(No Model.)

R. J. GÜLCHER.

ELECTRIC ARC LAMP.

No. 259,756. Patented June 20, 1882.

Fig: 1.

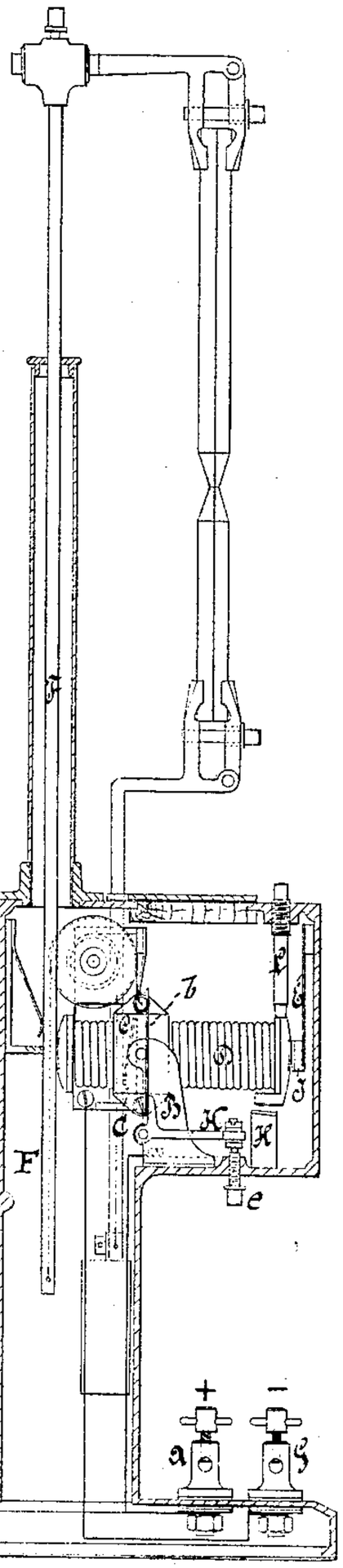
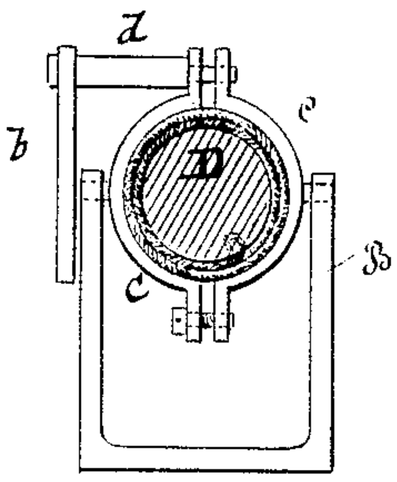


Fig: 2.



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ROBERT J. GÜLCHER, BIALA, AUSTRIA.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 259,756, dated June 20, 1882.

Application filed November 17, 1881. (No model.) Patented in Germany November 8, 1879, No. 10,333; in France March 10, 1881, No. 141,632; in Austria November 12, 1881, No. 28,431; in Hungary November 12, 1881, No. 41,673; in Spain November 22, 1881; in Italy November 26, 1881, XV, 13,550, XXVII, 93; in Sweden November 26, 1881; in Norway November 29, 1881; in Portugal January 18, 1882, No. 722, and in Russia January 25, 1882, No. 368.

To all whom it may concern:

Be it known that I, ROBERT JACOB GÜLCHER, mechanical engineer, residing at Biala, in the Empire of Austria, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

The invention relates to an electric lamp in which the size of the voltaic arc is produced by the action of an oscillating bar electro-magnet, one pole of which acts by magnetic contact upon the guide-rod of the upper-carbon holder, while a brake device acts upon the other pole of the electro-magnet for regulating the movements of the same. In connection with the oscillating electro-magnet are used certain stop devices, by which the extent of the oscillating motion of the magnet and the size of the arc are controlled, as will appear more fully hereinafter.

Figure 1 represents a sectional side elevation of my improved electric lamp, which is adapted for being used with my system of parallel derivation of the current; and Fig. 2 is a detail vertical transverse section of the oscillating magnet of the lamp.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, A and G represent the binding-posts of my improved electric lamp, to which the current is supplied from a dynamo-electric machine or other source of electricity, it entering the lamp at the binding-post A, from whence it passes over a short connecting-wire to a vertical frame which is insulated from the horizontal portion of the casing of the lamp. A metallic ring, C, made of two semi-sections, is hung by center pivots to the frame A.

To the ring C is applied a bar electro-magnet, D, in such a manner that one end of the same extends at greater length from the ring than the other. The current passes from the frame B through the pivots of the ring, then through the ring itself and the coil of the electro-magnet, with which it is electrically connected, and finally into the core of the same, which core is provided with enlarged poles, the pole of the shorter end of the magnet forming contact with the vertically-guided rod F of the upper-carbon holder, the other with a contact-plate, I, of a spring, E, said spring being attached to the metallic casing of the lamp, and forming with the plate I a magnetic brake.

Below a rectangular extension of the pole of the longer end of the electro-magnet is arranged inside of the casing an iron block, H, toward which the enlarged pole of the electro-magnet is attracted when the current passes through the coil of the same. A spring, *b*, which is attached to the shorter arm of an elbow-lever, K, and which is insulated from the case, engages the sidewise extended screw *d* of the metal ring C and throws the electro-magnet D against the movable bolt of a screw-post, L, when no current flows through the lamp.

The tension of the spring *b* is regulated by a set-screw, *e*, which is attached to the longer arm of the elbow-lever K and extended to the outside of the casing, as shown clearly in Fig. 5. The screw-post L is arranged above that pole end of the electro-magnetic to which the spring-brake E is applied. The outer faces of the electro-magnet D are made in the shape of arcs of a circle, the centers of which coincide with a point midway between the pivots of the ring C.

The pole-faces and the contact-surface of the rod F and brake-plate I are coated by a thin layer of brass with a view to prevent the rusting of the iron and to secure the exact working of the lamp by diminishing the adhesion of the poles to the rod F and brake-plate I.

The current is divided in the core and conducted through the poles of the same to the spring-brake I E and the metallic casing of the lamp, and through the guide-rod F to the upper-carbon holder, then through the carbon points and the guide-rod of the lower-carbon holder and a wire-connection to the insulated binding-post G, and thence back to the negative pole of the source of electricity. When

the current is thrown through the lamp the electro-magnet is moved by the attraction of the fixed iron block H by its longer end toward the same. As the block H is fastened to the casing, the electro-magnet is forced to approach it—that is to say, the electro-magnet is made to oscillate on the pivots of the ring C. By this motion the upper-carbon holder is lifted, owing to the contact of its guide-rod F with the arc-shaped opposite pole of the electro-magnet. This lifting of the guide-rod F is accomplished in exactly the same way as if the contact-surfaces were composed of a rack and pinion of infinitely small pitch. By the lifting of the upper-carbon holder the carbons are separated and the voltaic arc is formed. As the distance between the carbon points increases the resistance also increases.. Consequently the force of the current and the power of the magnet are diminished. As the distance between the carbon points by which the arc is formed corresponds with the force of the current, owing to the fact that the weight of the upper-carbon holder is equal to and balances that of the lower, it is obvious that with the increasing distance the magnetism of the core of the electro-magnet becomes weaker, so that the same gradually recedes from the iron block H, by which motion the carbon points are made to approach each other until the electro-magnet is stopped by the spring-bolt of the screw-post L. From this moment the magnet remains in a state of rest, and the carbon points assume soon, by burning off, that proper distance which produces the greatest intensity of light corresponding to the force of the current. As soon as this intensity of light is attained the power of attraction of the magnet becomes, by the further burning off of the carbon points, so small that the guide-rod of the upper-carbon holder cannot be held back any longer by the pole of the electro-magnet. Consequently it commences to slide down. This sliding down of the carbon-holder, however, proceeds very slowly, as with the approach of the carbon points the magnetism in the core of the electro-magnet increases again, attracts the carbon-holder to the pole end, and thus prevents the further downward motion of the guide-rod. If the guide-rod had descended too far down, the magnetism would increase suddenly to such a degree that a powerful attraction of the enlarged pole of the electro-magnet toward the iron block H would take place, and consequently the carbons would instantly be separated and the operation before described would repeat itself.

Experiments have shown that the magnet remains almost continuously in a state of rest, provided the fluctuations of the current are not too great, and that the carbon-holder sinks never too far down, even if set free. By means of the layer of brass at the pole-faces and contact of the guide-rod, the motion of the guide-rod takes place freely, as it does not remain attracted too long to the pole. In this manner a steady and uniform sliding-down motion of the carbon-holder is obtained.

The magnetic brake formed by the spring E and contact-plate I serves to retard the oscillations of the electro-magnet at the time when the current is first thrown into the lamp. This brake accomplishes its object in a more perfect manner than the flies or other regulating devices generally used in arc-lamps. The reason is simply this, that the stopping force, consisting of the coefficient of friction of the metals multiplied by the power of attraction of the electro-magnet, is in direct proportion to the force of the electric current. By the use of the magnetic brake the lamp burns steadily from the very beginning, which is afterward kept up by the position of the magnet on the screw-stop L.

It is preferable to make both carbon-holders movable and to connect them with each other in any approved manner, so that the focus of the lamp is maintained at a constant height. The lower-carbon holder can be employed for balancing the upper holder if the weight of the same is too great for the electro-magnet D.

It is not necessary to connect the carbon-holders by the usual rack-and-pinion device, as it is sufficient to simply connect the guide-rods of the carbon-holders by means of silk or other strings conducted over guide-pulleys of proper diameter, so that the required motion is imparted to the carbon-holders—to wit, a quicker feed-motion to the upper and a slower motion to the lower carbon holders, as required for arc-lamps.

My improved electric lamp is also adapted for use in series for the division of the electric current—that is to say, several arc-lamps may be supplied from one single source of electricity without changing anything in the construction of the lamp or adding any other mechanism for this purpose. This is accomplished by placing any desired number of lamps in parallel derivation and employing quantity-currents instead of intensity-currents, as only the former currents can be successfully used for supplying lamps placed in parallel derivation.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination of an oscillating electro-magnet having enlarged poles with a fixed iron block below one pole and with the guide-rod of the upper-carbon holder being in contact with the opposite pole, substantially as set forth.

2. The combination of an oscillating electro-magnet having enlarged poles with a fixed iron block below one pole and with a magnetic brake at the same pole, for regulating the motion of the electro-magnet when starting the lamp, substantially as set forth.

3. The combination of an oscillating electro-magnet having enlarged poles with a fixed iron block below one pole, a spring-brake at

the same pole, and a spring-stop above the pole, substantially as set forth.

4. The combination of an oscillating electro-magnet, supported in a pivoted ring-frame, with an adjustable elbow-lever having a contact-spring which engages a stop-screw at the outer end of the ring, substantially as specified.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 30th day of August, 1881.

R. J. GÜLCHER.

Witnesses:
E. BOETTCHER.
ROBT. M. HOOPER.