the armature-lever *g* is immediately attracted by the series-electromagnet *g'* and, acting through the balanced-lever mechanism, raises the lever *b* and the clutch *a*, which lifts the carbon and establishes an electric arc of approximately normal length. At the same time the rod *f*, which is connected with the lever *g*, is depressed, so that the pin *e*, carried upon its end, is lowered, and the arms *c² c²* of the stops *c c* are thus allowed to fall, thereby rocking the stops upon their pivots *d d*. A glance at Fig. 3 will show the relative positions of the parts at this time. It will be observed that the ends *c² c²* of the stops *c c* are rocked into the path of the clutch *a*, so that upon a comparatively very slight descent of the clutch said clutch will be engaged by the ends *c²* of said stops and will thereupon act to release the carbon until it has fallen a sufficient distance to establish a proper length of arc, when the clutch will again grip the carbon-rod and maintain the same in this position until a further adjustment is required by the burning away of the ends of the carbons.

It will be observed that although the upward movement of the clutch is comparatively

great (in practice about five-sixteenths of an inch) upon a very slight downward movement thereof—say a little less than one-sixteenth of an inch—it will be engaged by the ends of the stops and caused to feed the carbon. This construction perfectly accomplishes the results which have been pointed out as desirable in the first part of this specification.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In an electric-arc lamp, the combination with a vertically-movable clutch adapted to grip the carbon or carbon-support, of electromagnetic regulating mechanism for raising and lowering the clutch, a movable stop *c*, wherewith the clutch is adapted to engage, such engagement causing the clutch to relax, means for interposing said stop in the path of the clutch after the initial raising of the carbon, and a vertically-movable part *c* operated by the regulating mechanism, ascending when the clutch descends and descending upon ascent of the clutch, adapted when lifted to remove the stop from the path of the clutch, substantially as described.

2. In an electric lamp, the combination with a vertically-movable clutch adapted to grip the carbon or carbon-support, of electromagnetic regulating mechanism for raising and lowering the clutch, pivoted stops *c c* wherewith the clutch is adapted to engage in its downward movement, such engagement causing the clutch to relax, arms *c² c²* carried by said stops tending to rotate the stops into the path of the clutch, a vertically-movable part *c* adapted to engage said arms to rotate the stops out of the path of the clutch, and an operative connection between said vertically-movable part and the regulating mechanism, substantially as and for the purpose set forth.

3. In an electric-arc lamp, the combination with a vertically-movable clutch adapted to grip the carbon or carbon-support, of stops *c c* with which said clutch is adapted to engage, such engagement causing the clutch to relax, portions *c' c'* upon which said clutch rests when the lamp is not in operation, regulating lever mechanism supporting said clutch and adapted, in initially striking the arc, to raise said clutch clear of the stops, and means for moving said stops into the downward path of the clutch so as to engage said clutch when the latter is lowered but a fraction of the distance which it previously ascended when striking the arc, substantially as set forth.

4. In an electric-arc lamp, the combination with a vertically-movable clutch adapted to grip the carbon or carbon-support, of pivoted stops *c c* with which said clutch is adapted to engage, such engagement causing the clutch to relax, portions *c' c'* of said stops upon which said clutch rests when the lamp is not in operation, regulating lever mechanism supporting said clutch and adapted, in initially striking the arc, to raise said clutch clear of the

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stops, and means for rocking said stops about
their pivots to bring the parts c^3 c^3 thereof
into the downward path of the clutch so as to
engage said clutch when the latter is lowered
5 but a fraction of the distance which it previ-
ously ascended when striking the arc, sub-
stantially as set forth.

In witness whereof I hereunto subscribe my
name this 15th day of July, A. D. 1898.

ERNEST P. WARNER.

Witnesses:

D. W. C. TANNER,
A. L. LAWRENCE.