(No Model.)

R. H. JAHR.

ELECTRIC ARC LAMP.

No. 524,981. Patented Aug. 21, 1894.

Fig:1.

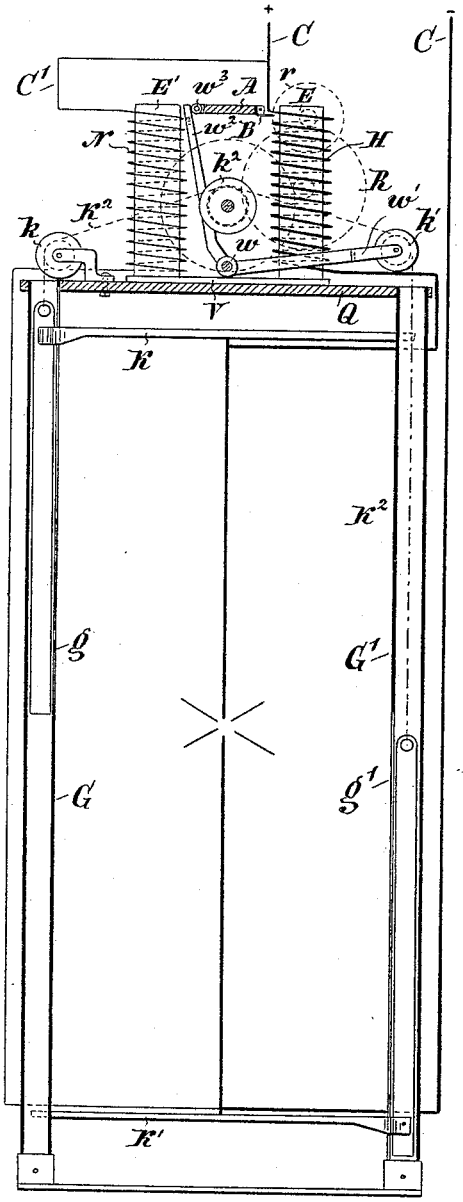
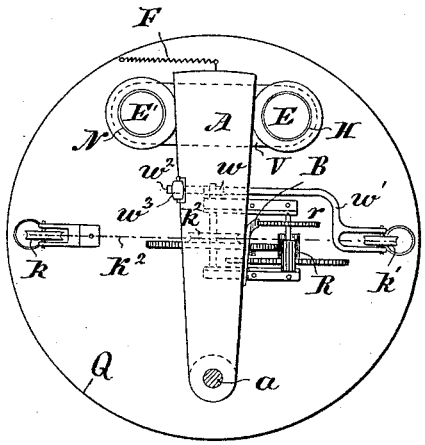


Fig:2.



Witnesses:
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Inventor:
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UNITED STATES PATENT OFFICE.

RUDOLF HERMANN JAHR, OF OPLADEN, GERMANY, ASSIGNOR OF ONE-HALF TO CARL FERDINAND SCHOELLER, OF SAME PLACE.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 524,981, dated August 21, 1894.

Application filed April 19, 1894. Serial No. 508,201. (No model.)

To all whom it may concern:

Be it known that I, RUDOLF HERMANN JAHR, a subject of the King of Prussia, and residing at Opladen, in the Kingdom of Prussia, German Empire, have invented new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

This invention relates to improvements in electric arc lamps and more particularly to the mechanism by means of which the regulation of the luminous arc is effected.

The electric arc lamps to which the present improvements are particularly applicable belong to that class in which the two carbon-holders are attached to the two ends of a chain or cord guided over pulleys or rollers and the carbons are caused to approach each other owing to the greater weight of the upper carbon-holder. According to this invention the said regulating device is so constructed that the shortening of the electric arc to the normal length or the feed of the carbons, the lengthening of the arc when shortened during the burning away of the carbons—as by the falling of small particles from the upper carbon onto the lower one—as well as the primary striking of the arc when the carbons are in contact, are effected by horizontal oscillations of a single armature which is placed under the influence of two magnetic poles of like name dependent for their respective magnetic strength on the fluctuations of the electric arc so that, according to the changing strength of said magnets, the armature is caused to oscillate to one side or to the other. In oscillating to one side the armature causes the upper carbon-holder to be released whereby the latter is permitted to descend in order to shorten the arc to normal length; in oscillating to the other side the armature causes the upper carbon-holder to be stopped again, while it allows the under carbon-holder to descend in order to compensate for shortening of the arc or to start the arc when the carbons are in contact on the lamp being put in the circuit.

A practical embodiment of my invention is represented in the accompanying drawings, in which—

Figure 1 is a sectional elevation of the lamp represented in a somewhat diagrammatical manner, the parts being shown in their normal position. Fig. 2 is a plan of the lamp.

The two carbon holders K and K′ sliding in tubular guides G, G′ provided with longitudinal slots respectively g, g' and hung from the base-plate Q as usually, are connected together by means of a chain or cord K^2 passing over guide pulleys R, R′ and a chain-wheel k^2 arranged between the same, the said wheel k^2 being regulated in its speed by a wheel work R, shown in dotted lines in Fig. 1, while it appears in full lines in Fig. 2. The guide pulley k is carried by a stationary support, while the other one is mounted in the end of the horizontal arm w' of a bell-crank lever w pivoted at the elbow and with its upright arm w^2 abutting against a small antifriction roller w^3 disposed at the side of a piece A mounted on a vertical axis a so as to be capable of being oscillated in a horizontal plane. This piece A is provided with a spring stop B opposite to the last wheel r of the wheel work R. It is made of soft iron and placed with its free end between the free polar ends of the cores E E′ of a horse-shoe electro-magnet or an electro-magnet composed of two single electro-magnets the cores of which are united by a connecting piece V. The coils respectively H and N on these cores are so arranged that the said two polar ends receive a like polarity either positive or negative. Thus the piece A receives by magnetic influence at the free end the opposite polarity to and at the rear end the same polarity as the polar ends of the said magnet. The winding H on the core E lies in or forms part of the main circuit C of the lamp, while the winding N on the core E′ is in a derivation C′ to the arc.

So long as the number of ampère-windings on both the cores E, E′ is alike, both poles will have an equal strength and each will exert a like but contrary attraction on the soft iron piece A forming the armature of the electro magnet. Consequently the two impulses neutralize each other with the effect of maintaining the armature A in the position it occupies at this moment and which is its normal position. If, on the contrary, the number of ampère-windings on the one side increases, the pole on this side becomes correspondingly stronger and so exerts a stronger

pull on the armature. Moreover, the other pole, besides being weakened by its decreasing number of ampère-windings, is further weakened by the propagation of the magnetism from the stronger pole, so that its resistance to the oscillation of armature A toward the stronger pole is reduced by the coaction of two causes. The result of this arrangement is a very great sensitiveness of the armature to the changes of the arc.

The arrangement is so designed that, if the lamp be out of circuit, the armature A is held in an approximately central position between the two poles but somewhat nearer to the pole of the derivation-magnet E′ N by the pull of a spring F (Fig. 2). In this position the armature causes the spring stop B to just engage with the last wheel *r* of the wheel work R and the bell crank lever *w* to assume such a position that its horizontal arm *w′* and thus the lower carbon-holder K′ are slightly raised.

The action of the device is as follows: Supposing the lamp to be put into circuit, the carbons being in contact. The whole of the current passes through the coil H of the main circuit magnet E H with the effect of the armature A being shifted toward this magnet and the spring stop B engaged deeper into the said wheel *r*, so that the bell crank lever *w* can obey the pull of the lower carbon-holder K′ which is thus allowed to descend correspondingly, while the upper carbon-holder K is held stationary. The result is the striking of the electric arc. On the other hand if, at the moment of switching in the lamp, the carbons are separated from one another, the current passes through the coil N of the derivation-magnet E′ N and the armature A is caused to travel to the other side so as to draw the stop B entirely out of the wheel *r*. This has the effect of permitting the upper carbon-holder K to descend and to raise the under carbon holder K′ until the two carbons contact with each other whereby the current is diverted from the derivation C′ and caused to pass through the coil H of the main circuit magnet E H. This causes the armature A to move in the other direction with the result of re-engaging the stop B in the wheel *r* and causing the lower carbon-holder K′ to descend, while the upper carbon-holder K is maintained, so that the arc is struck. By the gradual wearing away of the carbons the number of ampère-windings on the derivation electro-magnet E′ N is increased and consequently the armature A is caused to travel gradually toward the same; as soon as it passes over the normal position, that is to say, when the power of the derivation magnet E′ N becomes greater than the normal power of the main circuit magnet E H, the stop B releases the wheel *r* and the feeding of the carbons takes place until the number of ampère windings of the main circuit magnet is again so increased and the number of ampère-windings of the derivation magnet so decreased that the former magnet causes the armature A to move back to its normal position in which it locks again the wheel *r*. In this case should the carbons be fed too far by an excess of ampère-windings on the main circuit magnet E H, the latter will cause the armature A to be attracted by it beyond the normal position whereby the lower carbon-holder K^2 is allowed to descend, while the upper carbon-holder K is held stationary by the stop B penetrating deeper in the wheel *r*, so that the correct length of arc is re-established. During the burning of the lamp should the arc be shortened from any cause, for instance by the accumulation on the under carbon of small particles of the upper-carbon, the resulting increase of the number of ampère-windings on the main-circuit magnet E H causes a correspondingly stronger attraction of the armature A toward said magnet with the effect of allowing the lower carbon-holder K′ to descend until the normal length of arc is re-established the lower carbon-holder being then raised again by the increasing action of the derivation magnet E′ N owing to the burning away of the said particles.

What I claim as my invention is—

1. The combination, in an electric arc lamp, of a horse-shoe electro-magnet having two adjacent poles of like name, an armature placed with one end between said poles and mounted so as to be capable of oscillations in a horizontal plane, a winding placed in the main circuit of the lamp for exciting one of the said poles, and a winding placed in a derivation to the luminous arc for exciting the other one of said poles, substantially as and for the purpose stated.

2. The combination, in an electric arc lamp, with an upper carbon holder, an under carbon holder of less weight than the upper one, a chain or cord or other equivalent connecting together the said holders, and a clock work for controlling the speed of said chain, of a horse-shoe electro-magnet having two adjacent poles of like name, an armature placed with one end between said poles, a winding placed in the main circuit of the lamp for exciting one of said poles, another winding placed in a derivation to the luminous arc for exciting the other one of said poles, and means controlled by said armature for stopping and releasing the clock work and raising and lowering the under carbon holder, substantially as and for the purpose specified.

3. The combination, in an electric arc lamp, with an upper carbon holder, an under carbon holder of less weight than the upper one, a chain or cord or other equivalent connecting together the said holders, and a clock work for controlling the speed of said chain, of a horse-shoe electro-magnet having two adjacent poles of like name, an armature placed with one end between said poles, a winding placed in the main circuit of the

lamp for exciting one of the said poles, another winding placed in a derivation to the luminous arc for exciting the other one of said poles, a spring stop disposed at one side of said armature for stopping and releasing the clock-work and means controlled by the said armature for lowering and raising the under carbon holder, substantially as and for the purpose specified.

4. The combination, in an electric arc lamp, with an upper carbon holder, an under carbon holder of less weight than the upper one, a chain or cord or other equivalent connecting together the said holders and a clock work for controlling the speed of said chain, of a horse-shoe electro-magnet having two adjacent poles of like name, an armature placed with one end between said poles, a winding placed in the main circuit of the lamp for exciting one of the said poles, another winding placed in a derivation to the luminous arc for exciting the other one of said poles, a spring stop disposed at one side of said armature for stopping and releasing the clock-work and a bent lever resting with an arm against the side of said armature and adapted to engage with its other end that portion of the said chain to which is fixed the under carbon holder, substantially as and for the purpose specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

RUDOLF HERMANN JAHR.

Witnesses:
FRITZ SCHRÖDER,
SOPHIE NAGEL.