

(No Model.)

3 Sheets—Sheet 1.

F. R. BOARDMAN.
ELECTRIC ARC LAMP.

No. 469,362.

Patented Feb. 23, 1892.

FIG. 1.

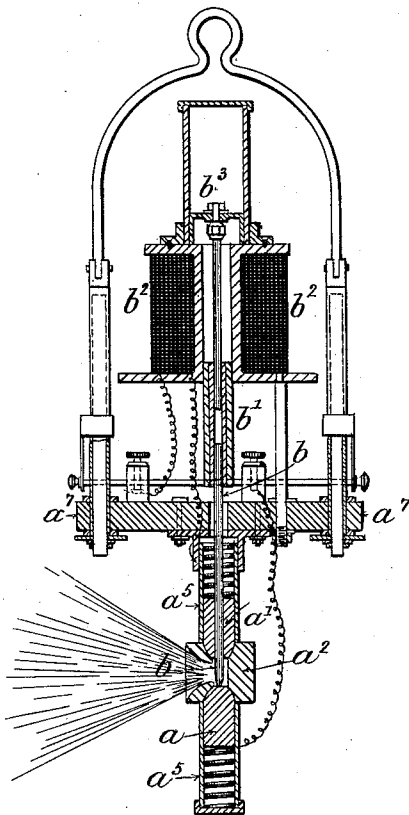


FIG. 2.

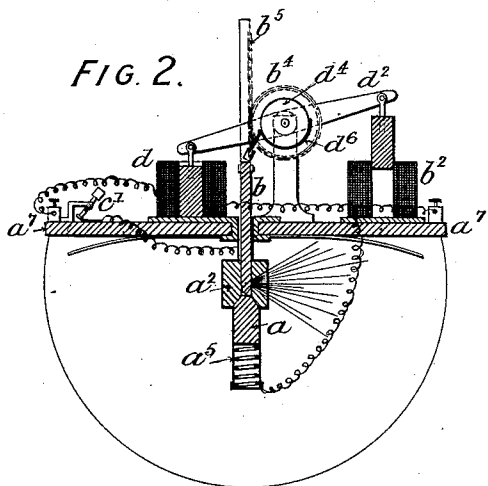
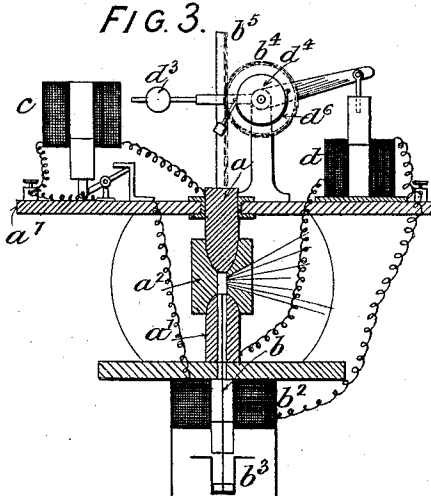


FIG. 3.



WITNESSES.

Wm. Andrew.
C. H. Giles.

INVENTOR.

F. R. Boardman
by Fairfax & Metter
Attorneys.

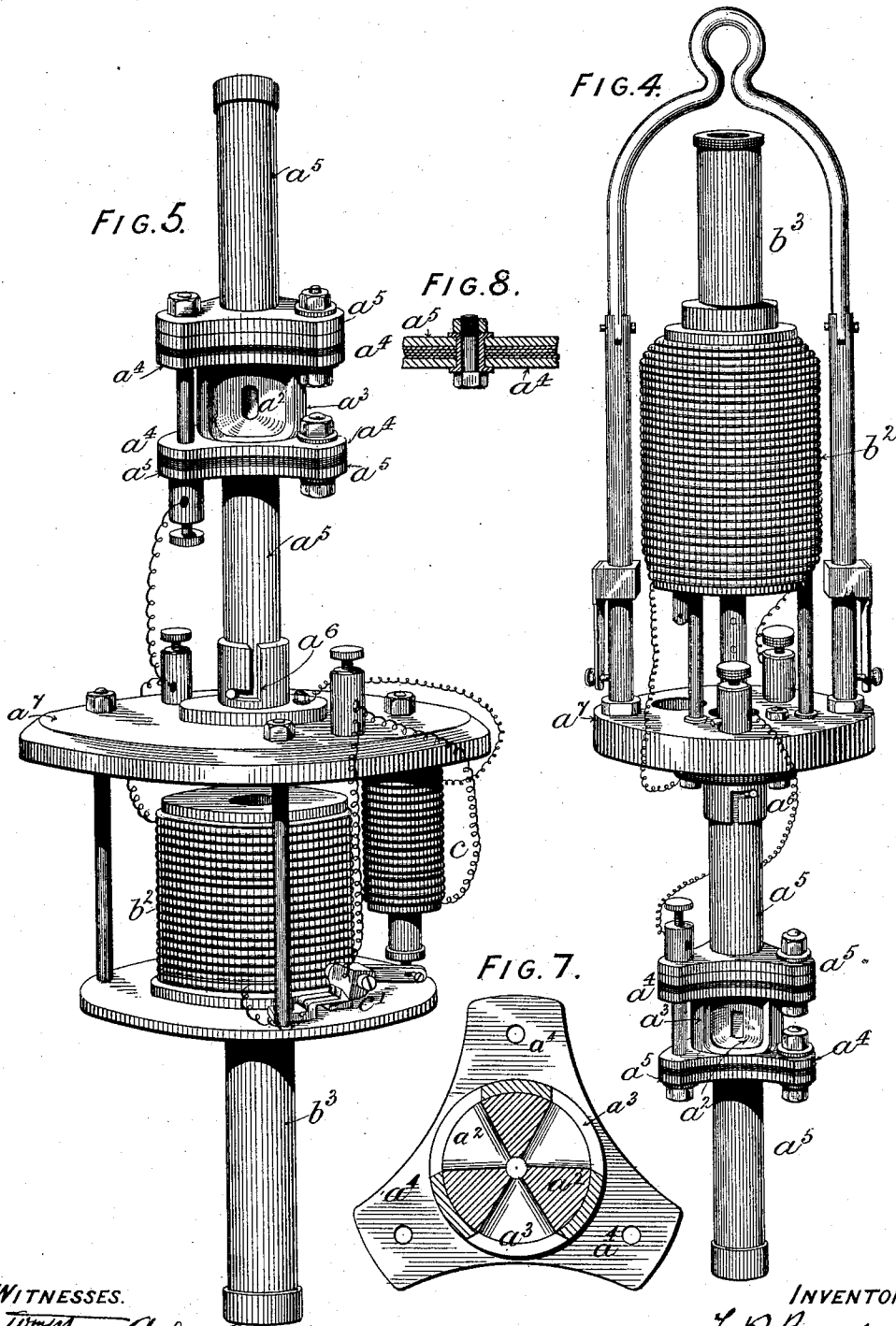
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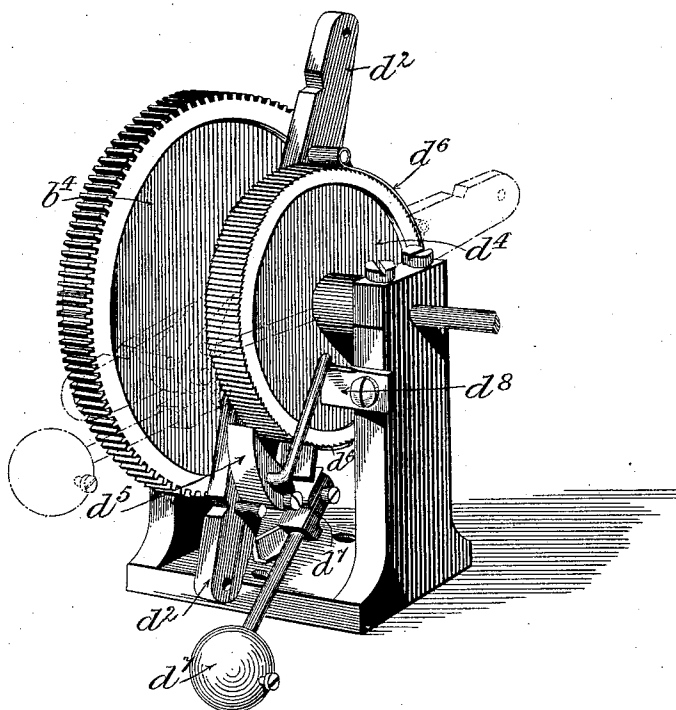
3 Sheets—Sheet 3.

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FIG. 6.



WITNESSES.

Wm. M. Andrews
A. H. Giles.

INVENTOR.

F. R. Boardman
by Fairfax & Metter
Attorneys.

UNITED STATES PATENT OFFICE.

FREDERICK RICHARD BOARDMAN, OF MANOR PARK, ENGLAND.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 469,362, dated February 23, 1892.

Application filed January 27, 1891. Serial No. 379,344. (No model.) Patented in England February 27, 1890, No. 3,133.

To all whom it may concern:

Be it known that I, FREDERICK RICHARD BOARDMAN, a subject of the Queen of England, residing at 3 Forest Villas, Manor Park, in the county of Essex, England, have invented certain new and useful Improvements in Electric-Arc Incandescent Lamps, (for which I have applied for British Letters Patent No. 3,133, dated February 27, 1890,) of which the following is a specification.

My invention relates to improvements in electric lamps of the semi-incandescent or arc-incandescent type, and it refers more particularly to improvements upon the lamp known as the "Sun" lamp, for which British Letters Patent No. 1,704, of 1880, were granted, and also upon my former invention for which British Letters Patent No. 10,833, of 1887, were granted to me. The Sun lamp is one in which a block of marble or other refractory material is made incandescent and luminous by the passage of the electric arc between two carbon electrodes, which are forced against their respective seats in the said block by gravity or spring-pressure.

The object of my present invention is to construct the lamp in a neater, cheaper, and lighter form, more convenient to handle and to trim, and more efficient in use.

In the accompanying drawings, Figure 1 is a vertical section through a hanging lamp in which the carbons and the marble block are placed beneath the supporting-plate which carries the automatic lighting device and circuit connections. Fig. 2 is a vertical section through a similarly-arranged lamp, but with regulating-gear in addition. Fig. 3 is also a vertical section of a lamp with a lower supporting-plate to carry the block, lower carbon, and automatic lighting-gear, while the regulating devices and circuit connections are carried on the upper supporting-plate, as before. Figs. 2 and 3 are diagrammatic. Fig. 4 is an enlarged view, in perspective, of the lamp shown by section in Fig. 1. Fig. 5 is also a perspective view of a lamp carried by a post or standard, the parts being generally inverted in position. Fig. 6 is a perspective view of the brake and feeding device shown in the diagrams, Figs. 2 and 3. Fig. 7 is a cross-section through the marble block and its containing-box, and Fig. 8 is a detailed

section of the insulated section between the said box and a carbon-holder.

Similar reference-letters refer to similar parts in the several views or to parts having similar functions.

In lamps of the class named above the marble or refractory block has hitherto been made square in section and with one light-giving opening upon one of the sides. Usually the carbon electrodes were seated in recesses, one at each end of the block, with a small channel-way connecting the two recesses and opening into the light-giving opening. In my improved lamp I use a refractory block a^2 , circular in cross-section, the carbon electrodes a and a' being seated therein at opposite ends, as shown in Fig. 1, with a small pencil carbon b for lighting purposes passing through the tubular carbon a' and the connecting-channel in the center of the block a^2 until it comes in contact with the solid carbon a . The block is cut away at three places on its circumference, with solid connecting-ribs of the material intervening. These openings are spaced symmetrically, as shown in the cross-section, Fig. 7, (taken through the center of the block a^2), and when the block is incandescent light is radiated and reflected from the surfaces of the openings, thus practically giving an all-round light. The block a^2 is inclosed and held in a circular metal box a^3 , with similar and corresponding openings therein, (to avoid obstructing the light,) and with conforming flanges a^4 at the top and bottom of the box, by which the latter is bolted to similar flanges upon the metal carbon-holders a^5 , containing the electrodes a and a' . The flanges a^4 of the box are insulated from the flanges of the carbon-holders a^5 in the manner indicated by the section Fig. 8. A pin on one of the carbon-holders a^5 engages with the bayonet-joint coupling a^6 , attached to the supporting-plate a^7 , so that by turning the box slightly the whole of the light-giving parts and their receptacles can be readily removed for trimming and as readily be replaced. Spiral springs are placed within the tubes a^3 to keep the carbons a and a' up to their respective seats in the block a^2 to compensate for waste, except in the case of lamps worked in parallel, to be described hereinafter.

It is to be noted that by making the block a^2 circular instead of square, as heretofore, and with three conical openings instead of one the amount of material kept in a state of incandescence is less, while the light-giving surfaces are increased, thus adding greatly to the electrical efficiency of the lamp.

The pencil carbon b , used for lighting the lamp, Figs. 1 and 3, is automatically advanced or withdrawn through a tubular carbon a' and communicating channel in the block by means of one or more electro-magnets, as described in my specification to United States Patent No. 411,088, dated September 17, 1889. The arrangement of the devices which control the speed in withdrawing the lighting-carbon b will vary according to their position and the character of the lamp. In some cases I place the lighting-coil b^2 below the block a^2 , as in Fig. 3, and the regulating-coil d and cut out coil c above it, and this arrangement is suitable for a standard lamp. The tubular-carbon electrode a' is placed below and the solid electrode a vertically above the block a^2 . The dash-pot b^3 is also placed beneath the block, and the core of the lighting-coil b^2 is adapted to hold and actuate the pencil carbon b for lighting purposes, the pencil carbon being withdrawn by gravity and its speed regulated by the dash-pot b^3 . Similar means are also used when the carbons are placed horizontally, the intervening connections, with the actuating magnet-cores, being cranked and pivoted. This lamp is adapted to be worked in parallel, the upper or solid carbon a being deeply seated and adjustable in the block a^2 and secured to a rack-holder b^5 , engaging with the toothed wheel b^4 , which is actuated by the regulating-coil d through the intervention of the counter-weighted lever d^2 . A brake and feed device (described hereinafter with reference to Fig. 6) is also mounted on the axis of the wheel b^4 .

Another form of lamp (suitable for a hanging lamp) to be worked in parallel is indicated by Fig. 2, in which the lighting-coil b^2 is caused to actuate a carbon electrode b of the usual size, (thus dispensing with the pencil and tubular carbons shown in other figures,) while the opposite electrode a has about double its sectional area. The latter is placed below the block a^2 and kept up to its seat therein by a spiral spring in the tubular holder a^5 . The remainder of the apparatus is placed above the block a^2 , and it is to be noted that both the lighting-coil b^2 (which is series wound), and the regulating-coil d (which is shunt wound) act to regulate the length of arc and therefore the resistance of the lamp, as well as to light the lamp. The upper or movable carbon b in Fig. 2 is secured to a rack-holder b^5 , gearing with a toothed wheel b^4 , actuated by the series coil b^2 through the intervention of the pivoted lever d^2 on the axis of the gear-wheel. A pawl d^5 upon the lever d^2 (shown in Fig. 6) engages with fine ratchet-teeth upon the face of the gear-wheel

b^4 or its equivalent a separate wheel d^4 , fixed to the axle thereof. A friction-brake d^6 is caused to bear upon a suitable face upon the gear-wheel b^4 or upon the wheel d^4 , (shown in Fig. 6 as embracing about one-half of the fine-toothed wheel d^4), and the brake is made tight or loose by a weighted lever d^7 , working independently upon the main pivoted lever d^2 . The series coil b^2 therefore acts upon the wheel b^4 and rack b^5 to move the carbon b , which movement is controlled by the brake d^6 , while this again is affected by the amount of current shunted through the regulating-coil d . When an excess of current is shunted through the regulating-coil d , its core is drawn down, entirely liberating the pawl d^5 and brake d^6 , and the upper carbon falls by gravity. This reduces the resistance between the carbon electrodes a and b , and the current being thereby increased in the series coil b^2 draws up the top carbon to form a proper length of arc. Thus the balancing of magnetic action between the two coils serves to regulate the length of arc and resistance of the lamp in addition to the function of striking the arc. When the lever d^2 falls too low, as shown in Fig. 6, the pawl d^5 is lifted clear of the teeth on d^4 by a lifter coming in contact with the trip d^8 . The working position of the lever and pawl is shown by dotted lines, and adjustments are made by the counter-weight d^7 .

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In incandescent arc lamps, the combination of a circular three-way refractory block, a metallic case or box therefor, two carbon electrodes seated in the said block, a tubular case for each electrode, insulated from the aforesaid box, and means for pressing the electrodes against the refractory block, substantially as and for the purpose herein described.

2. In incandescent arc lamps, the combination of a circular three-way refractory block, a metallic case or box therefor, two carbon electrodes seated in the said block, a tubular case for each electrode insulated from the aforesaid box, a pencil carbon adapted to slide within one of the said carbon electrodes, and automatic devices for moving the same, and means for pressing the electrodes against the refractory block, substantially as and for the purpose herein described.

3. In combination, a fine ratchet-toothed wheel d^4 , connected to or turning with a toothed wheel b^4 , a rack carbon-holder b^5 , a lever d^2 , turning freely upon the axis of the said wheels and actuated by the magnetic effect of one or more electro-magnets, a pawl d^5 , engaging with d^4 , a brake d^6 , and counter-weight d^7 , operating substantially as and for the purpose herein described.

4. In incandescent arc lamps, the combination of an insulated box for containing a refractory block with two carbon-holders rigidly connected to the box on opposite sides by insulated connections, a spring or weight

within each of said holders acting to feed the
carbons toward the said block, a bayonet joint
or pin secured to one end of a carbon-holder,
and a corresponding attachment upon the
5 base or frame of the lamp, substantially as
and for the purpose described.

In testimony whereof I have signed this

specification in the presence of two subscri-
ing witnesses.

FREDERICK RICHARD BOARDMAN.

Witnesses:

C. J. PREECE,

E. C. BARKER.