(No Model.)

3 Sheets—Sheet 1.

W. H. KLEES.

ELECTRIC ARC LAMP.

No. 501,884. Patented July 18, 1893.

Fig.1

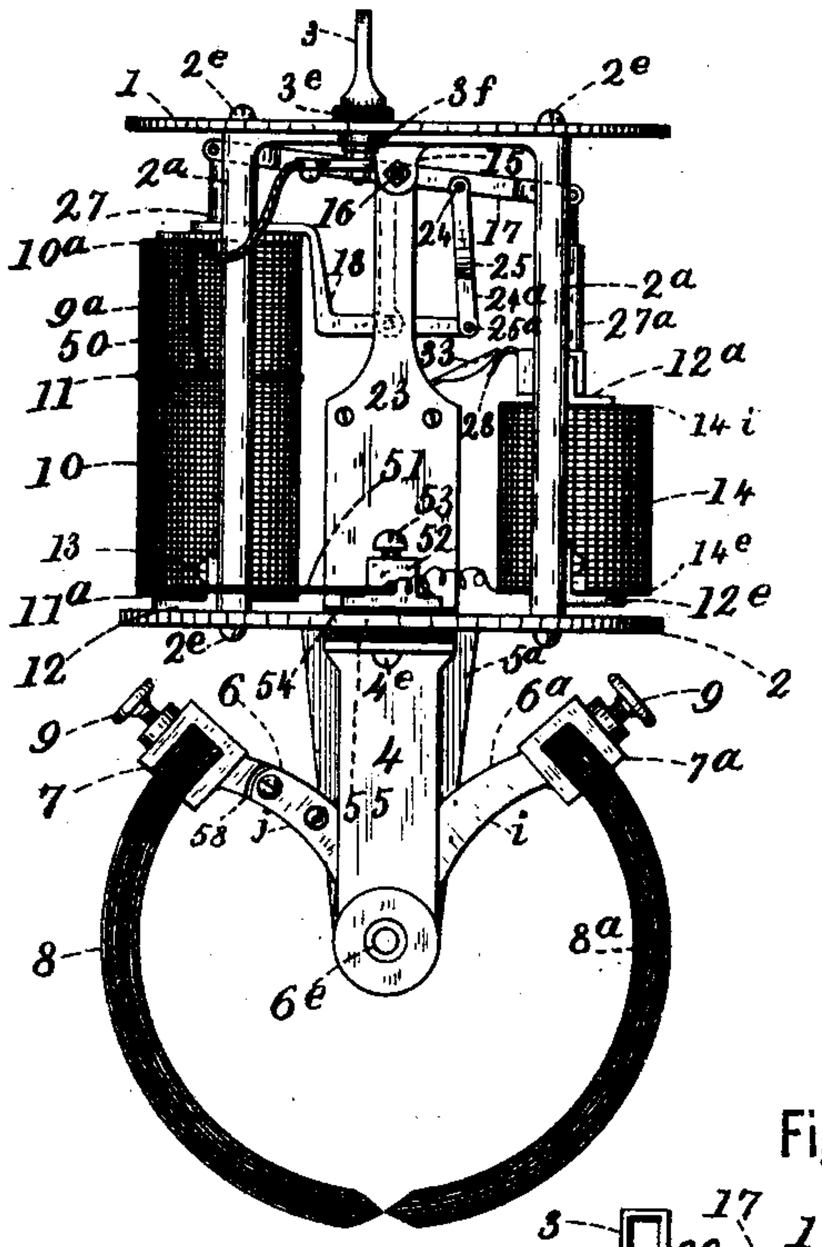


Fig.2

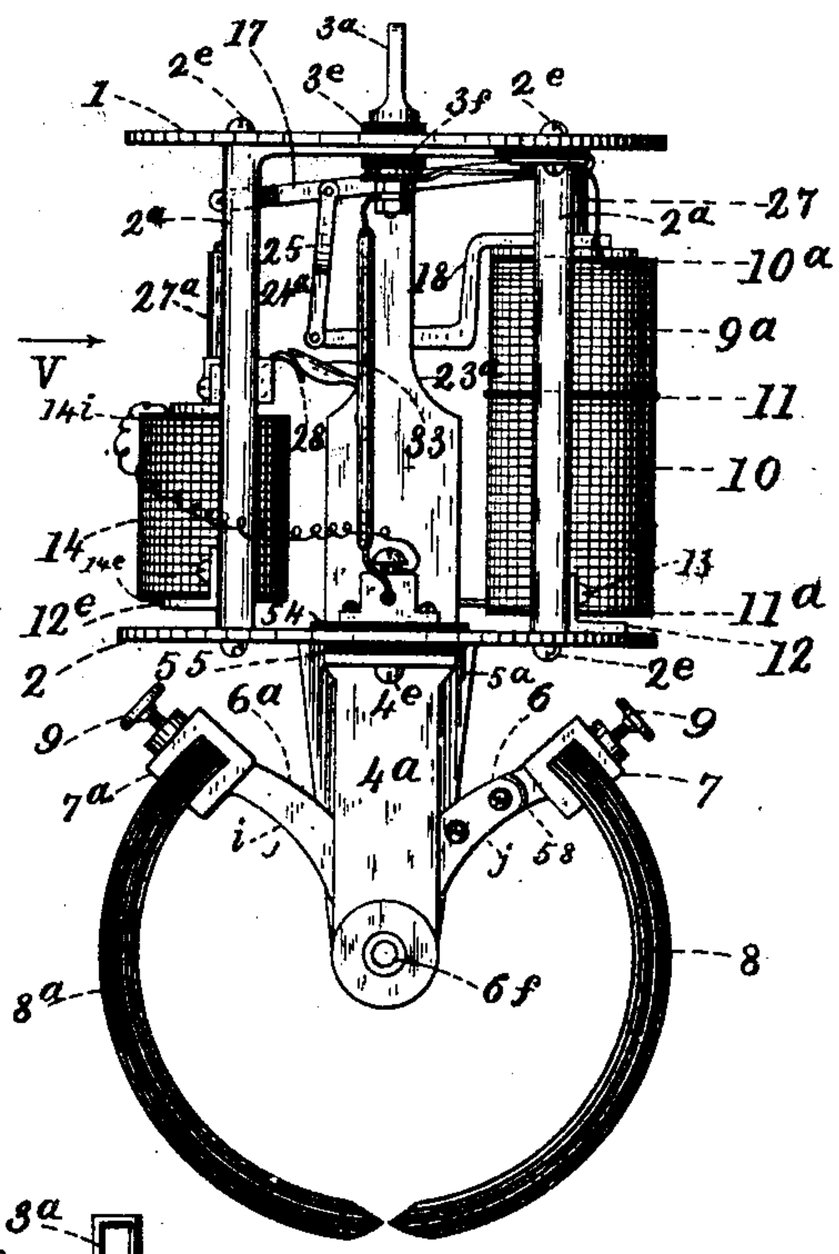
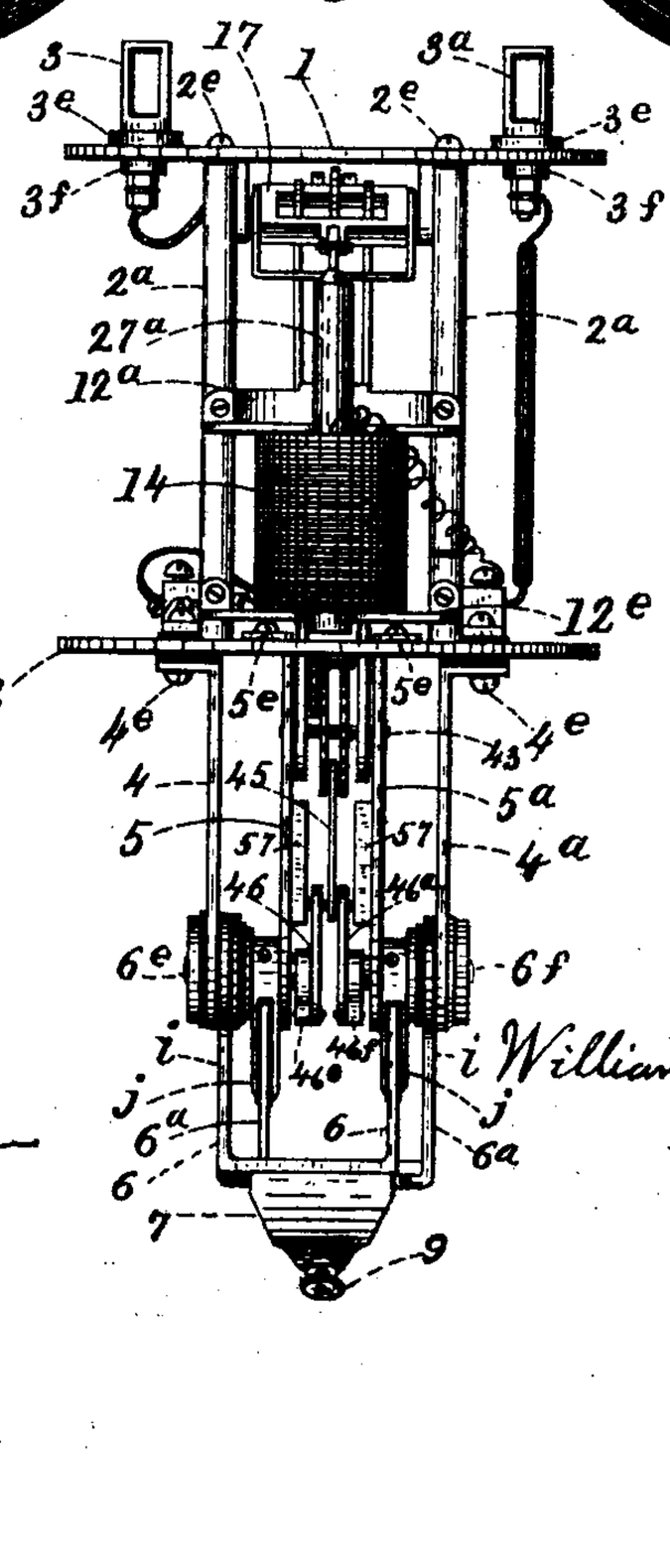


Fig.3



Witnesses.

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(No Model.)

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ELECTRIC ARC LAMP.

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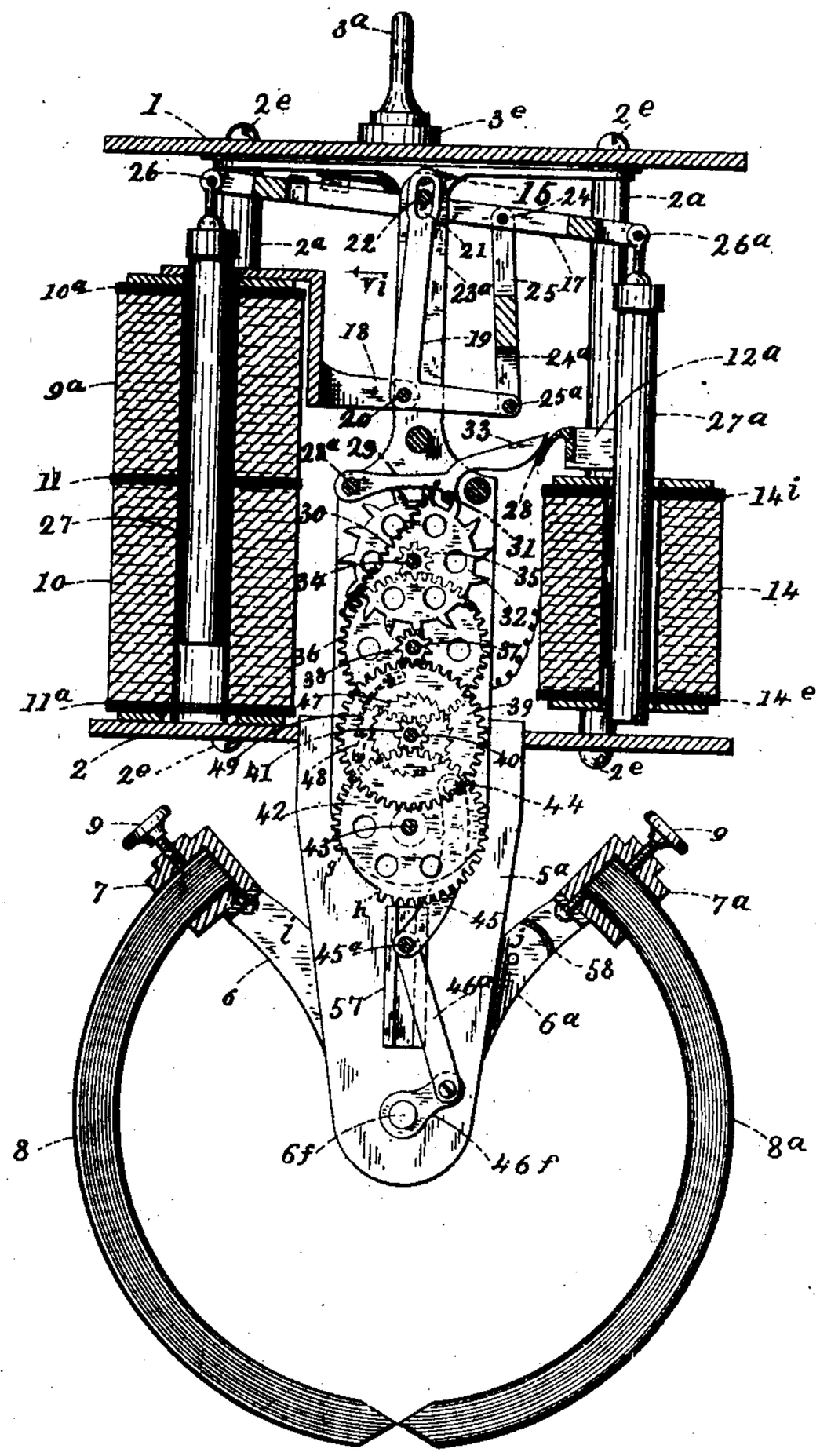
Fig. 4.



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By James Sangster

Attorney.

(No Model.)

3 Sheets—Sheet 3.

W. H. KLEES.

ELECTRIC ARC LAMP.

No. 501,884. Patented July 18, 1893.

Fig.5.

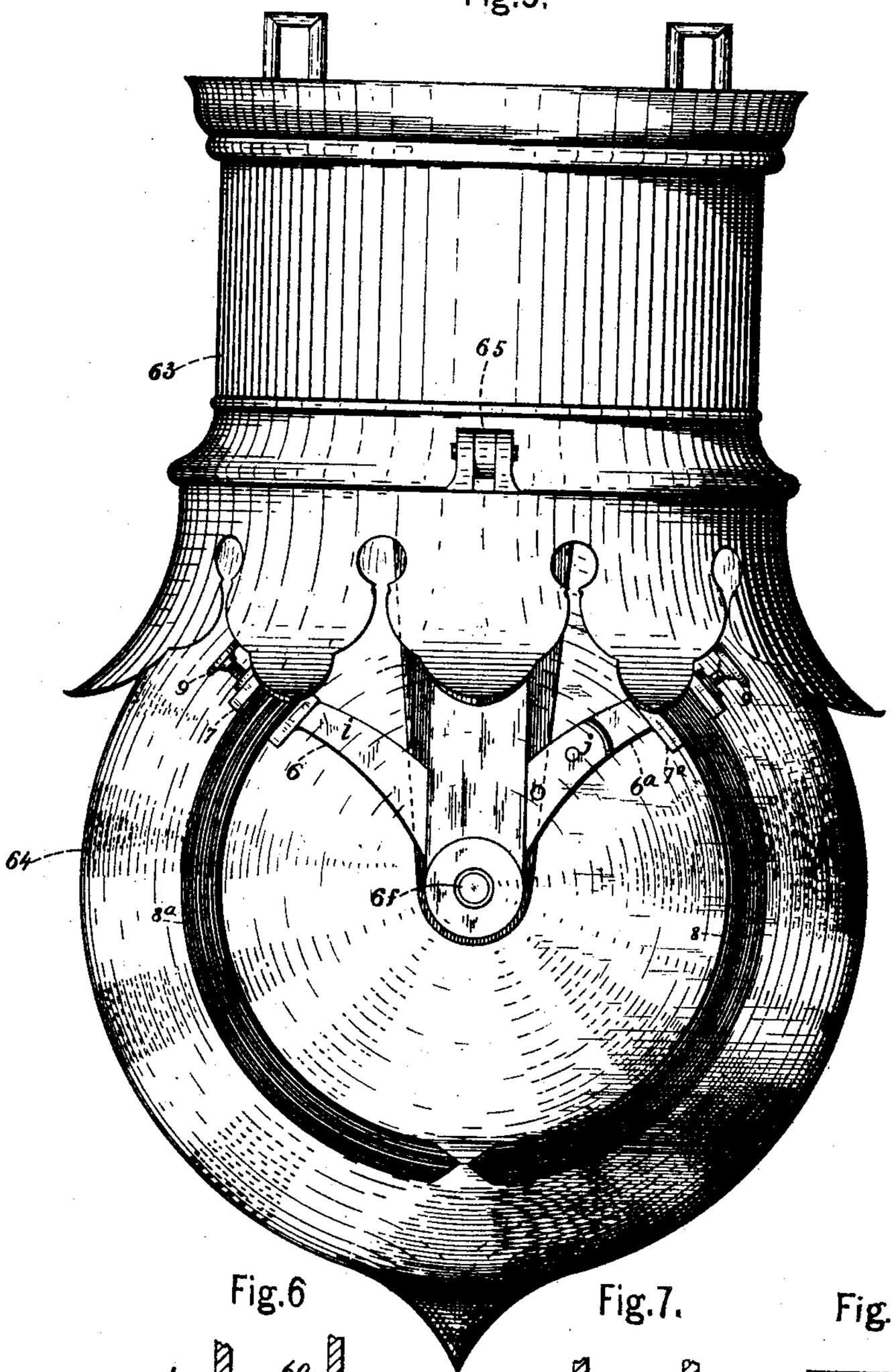


Fig.6

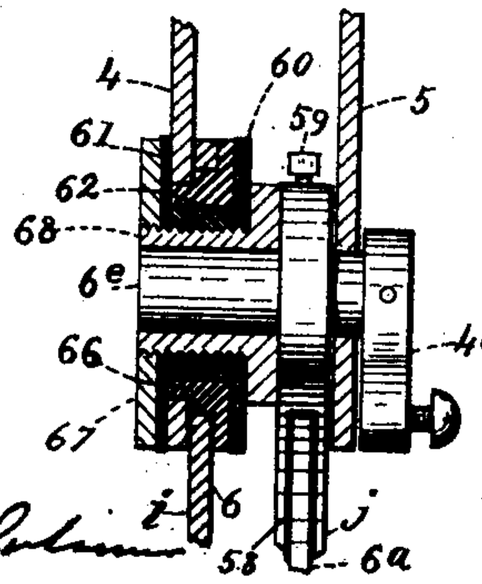


Fig.7.

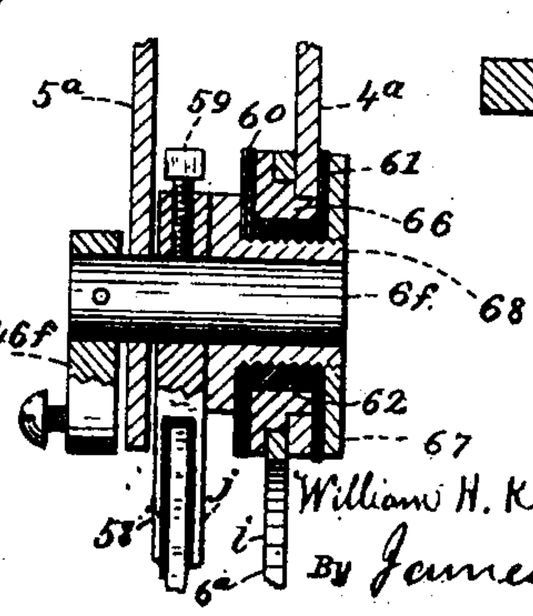
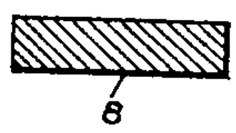


Fig.8.



Witnesses.
Harriet Johnson
Arthur Kemp

William H. Klees. Inventor.
By James Sangster.
Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM H. KLEES, OF SUSQUEHANNA, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND H. E. OUTWATER, OF SAME PLACE.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 501,884, dated July 18, 1893.

Application filed June 10, 1892. Serial No. 436,200. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. KLEES, a citizen of the United States, residing in Susquehanna, in the county of Susquehanna and State of Pennsylvania, have invented certain new and useful Improvements in Electric Alternating-Current Lamps, of which the following is a specification.

My invention relates to certain improvements in electric lights whereby the usual shadow directly below or to one side of the lamp is avoided, and also to certain details of construction, all of which will be fully and clearly hereinafter described and claimed, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of the lamp, the outside covering case and glass being omitted. Fig. 2 is a reverse side elevation of the same. Fig. 3 is an end elevation of the same, looking in the direction of the arrow, V, Fig. 2, the carbons being omitted. Fig. 4 is a sectional elevation cutting through the coils 2—9 and 10, also through the upper and lower frame pieces and other parts, enough being cut away to expose the arrangement and construction of the gearing and its connecting parts. Fig. 5 is a side elevation of the lamp complete, showing the covering case and glass connected with it. Figs. 6 and 7, are enlarged detached sectional elevations for showing the arrangement of the insulations in the lower portions of the lamp as will more clearly hereinafter appear. Fig. 8, is a cross section through one of the curved carbons, all beyond the section being omitted.

The object of my invention is to prevent the usual shadow directly below or to one side of the lamp by the employment of curved carbons, and an alternating electric current and also to render more effective the operation of the lamp.

Referring to the drawings, 1 and 2 represent two upper and lower circular plates forming the top and bottom supporting pieces for the vertical frame pieces 2^a, which are rigidly secured thereto by screws, 2^e, or in any well known way. To the top plate, 1, are secured two suspending loops 3 and 3^a, and between the said loops 3 and 3^a and the top disk 1, (above and below) is a suitable insulating material, 3^e and 3^f. On the under side of the base plate, 2, are two downwardly projecting supporting pieces 4 and 4^a. These supporting pieces 4 and 4^a, are firmly secured in place by screws, 4^e. Inside of the supporting piece 4 and 4^a, firmly secured in place by screws 5^e, see Fig. 3, is two more supporting downwardly projecting pieces 5 and 5^a, arranged so as to project down between and parallel with the pieces 4 and 4^a. Between the pieces 4 and 4^a and 5 and 5^a, are pivoted the carbon holder arms 6 and 6^a, on short shafts 6^e and 6^f, having at their outer ends the carbon holding jaws 7, and 7^a, between which the circular carbons 8 and 8^a are secured by thumb-screws 9. The coils 9^a and 10, are insulated by insulating disks 10^a, 11 and 11^a, which may be of any well known material and are firmly secured to the two posts, 2^a, on that side of the supporting frame, by cross-bars, 12, and screws, 13, similar to the cross-bars 12^a 12^e, shown in the front view in Fig. 3, securing the coil 14, in its place. The coils 9^a—10 and 14, are hollow coils made in the usual way.

At the top just under the plate, 1, at each side of the device is a downwardly projecting fixed or stationary ear, 15, and between the two ears, 15, is pivoted, by pins, 16, a rocking frame, 17, and to the top of the coil, 9^a, is rigidly secured a fixed arm, 18, to which is pivoted an angular arm, 19, by a pin 20, shown more clearly in Fig. 4. At the top of the angular arm, 19, is a slot, 21, through which a pin, 22, passes and is secured to the plates 23 and 23^a, one end of the pin 22, being secured to the plate 23 and the other end to the plate 23^a.

To the sides of the rocking frame, 17, is pivoted by pins 24 a forked bar 25, having its lower or single end 24^a, pivoted to the shorter portion of the angular arm, 19, by a pin 25^a, see Fig. 4. At each end of the rocking frame, 17, is pivoted by pins 26 and 26^a, a soft iron bar 27 and 27^a, the bar 27 passing down through the center of the coils 9^a and 10, and the bar 27^a, passing down through the center of the coil, 14. These vertical bars 27 and 27^a, may be either solid bars or made of a series of wires secured together in the well known way.

On the cross-bar, 12^a, is a downwardly bent

hook portion, 28, and between the bars 23 and 23^a, is pivoted by a pin 28^a, a pawl arm 29, having a spring 30, to hold it downward and a pin, 31, which catches in between the teeth in the escapement wheel 32. At the opposite or free end of the pawl arm, 29, is a curved forwardly projecting portion, 33, the under side-end of which rests on the hook portion, 28.

On the shaft 34, upon which the toothed wheel 32 is mounted is a pinion, 35, (shown by dotted lines) gearing in which is the toothed wheel, 36, which is mounted on a shaft, 37, having a small pinion, 38, mounted thereon. The pinion, 38, gears in with the toothed wheel, 39, which is mounted on a shaft 40, having a pinion 41, secured thereon. The pinion, 41, gears in with the teeth in the wheel, 42, which is mounted on a pin or shaft 43. This shaft, 43, is the supporting shaft for the two plates 23 and 23^a, in which are mounted the gearing shafts, 34, 37 and 40, so as to turn therein, the shaft, 43, being mounted in the plates or bars 5 and 5^a, so that the upper portions of the gearing frame plates 23 and 23^a, can swing slightly back and forth on the shaft 43.

To the wheel, 42, is pivoted by a pin, 44, an arm 45, having its opposite end pivoted by a pin 45^a, to two arms 46 and 46^a, see Fig. 3, where both arms 46 and 46^a are shown, and Fig. 4 where one of these arms is shown. The outer ends of the pin 45^a project into and are kept in line as they move up and down, by the slideways, 57. The arm 46, is pivoted to a crank 46^e, which is rigidly secured to the shaft 6^e, and the arm, 46^a, is pivoted to a crank 46^f, rigidly secured to the crank shaft, 6^f, see Figs. 3 and 4.

On the shaft, 40, is secured a ratchet wheel, 47, (shown in dotted lines in Fig. 4,) which lies close against the wheel 39. This wheel, 39, is mounted on said shaft so as to turn loosely thereon and is provided with a pawl, 48, and a spring, 49, for keeping its free end in the ratchet teeth, also shown in dotted lines. By this means the carbon arms can be easily turned upward to insert new carbons when the old ones are burned out, the shaft turning freely in the wheel, 39, but is prevented from turning in the reverse direction by the pawl engaging with the ratchet wheel, so that when turning the carbon arms upward the gearing above it and the escapement wheel and its several connecting parts are not interfered with. The carbon arms may therefore be moved easily upward but cannot move downward again unless the operation of the escapement arm 29, allows them to move. (See Fig. 4.)

From the above construction it will be seen that when the electric current is on so as to draw the arm or bar, 27, downward, thereby turning the arm, 19, see Fig. 4, on its center or pivot, 20, through its connecting forked arm 25, and moving the gearing frame-bars 23, 23^a, in the direction of the arrow V^1 (see Fig. 4) the end 33, of the escapement arm 29, will be drawn away from the part 28, thereby allowing the spring 30, to act and keep the pin 31 in full engagement with the teeth on the escapement wheel 32, and thus prevent the movement of the carbons downward, until the action is reversed so as to cause the end, 33, of the escapement arm to move up over the inclined face of the portion, 28, and thereby lift the pin, 31, out of engagement with the escapement teeth of the wheel, 32, and allow the carbons to move downward until the action is again reversed when the operation is instantly arrested as above mentioned. The current passes in at loop or binding post, 3, (which is insulated from the plate, 1, by a suitable insulation 3^e—3^f, porcelain, rubber or their equivalent well known material) and travels along the wire 50, to and through the coil, 10, thence along the wire 51, and down the supporting bar or bracket, 4, to carbon holder, 6^a, from thence to carbon 8^a, and coming in contact with carbon, 8, passes from thence through carbon holder 6 to and through bracket, 4^a, thence to loop 3^a, and to line. The wire, 51, is secured to the block 52, by the binding screw, 53. The block 52 (see Fig. 1), rests and is secured upon a plate of insulating material, 54. The supporting bar or bracket, 4, is also secured against a plate of insulating material, 55, by means of a screw, 4^e. Shunt, 14, is in shunt with coil, 10, and loop, 3^a. The current passing through main coil, 10, forms a magnetic attraction with the vertical bar, 27, thereby drawing it downward and causing the rocking frame, 17, to move downward so as to lift the forked connecting rod, 25, and through the angular arm, 19, causing the gearing supporting frame to be thrown back, thereby separating the carbons sufficiently to form an arc. If the arc is too large the coil, 14, comes into action on the vertical bar, 27^a, thereby causing the rocking frame, 17, to pull downward on that side toward the coil 14, thereby causing bar 27, to lift up so as to throw the gearing supporting frame in the opposite direction, which operation carries the end 33 of the escapement arm up over the portion, 28, thereby lifting the pin, 31, out of the escapement wheel teeth so that the gearing is free to move and allow the carbons to come together. In other words, the current passing through, 10, forms a magnetic attraction on, 27, causing that side of the rocking frame, 17, to pull down, thereby lifting up, 25, and throwing back the frame, 23—23^a, thereby causing the pin, 31, to fall into the teeth of the escapement wheel, 32, so as to hold the gear wheels, 36—39 and 42 and the intermediate connecting mechanism, and the carbons, stationary. When the gearing frame is turned back the other way it will lift up the arm, 45, and cranks, 46^e—46^f, and cause the carbon holders 6 and 6^a, to turn upward and thereby separate the carbons 8 and 8^a.

The carbon holding arms 6 and 6^a, are each composed of two arms *i* and *j*, secured together at the bottom by the carbon holding jaws. It will be noticed that the arms, *j*, in

each pair of arms are insulated by a suitable insulating material, 58, (india rubber or other similar material.) One of each pair of these arms, (see Figs. 6 and 7) the arms, *j*, are secured rigidly by a set screw, 59, to the shafts 6^e and 6^f, while the other arms, *i*, are made to run loosely on the thimbles, 66, which are secured over the insulations, 62, by the screw nuts, 67, and parts, 68, on said shafts 6^e and 6^f, so that while one arm of each pair of arms is rigidly secured to one of each of said shafts 6^e and 6^f, the other runs loosely on the thimbles, 66, mounted on and secured to the said shafts. The arms *i* and the supporting bars 4 and 4^a, are each insulated from the said shafts and their cranks and other connecting portions by rubber or other well known insulating material 60—61 and 62, so that the current cannot pass from one side of the lamp to the other except through the proper channel.

In Fig. 5, I have represented the lamp complete with the outside casing, 63, and glass globe, 64. The casing is provided with a hinge 65, so that it may be opened to allow the lamp and carbons to be got at when required.

It will be noticed that the gear wheel, 42, has some of the teeth cut away at and between the points *g* and *h*, (see Fig. 4.) The object of this is that when the carbons are worn away to within an inch or thereabout, the lamp will stop feeding when the open space between *g* and *h*, comes opposite the pinion 41.

From the above description it will be noticed that this lamp is adapted for and is intended to be used with an alternating electric current only. It is well known that in using a direct electric current in an arc lamp one carbon (the positive) is consumed much faster than the other and that while in operation the positive carbon is hollowed out or made concave, and the negative is pointed. The result of this operation is that the rays of light are thrown in one direction forward from the concave end of the positive carbon which would render objectionable the use of curved carbons such as I use because the rays of light would be thrown to one side instead of directly downward. The concave end of the positive carbon casts a shadow at the rear of its concave end so that the light is thrown directly forward and to one side, as above stated. Another trouble with the direct electric current in an arc lamp, is the complication of mechanism required to vary the feed of the two carbons. The main object of my invention is to avoid these objections by adapting an arc lamp provided with curved carbons having a flat bar shape of rectangular cross section, to an alternating electric current which while in operation keeps both carbons pointed and consumes each carbon alike so that both carbons move together until consumed and the light is cast directly downward instead of to one side.

I claim as my invention—

1. In an alternating current arc lamp, the combination, with a support, of carbon holders movably secured thereto, two hollow magnets in the support, an oscillatory frame within the support, each end of which frame is provided with a core pivotally secured thereto, said cores passing down into the magnets, side pieces pivotally secured at their lower ends to the support and provided with a train of gearing, one end of which train is connected with the carbon holders, an angle lever, one arm of which is connected with the top of the plate and the other arm is connected with the frame, and a locking and releasing mechanism for the opposite end of the train of gearing for regulating the movement of the carbon holders by the movement of the frame, substantially as set forth.

2. In an alternating current arc lamp, the combination, with a support, of carbon holders movably secured thereto, two hollow magnets within the support, an oscillatory frame within the support, each end of which is provided with a core to pass into magnets, side pieces pivotally secured at their lower ends to the support and connected with the carbon holders, an arm secured to one of the magnets, an angle lever pivotally secured to the arm, the end of one of the arms of which angle lever is slotted and pivotally secured to the side pieces, a bifurcated bar secured to the end of the other arm of the lever and with the frame, and means for locking and releasing the opposite end of the train of gearing as the frame and side pieces are oscillated back and forth, whereby the movements of the carbon holders are regulated, substantially as set forth.

3. In an alternating current arc lamp, the combination, with a support provided with depending supporting pieces, a slide way upon each piece, two carbon holders pivotally secured in the lower ends of said pieces, the inner end of the shaft of each holder being provided with a crank, a train of gearing, a jointed connection between the cranks and the last wheel of the train of gearing, the ends of the pivot of which connection engage with the slide way of the depending pieces, and means for regulating the movement of the train of gearing, substantially as set forth.

4. In an electric lamp, the combination of two electro magnets, their soft iron cores 27 and 27^a, a pivoted rocking frame connecting said cores, a pivoted swinging gear-holding frame carrying an escapement wheel and its connecting gearing for operating the carbon holders, a spring for holding the escapement arm in engagement with the escapement wheel and an inclined faced portion secured to a stationary portion of the lamp for throwing said escapement arm out of engagement with the escapement wheel every time the gear holding frame is moved toward it, substantially as described.

5. In an electric lamp, the combination with two carbon holders, each consisting of a pair of arms, one of each of which is rigidly connected to its pivotal shaft and the other arm

of each adapted to run loosely thereon, one carbon holder being insulated from the other as above described, a crank firmly connected to each shaft each having an arm pivoted thereto and kept in line at that pivotal point by slideways, a connecting rod pivoted at the opposite ends of said arms having its upper end pivoted to a gear wheel connected with a train of gear wheels and an escapement wheel and its several operating parts, a pivoted frame carrying the gear wheels and the escapement pawl arm, a stationary inclined plate secured to the frame of the lamp and against which the end of the pawl moves while operating, and mechanism consisting of a pivoted rocking frame connected with electro magnets and electrical connections and with an angular arm pivoted to a stationary support, and having its short end connected by a connecting rod with the rocking frame and its upper or slotted end, connected with the pivoted gear holding and escapement frame, the whole combined for joint operation substantially as described.

WILLIAM H. KLEES.

Witnesses:
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