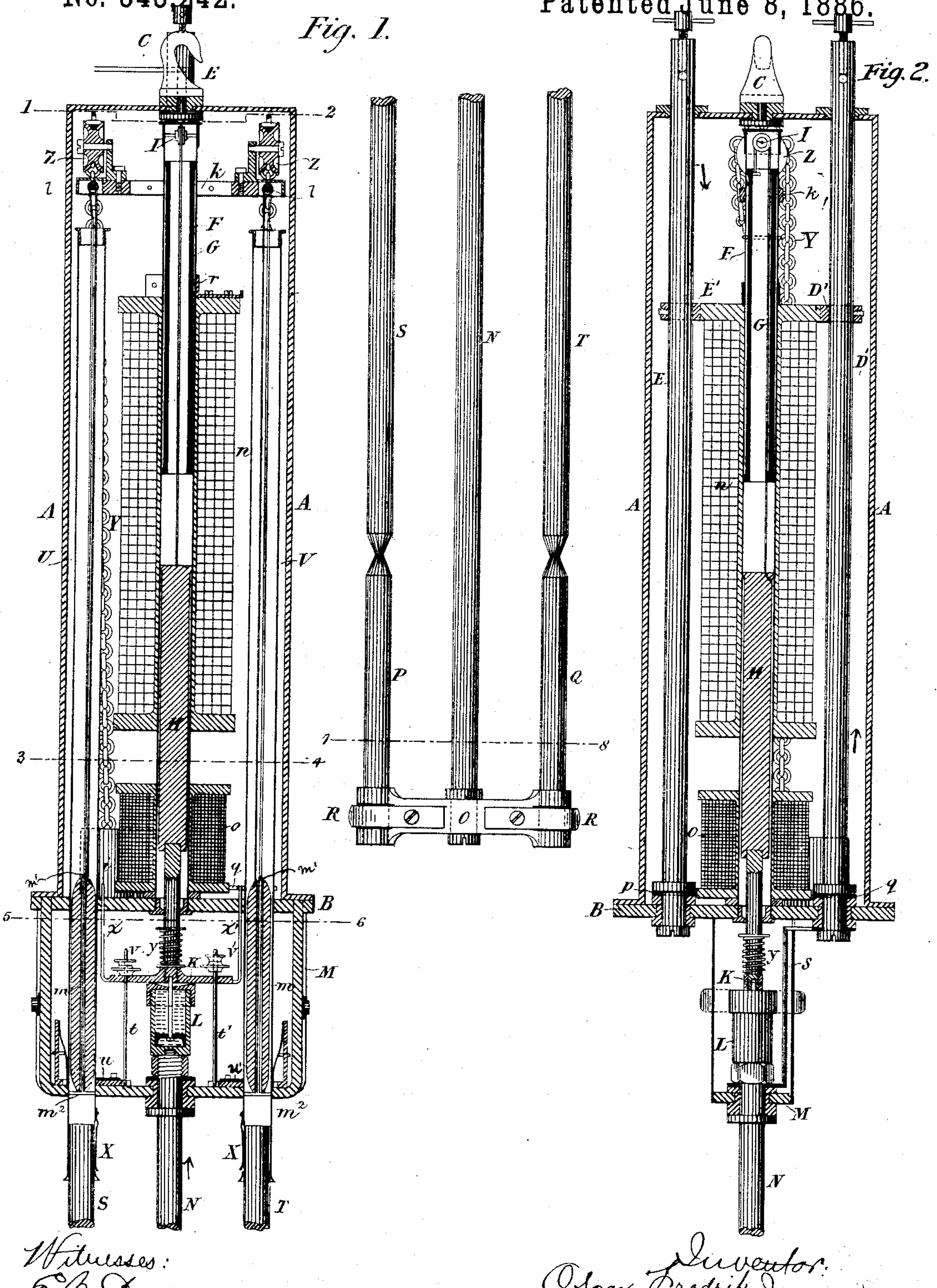
(No Model.) 2 Sheets—Sheet 1.

O. F. JÖNSSON.

ELECTRIC ARC LAMP.

No. 343,242. Patented June 8, 1886.



Witnesses:
E. C. Davidson
James Young.

Inventor:
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by his Attorneys
Baldwin, Hopkins & Peyton

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.)

2 Sheets—Sheet 2.

O. F. JÖNSSON.

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Fig. 3.

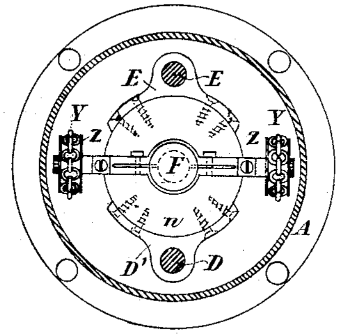


Fig. 5.

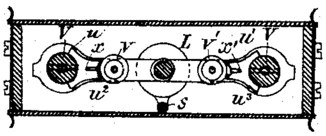


Fig. 6.

Fig. 8.

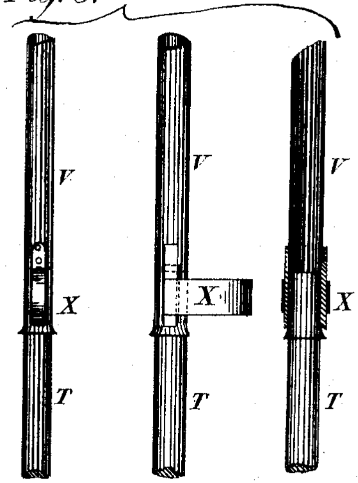


Fig. 4.

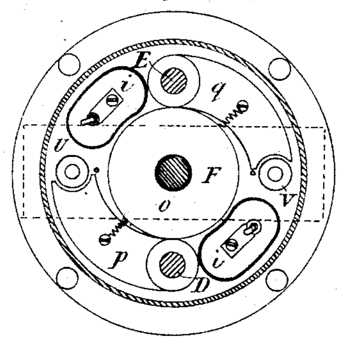


Fig. 10.

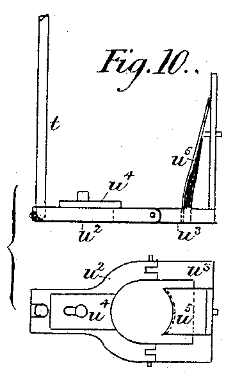


Fig. 9.

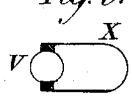
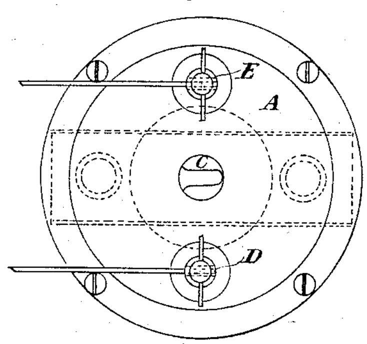


Fig. 7.



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UNITED STATES PATENT OFFICE.

OSCAR FREDRIK JÖNSSON, OF STOCKHOLM, SWEDEN.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 343,242, dated June 8, 1886.

Application filed February 10, 1885. Serial No. 155,515. (No model.)

To all whom it may concern:

Be it known that I, OSCAR FREDRIK JÖNSSON, a subject of the King of Sweden, residing at Stockholm, Sweden, have invented a certain new and useful Improved Electric-Arc Lamp, of which the following is a specification.

The object of this invention is an automatically-regulating electric-arc lamp, having two pairs of carbons intended to burn one after another. The top carbons with their holders are exactly counterbalanced by weights and chains, in order to reduce to a minimum the power required for regulating the arc and maintain the length of the arc constant, whereby irregularities in the light are prevented as far as possible. The lamp is also arranged as a differential lamp.

On the annexed drawings, Figure 1 represents an arc lamp in longitudinal section. Fig. 1ª is an elevation of the carbons and carbon-holder, and Fig. 2 a section of the lamp at right angles to the section shown in Fig. 1. Fig. 3 is a horizontal section of the lamp on the line 1 2, Fig. 1; Fig. 4, a section on the line 3 4; Fig. 5, a section on the line 5 6, and Fig. 6 a section on the line 7 8. Fig. 7 is a plan view, and Figs. 8 and 9 are details, of the bottom part of the top-carbon holder. Fig. 10 shows the catch for the carbon-holder.

A is a case inclosing the top part of the lamp. This case is attached to a metallic plate, B, and is provided with a hook, C, for its suspension. The hook is insulated from the metallic mass of the lamp.

D and E are two metallic standards attached to the plate B and passing upward through the case A, but insulated from it and the plate.

F is a tube projecting vertically from the center of the plate B, in which are suspended, by a string running over a pulley, I, two tubes or cores of iron, G and H, of which the lower one, H, has at its lower end a guide-bar of non-magnetic matter terminating in a cross-piece, K, beneath the plate B. It is preferred, however, to form the upper iron core, G, of a tube and to make the lower one, H, solid. Beneath the cross-piece K there is a cataract or dashpot cylinder, L, containing fluid and having within it a piston. The top end of the piston-rod is attached to the cross-piece K. The cylinder L is attached to the top of the metallic rod N, which in its turn is attached to a bar, M, which descends from the plate B and forms part of the frame of the lamp. The rod N is insulated from the bar M.

At the lower extremity of the rod N is a cross-piece, O, which carries the lower carbons, P and Q. The cross-piece O has holes at its ends in which the carbons are held each by its spring R. (See Figs. 1 and 6.) The top carbons, S and T, are held in the lower ends of their respective tubes U and V, and are retained there by the springs X, attached to the tubes. These springs pass through slots in the tubes and press against the carbons. (See Figs. 1, 8, and 9.) The tubes U and V pass upward through holes in the bar M and the plate B. To the tops of the tubes are attached chains Y Y, passing over pulleys Z Z, the other end of the chains being fastened to the bottom of their respective chain-boxes *i*. The chains Y are of such a weight that length for length their weight equals that of the carbon. The pulleys Z are attached to a cross-piece, *k*, projecting from the top of the tube F. In the same cross-piece and directly above the tubes U and V are two small pulleys, *l*, over which threads or fine cords are laid. One end of each is attached to the top of a hollow counter-weight, *m*, and the other end is attached to a pin, m', passing through the counter-weight and attached by the cross-pins m^2 to the lower end of the tube. The weights *m* approximately balance the tubes, the tubes being somewhat the heavier, so that they have a tendency to slide downward.

n and *o* are two solenoids on the tube F. The lower one, *o*, is stationary and connected with two contact-pieces, *p* and *q*, projecting horizontally from the metallic standards or contact-pieces D and E. (See Fig. 4.) These contact-pieces terminate near their respective tubes U and V. The interior wire end of the top solenoid, *n*, is adjustable on the tube F, and is secured to the metallic piece E′, supported by the standard E, and its exterior end is secured to the contact-pincher *r*. The piece D′, corresponding with the piece E′, is insulated.

The lamp is worked in the following manner: The current enters the lamp through the metallic standard E, passes from this through the coils of the bobbin *n*, to the tube F, through the contact-pincher *r*. When the current has entered the tube F, it spreads through the metallic mass of the lamp and enters the tubes U and V. From this it branches down through the carbons S and T and the carbons P and Q, which are in contact with the cross-piece *o*. It descends through the rod N, the connecting-wire S, the standard D, and then passes out into the circuit. During the passage of the current through the solenoid *n* both the iron cores G and H will be pulled in toward one another, causing the cross-piece K to rise. Through this cross-piece two bars, *t* and t', pass, one at each side of the cataract-cylinder L. Each of these bars is jointed to its respective catch *u* and u'. These entirely encompass their respective tubes U and V.

The catches are represented in detail, Fig. 10, and each consists of two jointed parts, u^2 and u^3, between which the tubes U and V pass, and the hole formed by these parts may be adjusted to the diameter of the tube by means of a movable metallic piece, u^4, and a spring, u^5. Thumb-nuts *v* and v' on the bars *t* and t' are adjusted, so that when the cross-piece K is raised the nut *v*, with its bar *t* and the catch *u*, for instance, will be raised first. When that takes place, the catcher *u* seizes the tube U, causing the catcher to assume an inclined position, thus lifting the tube U and the carbon S, and breaking the contact. The current passes then only through the carbons T and Q. During the continued rise of the iron core H the cross-piece K comes against the nut v', so that the bar t' and the catcher u' in their turn lift the tube V, causing the carbons T and Q to separate. Then the arc is formed between these carbons. As already indicated, a small portion of the current passes through a derived circuit from the standard E, the contact-plate *q*, the bobbin *o*, the contact-plate *p*, and the standard D. When the arc is prolonged, and the resistance consequently increased, the derived current increases, whereby the core H is drawn downward until the catcher u' comes against the bar M, which allows the tube V to slide down and restores a suitable length of arc. Thus the derived current will again be diminished and the carbon stopped. This arrangement of the solenoids *n* and *o*, with their cores G and H, has the advantage of preventing shocks in the motion of the cores. When the derived current increases, and the traction of the solenoid *o* is, in consequence, augmented, this solenoid has to overcome not only the tendency of the solenoid *n* to draw the lower iron core, H, upward, but also to overcome the tendency of the same solenoid to draw the iron core G downward. In the manner described the descent of the carbon continues until a flange round the top of the tube V comes against a pin, x', projecting vertically from the cross-piece K and passing through a hole in the plate B. The tube V thus becomes suspended thereon, and so the equilibrium within the lamp will not be deranged. In proportion as the tube V descends and the carbons T and Q are consumed, the chain Y also is drawn over the pulley to a length equal to that consumed of the carbon T. When the flange of the tube V has come against the pin x' and the carbon T cannot descend farther, the cross-piece K is pulled down farther than before, owing to the influence of the solenoid *o*, so that the catcher u' bears against the bar M. The tube U, with its carbon S, now descends until the carbons S and P come into contact. The current will then pass by this pair of carbons, between which the arc is formed in the manner already described. The carbon S will descend in due course until it is consumed and the flange of the tube U rests against a pin, *x*, projecting from the cross-piece K. When this tube is suspended on its pin, the core H is still pulled down until the flanges of both the tubes U and V touch the contact-rails *p* and *q*. The contact-rails are thus put into direct contact with the metallic mass of the lamp. The consequence is that the current passes from the standard E through the rail *q* over into the tube V and into the metallic mass of the lamp, and from this through the tube U, the rail *p*, and away through the standard D. When this takes place, no current passes through the solenoid *o*, and it is not exposed to destruction by the current. In this manner an automatic cutting out of the lamp from the circuit takes place when both pairs of carbons are consumed; but the current is not interrupted for the other lamps on the circuit.

In order as far as possible to steady the motions of the the iron cores H and G they are controlled partly by the cataract-cylinder L and partly by a spiral spring, *y*, which is compressed when the iron core H has been drawn up to a certain height. The bars *t* and t' may also be made in the shape of spiral springs, to prevent too rapid motions. It is, finally, obvious that the lamp may also be used if the chains and the counter-balances are removed; but then the positions of the solenoids *n* and *o* in relation to each other and to the iron cores G and H must be adapted to correspond, because the solenoid *n* must then be made to work more powerfully, that it may counteract the weight of the tubes and the carbons, which are then not counterbalanced.

I am aware that heretofore it has been proposed to employ two sets of carbons in an electric lamp, to burn one set of carbons at a time, and to divert the electric current from one set of carbons to the other as soon as the first set is nearly consumed.

I am also aware that it has been proposed to employ chains for counterbalancing the carbons length for length, and also weights for counterbalancing both the carbons and their holders.

I claim as my invention—

1. The combination, in an electric-arc lamp, of the two solenoids *n* and *o*, of which solenoids one is movable and traversed by the greater part of the current, while the other is station-

ary and forms a derived circuit, the two connected cores G and H, suspended within the solenoids, the cross-piece K, connected with the cores, the carbon-holders, and the clips on the cross-piece that embrace the carbon-holders, substantially as set forth.

2. The combination, in an electric-arc lamp, of the contact-rails p and q, connected with the metallic body of the lamp, the flanged tubes or carbon-holders U and V, the solenoids, their cores, the cross-piece K, connected with the cores, and the pins or projections $x\ x'$, carried by the cross-piece, upon which the flanges of the tubes rest, whereby the equilibrium of the lamp is maintained, and whereby the tubes are prevented from coming in contact with the contact-rails p and q before the carbons are completely consumed, substantially as specified.

3. The combination, in an electric-arc lamp, of the rising and falling tubular carbon-holders, the carbons, the chains attached to the holders that counterbalance the carbons length for length, the weights that nearly counterbalance the holders, and the fine cords that pass over pulleys and connect the tubes to the weights, substantially as described.

4. The combination, in an electric-arc lamp, of the two standards or terminals D and E, the solenoid or solenoids, the core or cores, the tubular carbon-holders U and V, connected with the cores, the contact-pieces p and q, connected with the standards, and the flanges on the upper ends of the carbon-holders, which, when the carbons have been in succession consumed, descend upon the contact-pieces, thus short-circuiting the solenoids, substantially as set forth.

OSCAR FREDRIK JÖNSSON.

Witnesses:

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ERNST SVANQVIST.