No. 638,836. Patented Dec. 12, 1899.

W. J. DAVY & G. THOMAS-DAVIES.

ELECTRIC ARC LAMP.

(Application filed June 6, 1898.)

(No Model.)

Fig.1.

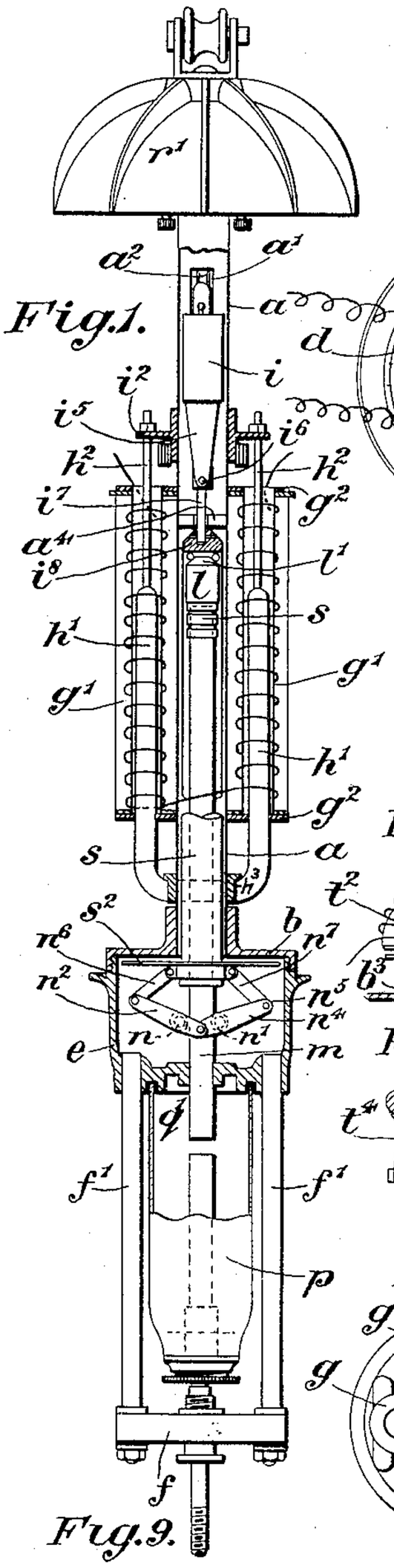

Fig.3.

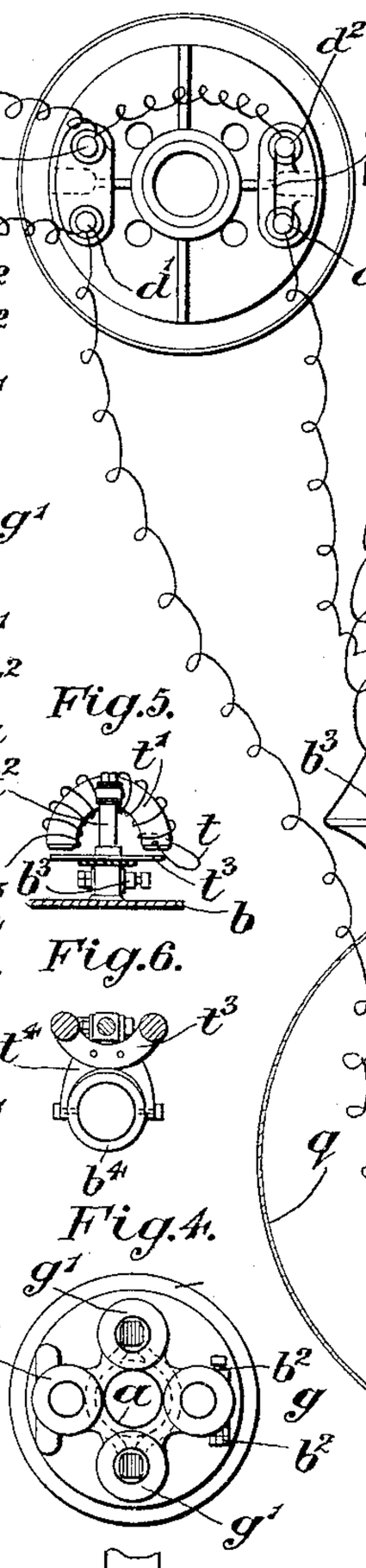

Fig.5.

Fig.6.

Fig.4.

Fig.9.

Fig.10.

Fig.8.

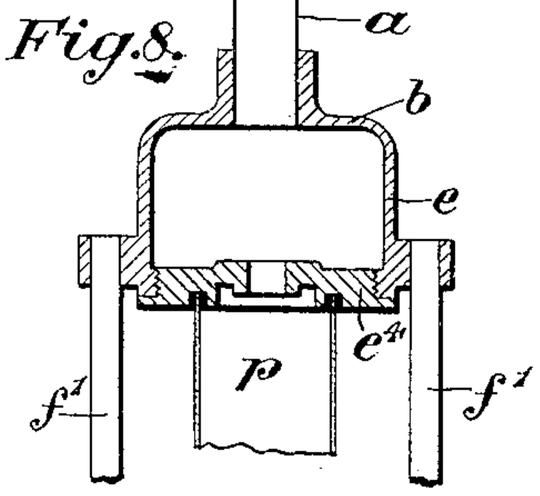

Fig.2.

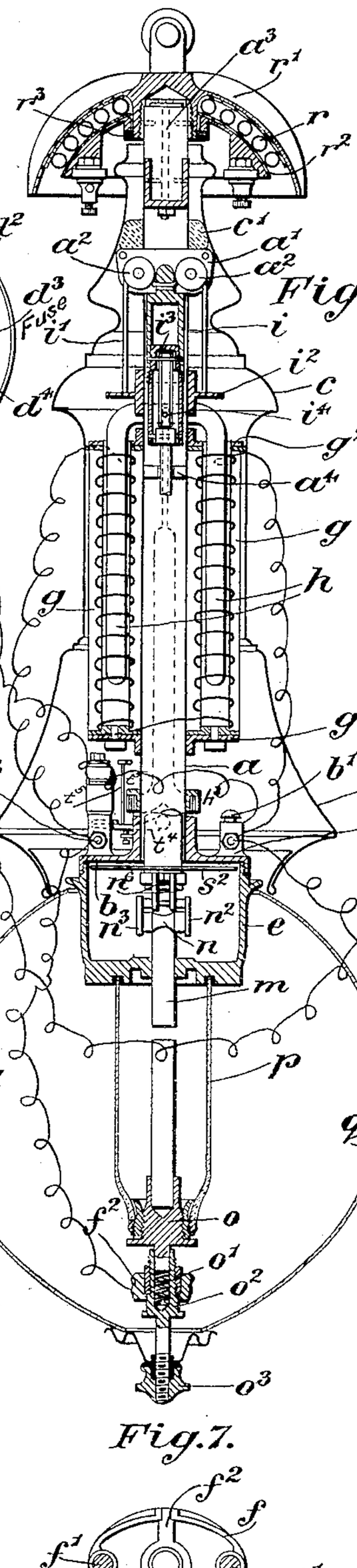

Fig.7.

Witnesses.
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UNITED STATES PATENT OFFICE.

WILLIAM JAMES DAVY AND GEORGE THOMAS-DAVIES, OF LONDON, ENGLAND.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 638,836, dated December 12, 1899.

Application filed June 6, 1898. Serial No. 682,698. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM JAMES DAVY and GEORGE THOMAS-DAVIES, subjects of the Queen of Great Britain and Ireland, and residents of London, England, have invented certain new and useful Improvements in Electric-Arc Lamps, (for which we have obtained Letters Patent in Great Britain, No. 27,749, dated November 25, 1897, and No. 143, dated January 3, 1898;) and we 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.

This invention for improvements in electric-arc lamps relates more especially to lamps in which the arc burns in an inclosed chamber to increase the length of life of the carbons, and has for its objects to provide an efficient inclosed alternate-current arc-lamp and an improved arrangement of controlling bobbins for arc-lamps, an improved arrangement of the idle resistance or choking coil, and an improved cut-out for arc-lamps. In this lamp the inclosure is obtained without the aid of the outer globe, so that the capacity of the chamber is small, and by the use of a sliding or similar joint reduced to its very smallest dimensions, so that practically no air nor gas can diffuse or pass.

In the accompanying sheet of illustrative drawings, Figures 1 and 2 are sectional elevations at right angles to one another of an inclosed arc-lamp constructed according to this invention. Fig. 3 is a plan of the top of the lamp. Fig. 4 is a sectional plan through the controlling-bobbins. Figs. 5 and 6 are elevation and plan of the cut-out. Fig. 7 is a plan of the bottom yoke. Fig. 8 shows a slight modification of the mechanism-chamber. Figs. 9 and 10 show wedge-shaped contact-pieces.

The frame of the lamp comprises a central tube a and the upper disk b, rigidly secured to the lower end of the tube a and forming the top of the chamber containing the regulating mechanism. The cylindrical case e, closed at its lower end, is screwed into the flange of the disk b, and the bottom yoke f is carried from the bottom of the case e by the yoke-rods f'. The top of the tube a is closed by an insulating-plug a^3, having metal caps on its ends. The lower end screws into the tube a. On the upper end is screwed the dome r'. The plug is fixed in the tube a and in the dome r' by screws passing through the tube or dome and into the plug. The ornamental casing c rests on an insulating-plug c'.

Near the top of the tube a is a rectangular hole, through which are passed plates a', carrying pulleys a^2. Fitting within the tube a, below the plates a', is a dash-pot cylinder i, fixed to the center of a cord i', passing over the pulleys a^2 and connected to a disk i^2, sliding on the central tube a. The piston i^3 of the dash-pot is fixed by the pin i^4 to the tube a. The cylinder i is connected by the side pieces i^5 and pin i^6 to the link i^7, pivoted to a cap-piece i^8, fixed in and closing the upper end of the controlling-tube s, that fits freely within the tube a and descends into the case e. The link i^7 slides through a hole in the plug a^4, closing the tube a.

The tube s is fitted with balance-weight or damper-disk s^2, working within the case e and assisting the dash-pot action.

The regulating-bobbins g g' are secured between two disks g^2, mounted on the tube a. The ∩-shaped core h of the series bobbin g at its upper end passes around the tube a and is secured to the boss of the controlling-disk i^2. The ∪-shaped core h' of the shunt-bobbin g' at its lower end passes around a sleeve h^3, sliding freely on the tube a, and at its upper ends is secured by the links h^2 to the controlling-disk i^2. The cores are made out of sheet-iron and may be opened out at their centers to encircle the boss or sleeve by forcing a mandrel or drift through their centers.

The upper-carbon holder l slides in the controlling-tube s and has its upper end l' coned. Balls are placed in the tube s and bear on the cone l' and the tube s and make a good contact. The upper carbon m passes between two jaws n n', fixed, respectively, between the pairs of links n^2 n^3 n^4 n^5. The links n^2 and n^3 and also n^4 and n^5 are pivoted together at their meeting ends and are connected by the links n^6 n^7 to the lower end of the tube s. Normally the jaws rest on a stop at the bottom of the case e. The lower-carbon holder o screws or fits into the lower end of the in-

closing transparent bell p, and the whole rests on a spring o', fitting in a recess or hole in the stud o^2, screwing into a cross-bar f^2, fitting in notches or trunnions in the bottom yoke f. The cross-piece f^2 can be lifted out of the yoke f. The stud o^2 also carries the nut o^3 for securing the usual globe q in position.

The resistance-coil r is coiled around between the dome r' and an inner dome r^2 and is secured to the dome r' by the nut r^3. The outer surface of the dome r' is ribbed to carry away the heat.

The cut-out comprises the coil t and the core t', fixed to but insulated from a support t^2, carried by the frame-disk b. The armature t^3 is fixed to an arm t^4, pivoted to the boss b^4 on the frame-plate b and working between stops. The headed rod t^5 is secured to the armature t^3. One end of the coil t is connected to the negative terminal d' of the lamp and the other end to the core t'. The insulated armature t^3 is connected to the frame of the lamp, and thus to the positive terminal d.

If the arc should fail or blow out, the core h' of the shunt-coil g' is drawn upward and its sleeve h^3 comes in contact with the head of the rod t^5 and raises armature t^3 into contact with the core t', and thus connects the coil t^2 to the plate b. The current then passes from the positive terminal d through the choke or resistance coil to the fuse-terminal d^2, fuse d^3, fuse-terminal d^4, terminal b', plate b, arm t^4, armature t^3, core t', and coil t to the negative terminal d'. The coil i serves to keep the armature t^3 in contact with the core and so preserve the cut-out circuit. Should the carbons again come into contact, the armature t^3 will fall and break the short circuit.

The current enters the lamp by the positive terminal d, passes then through choke or resistance coil to the fuse-terminal d^2, fuse d^3, fuse-terminal d^4, terminal b', plate b, tubes a s, carbons, yoke, insulated terminal b^3, the series coil g, and insulated terminal b^2 to the main terminal d'. The shunt-coils are connected directly across the terminals d d'. The carbons being in contact, the upper carbon resting on the lower by its own weight, on the passage of the current through the series solenoid g the core h is drawn down, and consequently the tube s is drawn up and first raises the links n' n^2 n^3 n^4 off the stop-plate and then causes the jaws to grip the carbon and raise it and strike the arc. As the arc lengthens, due to the burning away, gradually the grip device is lowered onto the stop-plate and the jaws relax their hold on the carbon, and a continuous and steady feed is obtained by the upper carbon slowly descending through the jaws. The spaces open to the arc are thus the chamber inclosed by the bell p, the chamber inclosed by the casing c, and the tube s. Any transference of air or gas from or into the inclosed space must take place between the link i^7 and the plug a^4. Any excessive pressure of gases accumulating escapes through the mouth of the bell, the spring o' acting as a relief.

To renew the carbons, the screw o^3 is slackened to remove the globe q. The stud o^2 is then unscrewed out of the cross-piece f^2 until the cross-piece can be raised out of its recesses or trunnion-bearings in the yoke f and then removed, with the bell and lower-carbon holder, through the yoke f, the top carbon and holder following by its weight. The top carbon is then removed and inserted in the lower-carbon holder and a fresh carbon placed in the upper holder, when the bell and lower carbon are placed in position, forcing upward the upper-carbon holder to its upper position. The upper edge of the bell rests against an asbestos washer q', and by gently screwing up the stud o^2 the bell is forced against the asbestos spring o', allowing for expansion and contraction and the like. The globe q is then replaced.

In the modification shown in Fig. 8 the mechanism-chamber e is shown as formed in one with the frame-disk b, and the bottom e^4 of the chamber is removable. The yoke-rods are screwed to a flange on the casing e. By this construction the mechanism can be got at without interfering with the connections.

In the modification shown in Figs. 9 and 10 the balls are replaced by curved wedge-shaped contact-pieces v.

What we claim, and desire to secure by Letters Patent, is—

1. The construction and arrangement of the inclosed arc-lamp consisting of the closed mechanism-chamber, the central frame-tube fixed to and entering into the mechanism-chamber, the inclosing bell supported from the mechanism-chamber and the carbon-holder sliding in the frame-tube and operatively connected to the exterior controlling devices through a link working in a snugly-fitting aperture in a plug closing the frame-tube.

2. The construction and arrangement of the frame of the inclosed arc-lamp consisting of the central frame-tube closed at its upper end by a plug, the frame-disk with mechanism-chamber secured to the frame-tube, the lower yoke secured by yoke-rods to the chamber, the inclosing glass bell forced up against the mechanism-chamber and the carbon-holder sliding in the frame-tube and operatively connected to the exterior controlling devices through a link working in a snugly-fitting aperture in the closing-plug, the whole forming a perfectly-closed chamber with the exception of the small sliding joint.

3. The means for connecting the controlling mechanism to the regulating mechanism consisting of the central frame-tube, a solenoid-coil secured to the central frame-tube, a solenoid-core, a guide-pulley mounted on the frame-tube, a flexible cord passing over the pulley and connected to solenoid-core, and a tube or link connected to the cord and pass-

ing down the central tube to the regulating mechanism.

4. The means for connecting the controlling mechanism to the regulating mechanism consisting of the central frame-tube, two solenoid-coils secured symmetrically to the frame-tube, the two solenoid-cores, a guide-pulley mounted on the frame-tube, a flexible cord passing over the pulley and connected at its ends to the solenoid-cores, and a tube or link connected to the cord and passing down the central tube to the regulating mechanism.

5. The arrangement of the controlling-magnets and their cores consisting of the central frame-tube, of the two symmetrically-placed solenoid-coils, of the disks supporting the solenoids and fixed to the central tube, and the U-core whose center piece or yoke surrounds the central tube.

6. The arrangement of the controlling-magnets and their cores consisting of the central frame-tube, of the two symmetrically-placed solenoid-coils, of the disks supporting the solenoids and fixed on the central tube, and the inverted-U core whose center piece or yoke surrounds the central tube.

In testimony whereof we have affixed our signatures in presence of two witnesses.

WILLIAM JAMES DAVY.
GEORGE THOMAS-DAVIES.

Witnesses:
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FRED. C. HARRIS.