(No Model.)

J. W. ELLS.

ELECTRIC ARC LAMP.

No. 453,693. Patented June 9, 1891.

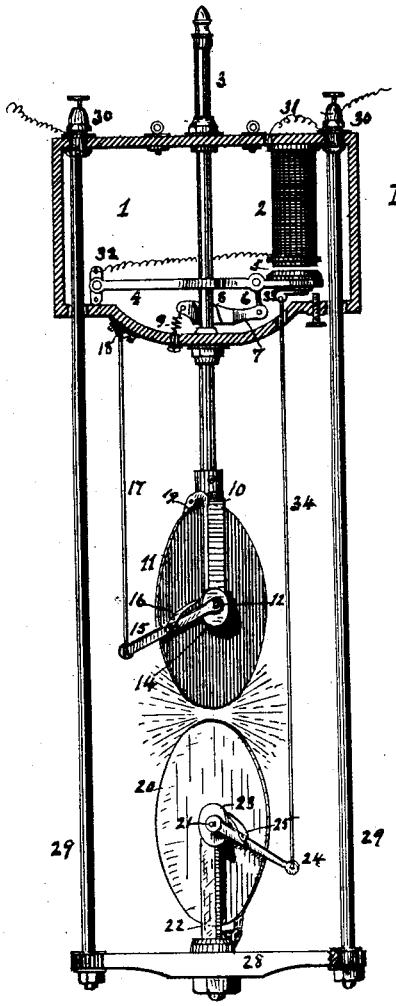

Fig. 1.

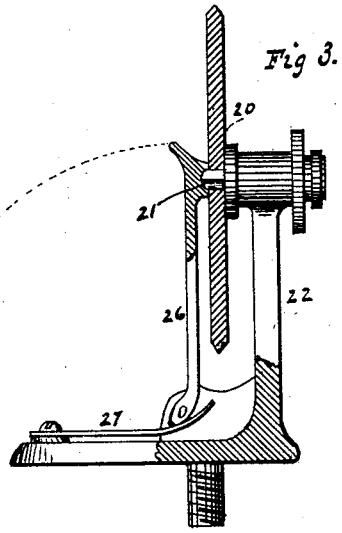

Fig 3.

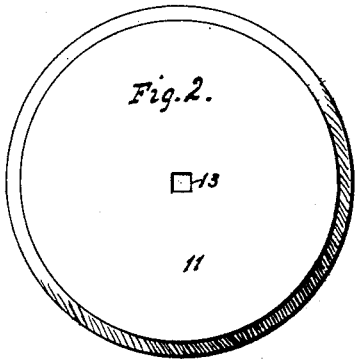

Fig. 2.

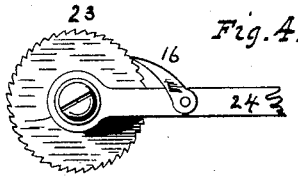

Fig. 4.

WITNESSES:

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Louis Kramer

INVENTOR

Josiah W. Ells

UNITED STATES PATENT OFFICE.

JOSIAH W. ELLS, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR OF THREE-FOURTHS TO HENRY B. SMITHSON AND LOUIS KRAMER, OF SAME PLACE, AND WILLIAM S. BOSTWICK, OF ALLEGHENY, PENNSYLVANIA.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 453,693, dated June 9, 1891.

Application filed March 21, 1890. Serial No. 344,809. (No model.)

To all whom it may concern:

Be it known that I, JOSIAH W. ELLS, of Pittsburg, in the county of Allegheny and States of Pennsylvania, have invented a certain new and useful Improvement in Electric-Arc Lamps; and I do hereby declare that the following is a full, clear, and exact description thereof.

My improvement relates to that class of mechanical contrivances known as an "electric-arc lamp," wherein the light is produced between the peripheries of two carbonaceous disks or circular plate electrodes. Heretofore the carbonaceous disks employed in such lamps have been arranged in the same plane or in positions whereby the adjacent peripheral edges of the disks are caused to rotate and move on the same line, and as a consequence the least wabble or deviation from their original "set" or plane causes them to consume unevenly and also throw an irregular light and dense shadow alternately on opposite sides. Another objection is that some portion of the mechanism has to be loosened and detached in order to remove a carbon disk from the lamp or replace one.

My invention is intended and designed to obviate the aforementioned imperfections and afford a lamp in which the carbons shall burn evenly and for a longer time with greater regularity than those unprovided with my improvement. To that end I arrange the carbon disks crosswise, and by suitable mechanism automatically adjust and cause them to rotate in planes or lines at right angles to each other, and also means whereby the carbon disks may be properly placed and held in position or removed without detaching any metallic portion of the lamp.

With these objects in view my invention consists in the construction, arrangement, combination, and operation of parts herein specified and claimed.

The construction and operation of my improved electric-arc lamp will be readily understood from the foregoing description, taken in connection with the accompanying drawings, wherein—

Figure 1 is a vertical front view of my electrical arc lamp, partly in sectional elevation. Fig. 2 is a side view of one of the circular carbonaceous disks. Fig. 3 is a sectional elevation of the lower carbon disk and its support. Fig. 4 is a detachable side view of one of the ratchet-wheels, together with its pawl and lever.

To give my invention bodily form I prepare a suitable box or case 1, and arrange therein one or more electro-magnets 2, together with such other parts as may be necessary to operate the lamp by means of an electric current. Down through the central portion of the box or case 1 extends a square vertical rod 3, which when the lamp is not in action can be easily moved up and down in suitable guides. Pivoted at one side or end of the case and inside of the same is a horizontal lever 4, the end of which most remote from its pivotal point being provided with a soft iron armature 5, attached thereto and arranged directly underneath the downward end of the aforesaid electro-magnets. To this horizontal bar 4, and by means of a pivotal connection, is one end of a small link 6, its opposite end being in like manner connected to the extreme longest end of a bar 7, in which is formed a hole 8 obliquely to the axis of the vertical rod 3, that passes downward through it. To the opposite end of this bar 7 is fixed a spring 9, by which that end of the bar 7 is constantly drawn downward, so that when the electro-magnet 2 attracts the iron armature 5 on the end of the long horizontal bar 4 it will raise it and to the same extent elevate by means of the link 6 the shorter bar 7 and cause the reverse edges of the oblique hole 8, through which the vertical rod 3 passes, to tightly grip the same, raising it to the extent of the upward movement of the grip-bar 7, it being assisted in the matter of the grip by means of the spring 9 at one end thereof. When the magnet ceases to act and releases its hold upon the armature, the sides of the oblique hole 8 in the secondary bar are brought more nearly to a vertical position, letting go its hold upon the rod 3, enabling it to fall by its own weight ready for repeated elevation or

adjustment. Attached to the lower end of this vertical central rod 3 is a suitable hanger 10, having pivoted therein a circular disk 11, formed of carbonaceous material. This circular disk 11 is supported within its hanger 10 by means of a transverse shaft 12, that part of which passing through the carbonaceous disks is square, corresponding in size and shape of a central hole 13 therein. The outer end of this transverse shaft is provided with a ratchet-wheel 14, and beside the same is a long outwardly-projecting lever 15, having pivoted thereto a pawl 16, that engages the teeth of the aforesaid ratchet-wheel 14. To the opposite end of this lever 15 is a long link 17, extending upward and pivoted at its upper end to a suitable support 18, connected to but insulated from the bottom or under side of the box or case; and to hold the circular carbonaceous disk 11 securely in place on its central shaft the same is provided with a latch or keeper 19, pivoted at one end to the hangers and operated on by a spring in such manner as that when the keeper or latch 19 is drawn away from the carbon disk it will compress the spring, release the carbon, and admit of its removal for the substitution of a new and fresh one, which will be held firmly and securely in place on the end of its shaft by a return of the latch or keeper to its former and original position.

On a right vertical line and immediately beneath the upper circular disk 11 is arranged a secondary and similar circular carbonaceous disk 20, the plane surface of which is at a right angle to that of the first, whereby the rays of light may pass outward without interference, and this lower carbon 20 is supported by a central transverse shaft 21, that passes entirely through it and a suitable bearing 22. This shaft is also provided with a ratchet-wheel 23 at or near its outer end, and is also provided with a lever 24 and pawl 25 for rotating the same by an intermittent up-and-down movement of said lever. This bearing or support 22 has also attached at the lower end thereof a latch or keeper 26, provided with a spring 27 to hold the carbon in substantially the same manner as that hereinbefore described, and this vertical bearing 22 is secured in a horizontal bar 28, sustained in proper position by means of long rods 29 passing through each end thereof. These rods extend upward to and entirely through the box or case 1, containing the electro-magnet, but are insulated therefrom and surmounted at the top each by means of a suitable binding-post 30, screwed thereon for the purpose of attaching wires leading to a dynamo or other generator of electricity. The rod on the right hand where it connects with the lower cross-bar 28 is also insulated therefrom at that point. From the binding-post 30 at the top of this rod 29 extends a wire 31, that passes into the box 1 without touching it, and after a number of convolutions or windings around the electro-magnet extends across the box, where its inner end is made fast to a suitable support 32 in connection with the box insulated therefrom, but in metallic contact with the lever of the electro-magnet, which is prevented from dropping too far from the magnet or out of the magnetic field of influence by means of a vertical thumb-screw, whereby the same may be adjusted. Immediately underneath this iron armature 5 and secured to the lever 4, carrying the same but insulated therefrom, is attached a short arm or hanger 33, to which is pivoted the upper end of a long vertical rod 34, that extends downward through a hole in the bottom of the case without touching it, and the lower end of this rod 34 is pivoted to the extreme outer end of the lever 24, designed to actuate by means of the pawl 25 and ratchet-wheel 23 aforesaid and the negative or lower circular carbonaceous disk 20, and to suspend the lamp the top or upper portion of the case is provided with two or more eyebolts securely attached thereto.

Having described the mechanical structure of my new and improved electric-arc lamp, its operation is as follows: The wires in the upper binding-posts having been properly connected to a dynamo or other sufficient generator of electricity so as to complete the electrical circuit, the current of electricity will pass first into the binding-post 30 at the top of the rod 29 at the right-hand upper corner of the case or box 1, and from thence, by means of a second wire 31 in connection therewith, pass around its convolutions, forming part of the electro-magnet 2, and from thence by a continuation enter the long lever 4, supporting the armature 5, and pass through its connections into the clutch 7 and central vertical rod 3, down through it and its hanger 10 into the upper or positive carbon 11, from thence into the lower carbon 20, and through its metallic support 22 into the cross-bar 28 beneath, and upward through the rod 29 on the left-hand side of the case or box 1, and out through the binding-post and wire 30 at the top, so as to complete the electrical circuit. At this instant the electro-magnet 2 will attract the iron armature 5, lift the lever 4 and its connecting-clutch 7, which in turn will grip tightly the central vertical rod 3, lift it and its suspended upper carbon 11 a sufficient distance from the lower carbon 20 to produce between them a space for the production of an electrical arc by a transiliency of the current or its leap across said space into the lower carbon, and pass therefrom in the manner hereinbefore stated. When the distance between the carbons becomes too great for the passage of the currents, the circuit will become temporarily broken. The electro-magnet will then cease to act, let go its hold on the iron armature, releasing the rod and enabling the upper carbon to fall and form a new contact with the lower carbon and re-establish the electrical circuit. At that instant the armature will be again attracted and, by means of the clutch,

draw up the rod and its suspended carbon a sufficient distance to re-establish the electrical arc between the carbons. As the armature drops free from the influence of the electro-magnet it will, by means of the long connecting-link 34, attached to the pivotal shaft of the lower circular carbon 20, enable the pawl on said lever to engage the teeth of its ratchet-wheel, so that the armature 5 on its attraction toward the magnet brings about a partial revolution of this lower circular carbon. The vertical rod 17 also in descending by means of a similar device will bring about a partial rotation of the upper circular carbon, so that on each make and break of the electrical current the circular carbons are brought together, separated a little distance, and caused to revolve as they are consumed, thus presenting new surfaces to the axis of the electrical arc, the operation in that respect continuing with intermittent action until the greater portion of the carbonaceous disks are consumed.

Having thus described my improvement, what I claim is—

1. In an electric-arc lamp, the combination of an electro-magnet, a lever pivoted to a bearing insulated from but connecting it to the lamp-frame, a shorter lever or clutch underneath and connected to the first lever by means of a link, a movable vertical rod that extends through a hole in the clutch, a hanger attached directly to the lower end of the vertical rod, a transverse shaft in said hanger, a carbon disk supported in the hanger by the transverse shaft, a ratchet-wheel rigidly secured to said shaft, a lever pivoted to the same, a pawl connected and adapted to move with said lever and engage the ratchet-wheel to rotate the carbon disk, and an insulated link connecting the long end of the pawl-lever to the frame of the lamp, whereby the carbon disk is adjusted vertically and partially revolved at the same time by action of the electro-magnet.

2. In an electric-arc lamp, the combination of an electro-magnet, a lever pivoted to one side of the lamp-frame, an armature rigidly secured to the free end of said lever, a clutch connected to the same, a vertical rod adapted to be lifted by the clutch, a hanger attached to the lower end of the vertical rod, a carbon disk journaled in said hanger, a ratchet-wheel secured to the shaft that extends through the carbon disk, a lever and pawl in connection therewith, and a spring latch or keeper hinged to the hanger and adapted to press against the carbon disk to hold it in place.

3. In an electric-arc lamp, the combination of an electro-magnet, an armature, a vertically-adjustable rod, a hanger secured to the lower end of said rod, a rotatable disk of carbon pivoted in said hanger, a clutch adapted to engage and operate said rod when the armature is attracted by the magnet, and a stationary support sustaining and having pivoted therein a second carbon disk arranged in a vertical plane beneath and at a right angle to that of the first, each carbon disk being provided with sutiable devices connecting them to the armature, whereby simultaneous partial rotation may be given said carbon disks in cross directions.

In testimony whereof I have hereunto set my hand this 19th day of March, A. D. 1890.

JOSIAH W. ELLS.

Witnesses:
A. C. JOHNSTON,
ALFRED H. JONES.

Correction in Letters Patent No. 453,693.

It is hereby certified that Letters Patent No. 453,693, granted June 9, 1891, upon the application of Josiah W. Ells, of Pittsburg, Pennsylvania, for an improvement in "Electric-Arc Lamps," was erroneously issued to Josiah W. Ells, Henry B. Smithson, and William S. Bostwick, as sole owners of the patent; whereas said Letters Patent should have been issued to *Josiah W. Ells, Henry B. Smithson, Louis Kramer, and William S. Bostwick*, said Kramer being joint assignee of one-fourth interest as shown by the record of assignments in this Office; and that said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 16th day of June, A. D. 1891.

[SEAL.]

CYRUS BUSSEY,
Assistant Secretary of the Interior.

Countersigned:

C. E. MITCHELL,
Commissioner of Patents.