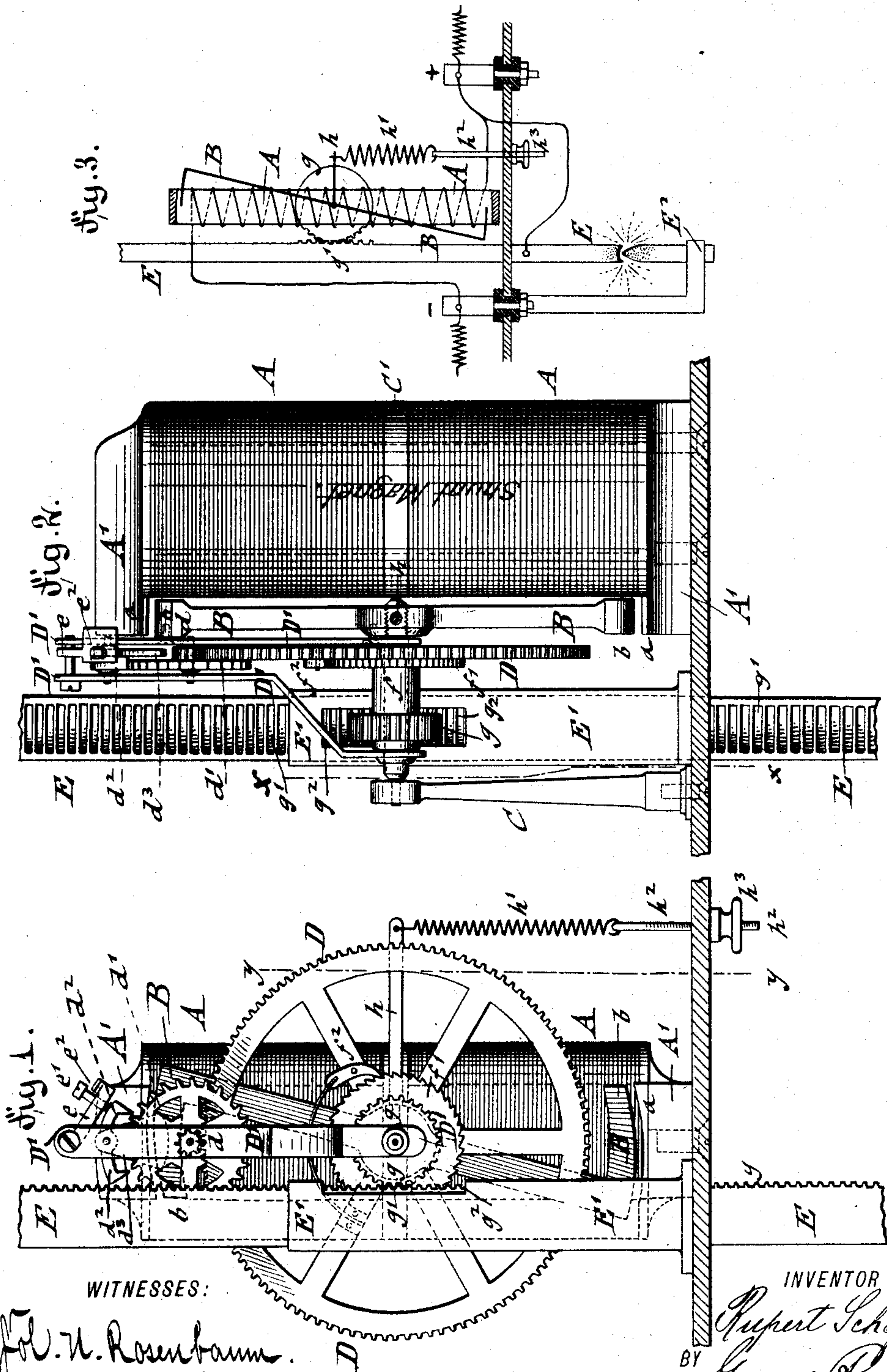


(No Model.)

R. SCHEFBAUER.  
ELECTRIC ARC LAMP.

No. 420,314.

Patented Jan. 28, 1890.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

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CHARLES BEIL, OF SAME PLACE.

## ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 420,314, dated January 28, 1890.

Application filed January 25, 1889. Serial No. 297,551. (No model.)

*To all whom it may concern:*

Be it known that I, RUPERT SCHEFBAUER, of the city, county, and State of New York, a citizen of the German Empire, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

This invention relates to an improved arc lamp in which the size of the arc is kept up in a regular and reliable manner by the action of an electro-magnet on an oscillating armature, which latter operates the upper-carbon holder in connection with a suitable releasing mechanism.

In the accompanying drawings, Figure 1 represents a front elevation of my improved electric-arc lamp, partly in section on line  $x x$ , Fig. 2. Fig. 2 is a side elevation of the same, partly in section on line  $y y$ , Fig. 1; and Fig. 3 is a diagram showing the arrangement of the main and shunt circuits of the lamp.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, A represents an electro-magnet, which is located in a shunt of the main circuit and provided at opposite ends with laterally-projecting poles  $A'$ , having segmental faces  $a$ . A Z-shaped armature B, provided with segmental ends  $b b$ , is centrally pivoted between its ends  $b b$  to bearings of a supporting-standard C and of an insulating-partition  $C'$ , arranged between the coils of the electro-magnet A, as shown in Fig. 2.

To the pivot-shaft of the armature B is applied a main gear-wheel D, which meshes with a pinion  $d$ , that turns in bearings of two arms  $D' D'$ , of which one is screwed to the armature B, while the other is connected to the former, both being applied to the pivot-shaft of the armature B and swinging therewith. The shaft of the pinion  $d$  carries an escapement-wheel  $d'$ , which is engaged by an escapement  $d^2$ , that is pivoted to the arms  $D'$  and provided with a pendent weight  $d^3$ , by which the escapement  $d^2$  is released from the teeth of the escapement-wheel  $d'$  whenever the arms  $D'$  arrive in a position vertically above the pivot-shaft of the armature B, as shown in Fig. 1. To the upper end of the

arms  $D'$  is pivoted an arm  $e$ , having a set-screw  $e'$ , which acts on the escapement  $d^2$ , controlling the escapement-wheel  $d'$ , and which is provided with a laterally-extended lug or plate  $e^2$ , that forms contact with the upper pole end  $A'$  of the electro-magnet A whenever the armature B is attracted by the poles of the electro-magnet A and the arms  $D'$  arrive in vertical position. As soon as the lug  $e^2$  forms contact with the pole end  $A'$  the set-screw  $e'$  is released from the escapement  $d^2$ , so as to permit by the action of the weight of the escapement the pallets of the latter to liberate the teeth of the escapement-wheel  $d'$ , whereby the same and the pinion  $d'$  can turn freely and follow the motion of the gear-wheel D. The gear-wheel D is applied to a sleeve  $f$ , which turns loosely on the pivot-shaft of the armature B, and which carries a ratchet-wheel  $f'$ , that is engaged by a spring-pawl  $f^2$ , pivoted to one of the arms of the gear-wheel D. The sleeve  $f$  also carries a pinion  $g$ , that meshes with a rack  $g'$  on the upper-carbon holder E, which latter is guided in a fixed upright guide-sleeve  $E'$ , that is attached to the casing of the lamp and provided with an opening  $g^2$ , for permitting the pinion  $g$  to mesh with the rack  $g'$ . The lower-carbon holder  $E^2$  is fixed and supports the lower carbon pencil.

To the hub of the armature B is applied a fixed laterally-projecting arm  $h$ , to the outer end of which and to an eye or hook of a screw-rod  $h^2$  is applied a spiral spring  $h'$ , the tension of which is adjusted by a screw-nut  $h^3$ , applied to the screw-rod  $h^2$ , so as to regulate the resistance of the armature to the attraction of the poles of the electro-magnet.

The operation of my electric-arc lamp is as follows: When the lamp is switched out of the circuit, the upper and lower carbon points are separated by the action of the tension-spring  $h$  to such a distance that the voltaic arc cannot be formed. As soon as the lamp is switched into the circuit the entire current passes through the shunt and energizes the electro-magnet to such an extent that the tension of the spring  $h$  is overcome and the armature B drawn in quickly by the poles  $A'$ . The arm  $e$  is thereby lifted by contact with the



pole end  $A'$ , and the escapement mechanism is thereby released from the main gear-wheel D and the upper-carbon holder permitted to drop by gravity, the gear-wheel D, pinion  $d$ , and escapement-wheel  $d'$  turning freely by the action of the rack  $g'$  of the carbon-holder and transmitting gear-wheel  $g$  on the gear-wheel D. By the dropping of the upper-carbon holder the contact of the carbon pencils takes place and the entire current passes from the ingoing binding-post through the carbons to the outgoing binding-post, so that the electro-magnet is without current, which causes the armature to be drawn quickly away from the poles of the electro-magnet by the action of the tension-spring  $h$ . This lifts the upper-carbon holder, and the arc is formed. A part of the current passes simultaneously through the shunt-circuit and energizes the electro-magnet A, so that the armature B is again attracted, and thereby the turning of the armature on its pivots and the downward feeding of the upper carbon by the intermediate train of gear-wheels produced. As the resistance of the arc increases a greater quantity of the current passes through the coils of the electro-magnet, so that the armature is drawn more and more inward by the poles of the electro-magnet and the upper carbon point fed downward toward the lower carbon point, and thereby an arc of a uniform size kept up. As the upper carbon is burned away the resistance of the arc between the carbon points is getting still greater, and the armature is finally drawn in so far by the action of the electro-magnet that the arms  $D' D'$  arrive in a vertical position (shown in Fig. 1) until the lug  $e^2$  forms contact with the upper pole  $A'$  and releases the escapement  $d^2$ , so that the pallets of the latter release the escapement-wheel by the action of the pendent weight  $d^3$  and permit the escapement-wheel  $d'$  and pinion  $d$  to turn on their axis in following the motion of the gear-wheel D, which is turned by the weight of the descending upper-carbon holder on the rack  $g'$  and pinion  $g$ . By the downward feeding of the upper carbon pencil the resistance of the arc is diminished and a smaller quantity of the current passes through the shunt, so that the armature B is moved away from the poles  $A'$  by the action of the spring  $h^2$ , and thereby the upper carbon pencil lifted again. The gradual burning away of the upper carbon produces again the drawing in of the armature and the lowering of the upper carbon until the train of gear-wheels is again released and the upper carbon dropped again, and so on, the oscillating motion of the armature caused by the varying resistance and the varying strength of the current in the main and shunt circuit keeping up the required size of arc in a uniform and reliable manner. As soon as the downward feed of the upper-carbon holder has taken place and the arm  $e$  is released from the pole  $A'$ , the escapement

$d^2$  locks the escapement-wheel and prevents the turning of the train of gear-wheels and the dropping of the upper carbon. The pawl-and-ratchet connection of the gear-wheel D with the sleeve  $f$  permits the inserting of a carbon into the upper-carbon holder and the turning of the pinion  $g$  and sleeve  $f$  in raising the upper-carbon holder without interfering with the transmitting-train of gear-wheels.

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

1. The combination of a main circuit, a shunt-circuit, an electro-magnet located in the shunt-circuit and provided with laterally-projecting segmental pole ends, a pivoted Z-shaped armature having segmental ends, arms fixed to the shaft of said armature and constituting a swinging frame, a sleeve on said shaft, a main gear-wheel on said sleeve, a pinion supported in said frame and meshing with the gear-wheel, an escapement-wheel on the shaft of said pinion, a weighted escapement-pawl for engaging said wheel, a short arm pivoted at the upper end of said frame for engaging said pawl to hold it in contact with said escapement-wheel, said arm being adapted to engage the upper pole end for releasing the pawl, an upper-carbon holder provided with a rack, a pinion engaging said rack connected with the gear-wheel, a lower-carbon holder, and a tension device for returning the armature.

2. The combination of a main circuit, a shunt-circuit, an electro-magnet located in the shunt-circuit and provided with laterally-projecting segmental pole ends, a pivoted Z-shaped armature having segmental ends, arms fixed to the shaft of said armature and constituting a swinging frame, a sleeve on said shaft, a main gear-wheel on said sleeve, a pinion supported in said frame and meshing with the gear-wheel, an escapement-wheel on the shaft of said pinion, a weighted escapement-pawl for engaging said wheel, a short arm pivoted at the upper end of said frame for engaging said pawl to hold it in contact with said escapement-wheel, said arm being adapted to engage the upper pole end for releasing the pawl, an upper-carbon holder provided with a rack, a pinion engaging said rack, connected with the gear-wheel, a lower-carbon holder, a tension device for returning the armature, a ratchet-wheel attached to said sleeve, and a pawl on said main gear-wheel for engaging said ratchet-wheel to connect it with said sleeve.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

RUPERT SCHEFBAUER.

Witnesses:

OSCAR F. GUNZ,  
PAUL GOEPEL.