H. W. HEADLAND & F. PLUTTE.

ELECTRIC ARC LAMP.

APPLICATION FILED OCT. 28, 1907.

960,911. **Patented June 7, 1910.**

2 SHEETS—SHEET 1.

FIG. 3.

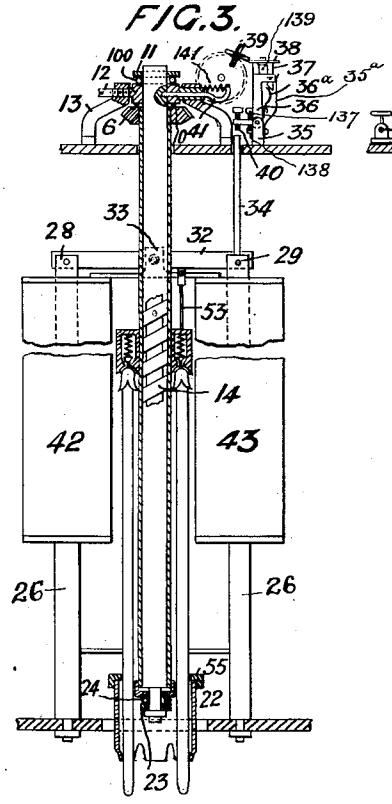


FIG. 1.

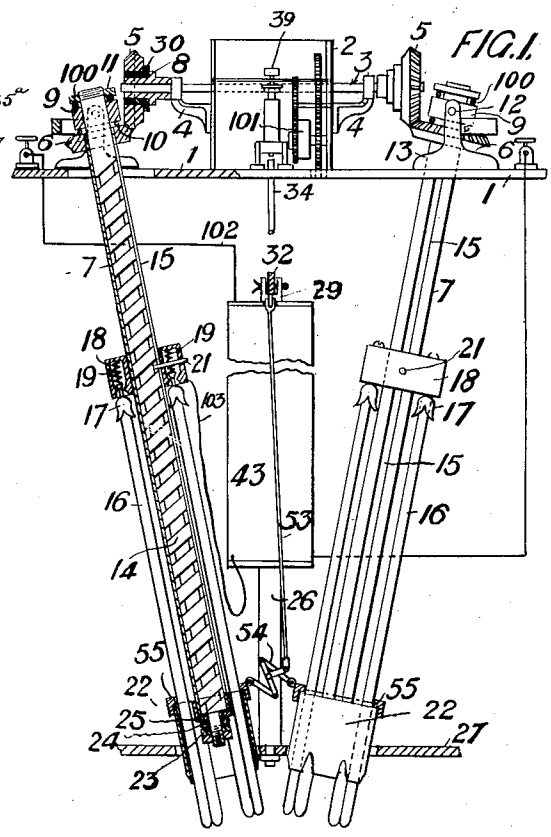


FIG. 4

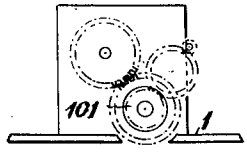
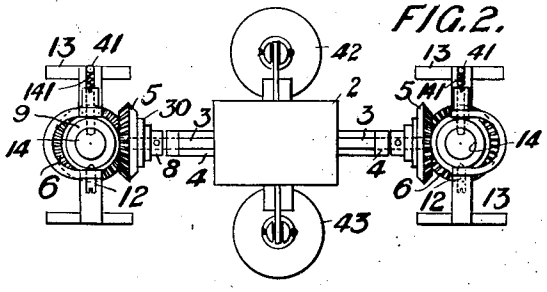


FIG. 2.



Witnesses.

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2 SHEETS—SHEET 2.

FIG.6.

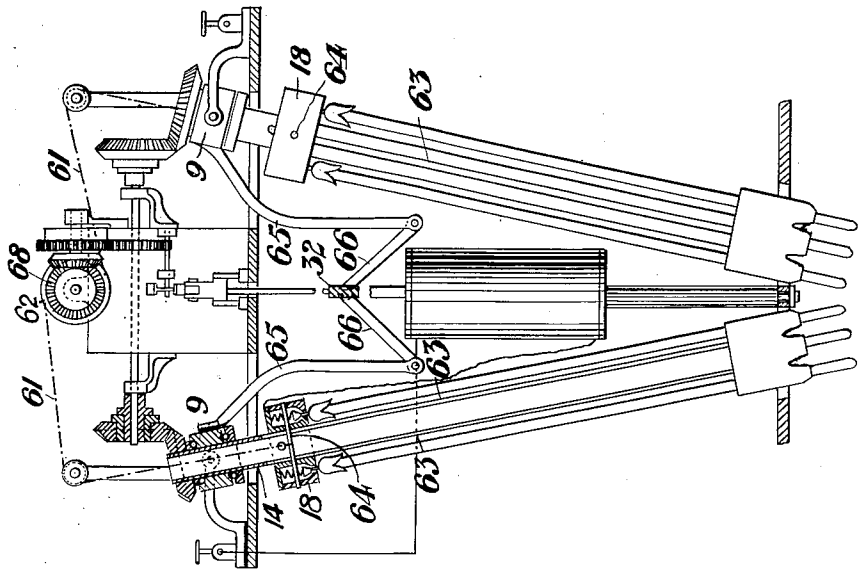
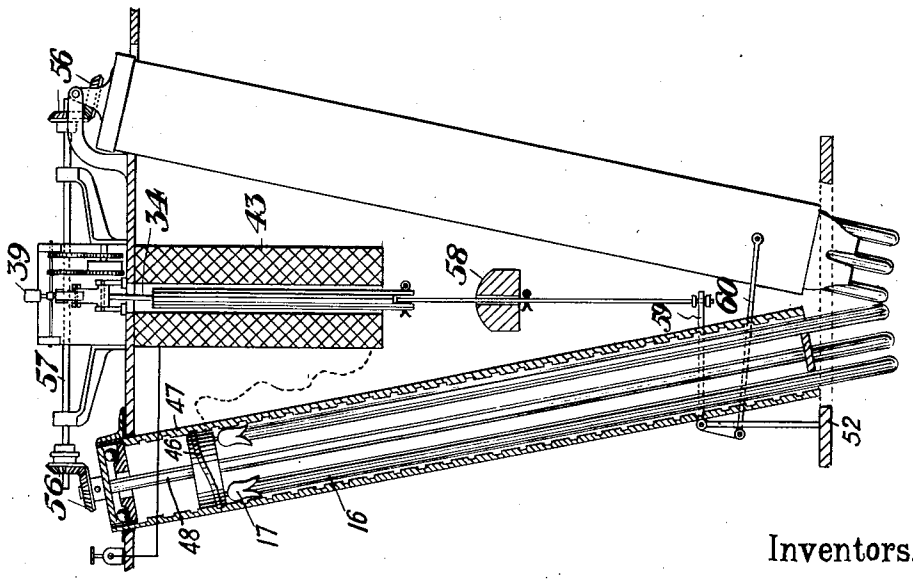


FIG.5.



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UNITED STATES PATENT OFFICE.

HENRY WILLIAM HEADLAND, OF LEYTON, AND FREDERICK PLUTTE, OF LONDON, ENGLAND.

ELECTRIC-ARC LAMP.

960,911. Specification of Letters Patent. Patented June 7, 1910.

Application filed October 28, 1907. Serial No. 399,573.

To all whom it may concern:

Be it known that we, HENRY WILLIAM HEADLAND and FREDERICK PLUTTE, subjects of the King of Great Britain, residing, respectively, at The Firs, High Road, Leyton, in the county of Essex, and 18 and 19 Queenhithe, in the city of London, both in England, have invented new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

These improvements in electric arc lamps refer to the arrangement of the carbons and to the means for feeding and regulating them. The electrodes consist of two bundles of carbons arranged in circular rows, one bundle for the positive and the other for the negative, these bundles being each at one end held in a holder and with their other or free end directed toward each other and by preference converging toward each other at an angle. The holders and bundles are each axially rotated step by step or intermittently and at the same time fed toward the place of convergence. It will thus be understood that one carbon after another in one bundle is brought into action with one carbon after another in the other bundle. The bundles may or may not be fed at the same rate and the number of carbons in the bundles may be the same or not.

Figure 1 of the drawings is a part sectional elevation of a lamp. Fig. 2 a plan and Fig. 3 a part sectional side elevation of the lamp seen at right angles to Fig. 1. Fig. 4 is an elevation of a detail. Fig. 5 is a sectional elevation of a modified lamp, and Fig. 6 is a sectional elevation of yet another modified form of lamp.

Upon a foundation plate 1, Figs. 1 to 4, is fixed a box 2 containing any usual driving mechanism for instance a spring motor 101 geared with the spindle 3 and also with a train of wheels ending in a revolving fly vane 39. Owing to the shunt magnet alternately engaging and releasing the vane intermittently, as hereinafter described, the spindle 3 is driven intermittently at a slow speed. The spindle is mounted in bearing 4 and is at each end provided with a bevel wheel 5 which engages with a bevel wheel 6 on a tube 7, which tubes are thus caused to rotate around the screw rods 14. The left hand bevel wheel 5 is insulated by a bush 30 of insulating material. The two tubes 7 work on ball bearings 24 at the bottom and against balls 10 running in contact with grooved rings 9 at the top, which rings are held between centers or pointed screws 12 screwed through the standards 13 that are fixed on the bed-plate. One in each pair of centers, as shown in Figs. 2 and 3 is hollow, and a locking pin 41 passes through it and the ring 9 into the screw rod 14 being maintained in locking position by a spring 141 as shown. The bearing rings 9 are by preference formed with a ring groove in their upper faces for receiving other anti-friction balls 100 to permit of easy running of the rods 14 when released as hereinafter described. The collar 11 fixed on the top of each rod 14 may also be provided with a ring groove for the balls 100. Each tube 7 is formed with a longitudinal slot 15. All of the carbons in each bundle are held by spring clips 17 entering recesses and holes in the bottom of a block 18 and forced down or suspended by springs 19. A peg 21 passing through one side of the block or holder 18 and through the slot 15 of the tube 7 engages with the screw thread of the screw spindle 14. It will thus be understood that as the tube 7 is rotated around the screw spindle 14 the block 18 is also rotated and at the same time owing to the engagement of peg 21 and screw 14 travels downward, so that the carbons in the one rotating holder successively come opposite corresponding carbons in the other rotating holder, and the arc is kept in about the same spot in space. The carbons in each bundle are near their lower ends guided in the bottom of a sleeve 22 fixed to each tube 7 and projecting through holes in the plate 27. The screw spindle 14 has on its lower end a disk 23 formed with an annular groove for receiving anti-friction balls 24 which are free to roll in an annular groove in a ring or flange 25 fixed or formed inside of the interior tubular projection of the sleeve 22.

42 and 43 are solenoid coils with central supporting rods 26 fixed in the bottom plate 27. This latter is united to the bed-plate 1 by means of stay rods, which are not shown. The solenoid cores 28, 29, are connected in the usual manner by the rocking lever 32 pivoted in the middle at 33 to a bridge piece supported upon the two coils. The core 29 is provided with a push rod 34. On the bed-plate 1 is fixed a standard 35 upon which is pivoted a crank arm 36 and on the latter is

pivoted the pawl 37 having a finger 38. A spring 35a on the bracket 35 maintains the cranked arm 36 normally with its set screw 137 in contact with the stop 138, and a spring 36a on the arm 36 maintains the finger 38 normally tilted onto its stop 139 in the position seen in Fig. 3. This finger engages normally with the vanes of the fly 39 which is driven by the clockwork and while so engaged prevents further downward feed of the carbons, but when the shunt coil 42 is energized and attracts its core 28 that end of the armature is depressed while the other end of the armature is raised so that the rod 34 hits the screw 40 thus canting the crank arm 36 so that the pawl finger 38 is withdrawn and releases the fly 39 and the carbon bundle is being given a partial rotation by the tube 7 and fed downward at the same time by the engagement of the peg 21 with the screw 14.

The lever 32 has pivotally connected to it a rod 53 which is connected at its opposite end with the central arm of a three-armed crank 54 whose other arms are suitably linked, as shown, to a ring 55 taking over the tops of the sleeves 22. Therefore as the arc lengthens and the shunt coil 42 becomes more strongly energized the resultant pulling upward of the rod 53 causes the two bundles to oscillate about their pivots 12 so that their lower ends approach one another, and shorten the arc until at last the pawl 38 is released from the fly vane 39 and the downward feed takes place, after which the series coil operates to lengthen the arc by the linkage and the tumbler or finger 38 is permitted to again engage the vane 39. The teeth of the bevel wheels 5 and 6 are made deep enough so as not to come out of gear when the bundles oscillate.

In order to facilitate readjustment of the blocks or holders 18 for the insertion of fresh carbons without removing the bevel wheels 5 and 6, the block 18 when the carbons are burned out being then in its lowest position, the pin 41 which connects the ring bearing 9 with the screwed rod 14 is withdrawn, whereupon the block can be pushed up by hand, thus rotating the liberated rod 14. The pin 41 is then re-inserted.

The circuits may be suitably arranged by insulating the left hand one of the standards 13, Fig. 1, and the terminal adjacent thereto from the plate 1. The left hand one of the rings 55 may be of insulating material in order to avoid short circuiting of the arc. The said terminal is connected by wire 102 with series coil which may have flexible connection 103 with the left hand bundle of carbons the opposite terminal of the lamps being in electrical connection with the plate 1. The coil 42 is connected across arc as shown.

In the construction Fig. 5 the carbon clips 17 with their carbons 16 are attached to a holder or block 45 provided with external screw thread 46 which engages with the internal screw thread of the tubular casing 47 which is stationary, while the spindle 48 whereon the holder 45 is non-revolubly, but axially movable, has intermittent motion due to the alternate engagement and release of the clockwork motor by the shunt magnet as in Figs. 1 to 4, the motor being geared by bevel gear 56 with the said spindle 48. The casings 47 do not rotate but are held by an upper bed-plate 51 and a lower plate 52 which plates are united by stay rods (not shown). In this figure only one bundle, viz:—the one on the right hand side, is pivotally mounted and the series coil 43 is fixed underneath the top plate, the core thereof being fitted with a striker rod 34 as in Figs. 1 to 3. The lower end of the core of the coil 43 is pivotally connected with a weighted rod 58 which is connected with a bell crank lever 59 linked by the member 60 to the right hand bundle. The left hand casing 47 and bevel wheel on shaft 57 are conveniently insulated. The working of this lamp and the circuits are very similar to those of the construction described with reference to Figs. 1 to 3.

It is not absolutely essential that a screwed member be employed, for as seen in Fig. 6 the blocks 18 with their bundles may be lowered by means of chains or cords 61, wound on to a drum 62 and at the same time rotated by the tubes 14 which are driven by bevel gear as in Fig. 1. In Fig. 6, however, the tubes are formed with diametrically opposite slots 63 and pins 64, pass right through the blocks 18 and the tubes 14. The bundles are oscillated in this construction by means of arms 65 fixed to the bearings 9, and connected by links 66 forming a kind of toggle with the yoke 32. The left parts on the left hand side are insulated as before in order that the working and the circuits may be similar to those hereinbefore described.

Supposing the carbons to have been inserted in their holders and lowered to the position seen in Fig. 1; the finger 38, having been allowed to engage the fly vane 39, prevents further downward movement, until such time as the current is turned on. The lamp having been placed in circuit no current passes through the series coil 43, but the shunt coil 42 is strongly energized and sucks down its core 28 thereby tilting the lever 32 and causing the rod 34 to strike the set screw 40 and tilt the crank arm 36, thus removing the finger 38 from the fly 39. The bundles of carbons thereupon descend under gravity, or due to the working of a motor in the casing 2, until a carbon in one bundle touches a carbon in the other bundle, whereupon a strong current flows through the series coil 43 and the current in the shunt

42 is greatly diminished, so that the core 29 is now sucked down thereby tilting the lever 32 in the opposite direction. Thus the arm 36 is free to be returned to its original position in which the finger 38 engages the fly 39 and the rod 53, being caused to descend, the bundles of carbons are pushed apart by the linkage 54 and the arc is struck. As the arc increases in length, due to consumption of the carbons, the coil 42 becomes more strongly energized and the coil 43 gets correspondingly weaker, resulting in a gradual upward movement of the core 29 and rod 53 and the shortening of the arc until the rod 34 again strikes the screw 40 and releases the fly vane 39. As soon as this happens the carbon bundles descend again meanwhile rotating and bringing a fresh pair of carbons into opposition. These being longer than those between which the arc is burning, it happens in practice with a proper correlation of parts that those fresh carbons touch and cause the striking of a fresh arc, as above described, actually before the old arc is extinguished, so that there need be no dark intervals in the working of the lamp, but only an increased intensity of the light as the arc is changed. Upon the current being cut off from the lamp the lever 32 takes a horizontal position and the finger 38 moves into engagement with the fly vane and locks the bundles of carbons in whatever position they may be in.

We claim:—

1. An electric arc lamp comprising groups of inclined carbons, supports for said groups, means for rotating the supports to revolve the carbons and means for moving the supports to feed the carbons longitudinally.

2. An electric arc lamp comprising groups of inclined carbons, supports for said groups, means for rotating the supports to revolve the carbons, means for moving the supports to feed the carbons longitudinally, and electro-magnetic means controlled by the arc to operate the feeding of the carbons simultaneously with their revolution.

3. An electric arc lamp comprising groups of carbons, blocks carrying said groups, downwardly converging guides for said blocks, means to rotate said blocks to revolve the carbons, and means to downwardly move the blocks simultaneously with their rotation.

4. An electric arc lamp comprising groups of carbons, converging screws, blocks surrounding the screws, a plurality of carbon supports in said blocks, means connecting the screws and blocks to move the latter along the screws, means to rotate the blocks on the screws, and means to control the rotation.

5. An electric arc lamp comprising groups of inclined carbons, a support for each group, means for simultaneously rotating the supports to revolve the carbons, means for moving the supports to feed the carbons longitudinally, and controlling means in connection with the arc to alternatively engage and release the last named means.

6. An electric arc lamp comprising groups of inclined carbons, a support for each group, means for simultaneously rotating the supports to revolve the carbons, means for moving the supports to feed the carbons longitudinally and simultaneously with their rotation, means to lock the rotating means, an electro-magnet in series with the arc to render the locking device effective, and an electro-magnet in shunt with the arc to render said locking device ineffective.

7. An electric arc lamp comprising groups of inclined carbons, a pivoted support for each group, means to rotate the supports and revolve the carbons, means for moving the supports to positively feed the carbons longitudinally and simultaneously with their revolution, means controlled by the arc to alternately stop and release the feeding means, and means to swing the supports on their pivots simultaneously with the stopping of the feed.

8. An electric arc lamp comprising groups of inclined carbons, a pivoted support for each group, means to rotate the supports and revolve the carbons, means for moving the supports to positively feed the carbons longitudinally and simultaneously with their revolution, electro-magnetic means in series with the arc to simultaneously stop the feeding and swing one of said supports about its pivot in one direction and electro-magnetic means in shunt with the arc to swing said support in the opposite direction and release said means.

9. An electric arc lamp comprising a group of positive electrodes and a group of negative electrodes, a rotatable holder for each group of electrodes, pivotally mounted screws, connections between the holders and screws to feed the holders downward, driving means for intermittently rotating said holders, and electro-magnetic means for swinging said screws and electrodes apart and locking the driving means after each downward feed movement of the electrodes and for swinging said screws and electrodes together prior to each downward feed movement.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HENRY WILLIAM HEADLAND.
FREDERICK PLUTTE.

Witnesses:
F. RICHERS,
H. D. JAMESON.