(No Model.) 2 Sheets—Sheet 1.

R. SCHEFBAUER.

ELECTRIC ARC LAMP.

No. 451,309. Patented Apr. 28, 1891.

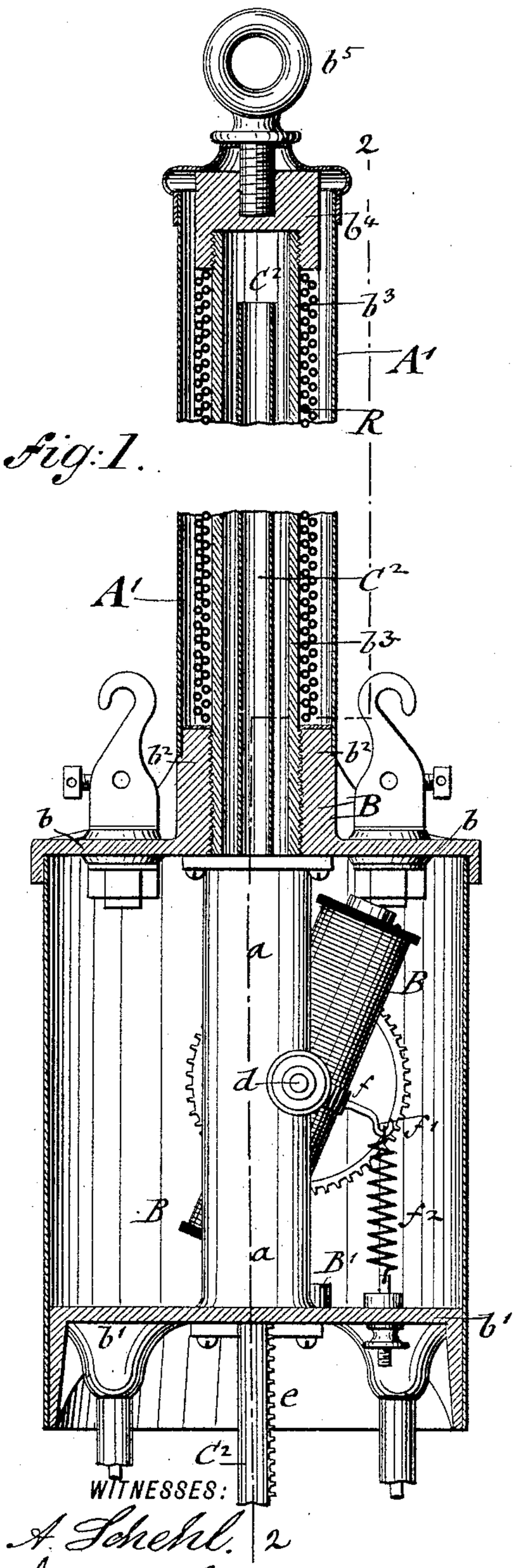

Fig: 1.

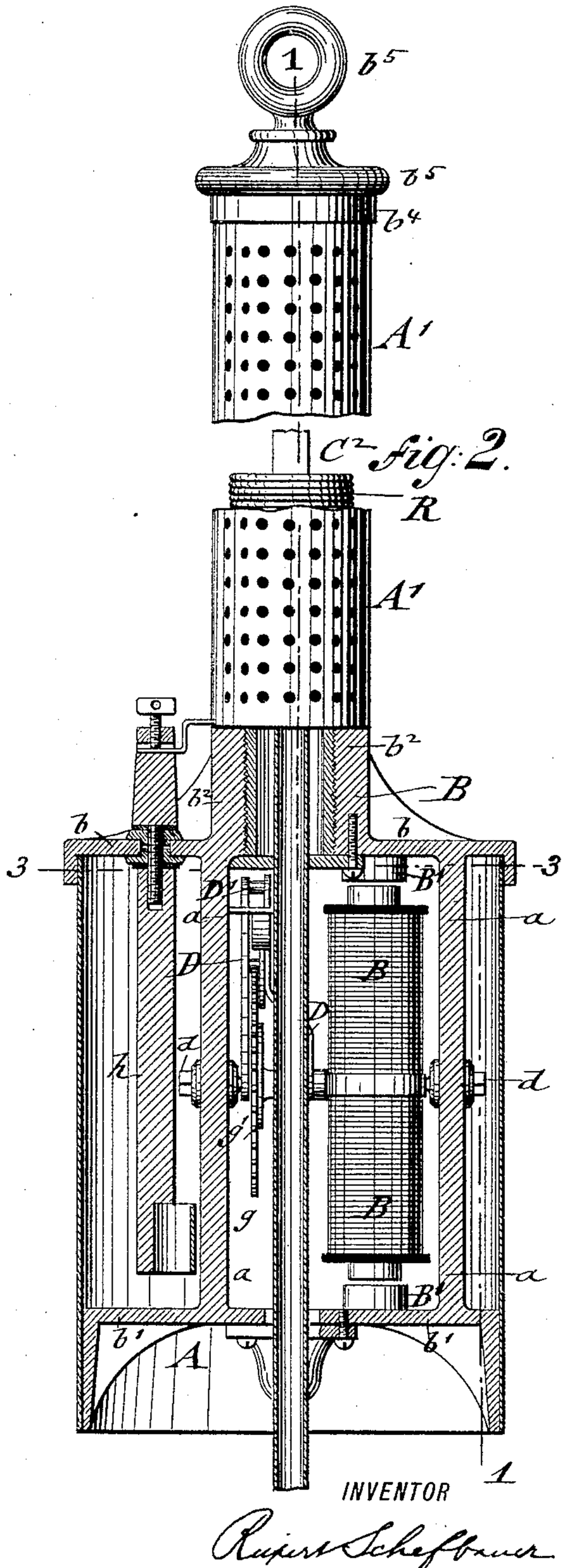

Fig: 2.

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(No Model.) 2 Sheets—Sheet 2.

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Fig: 4.

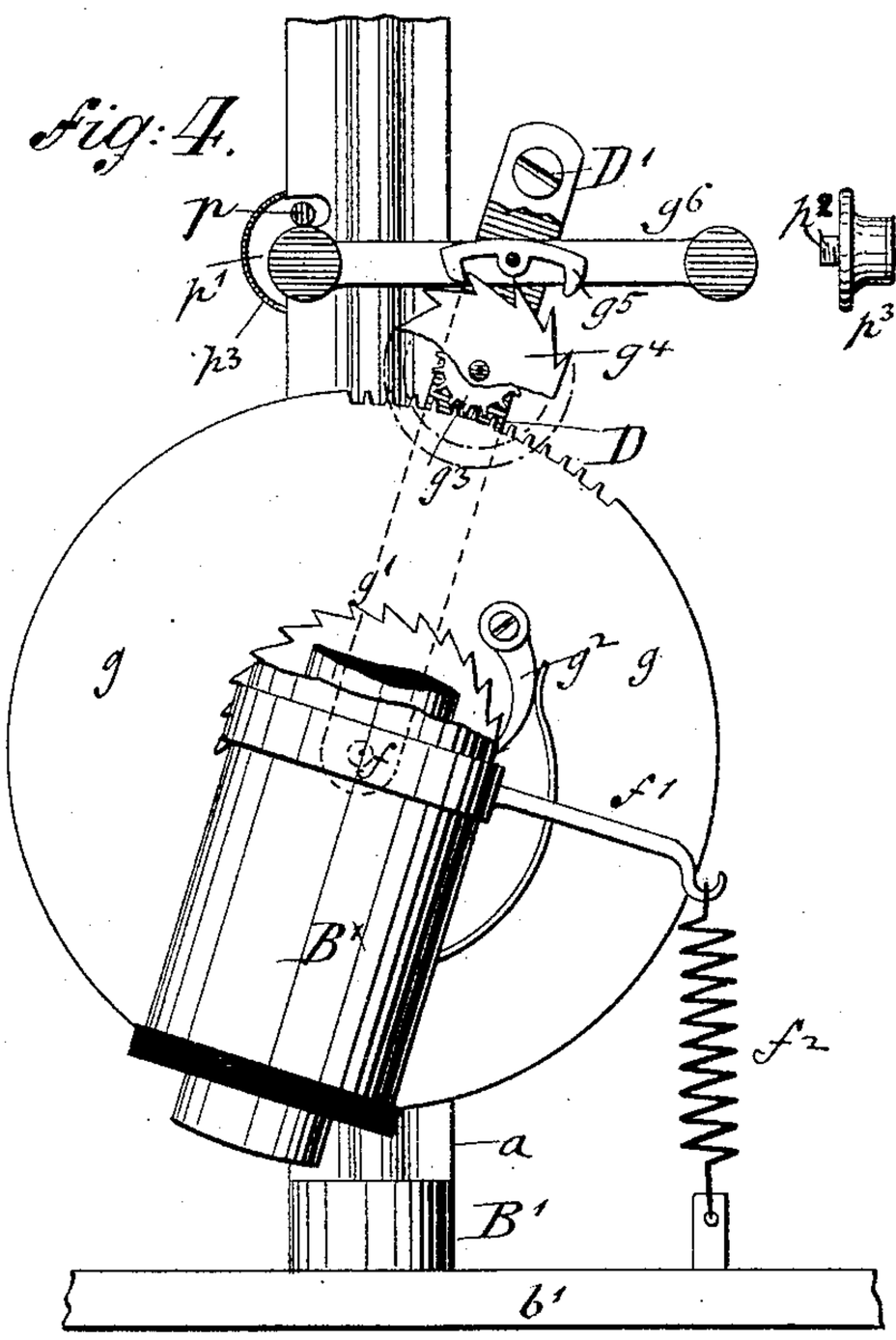


Fig: 3.

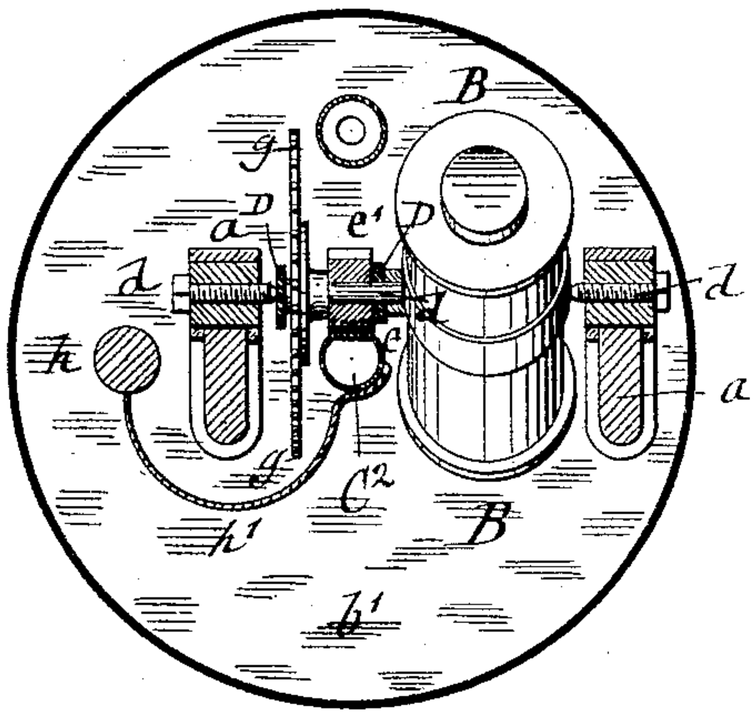


Fig: 5.

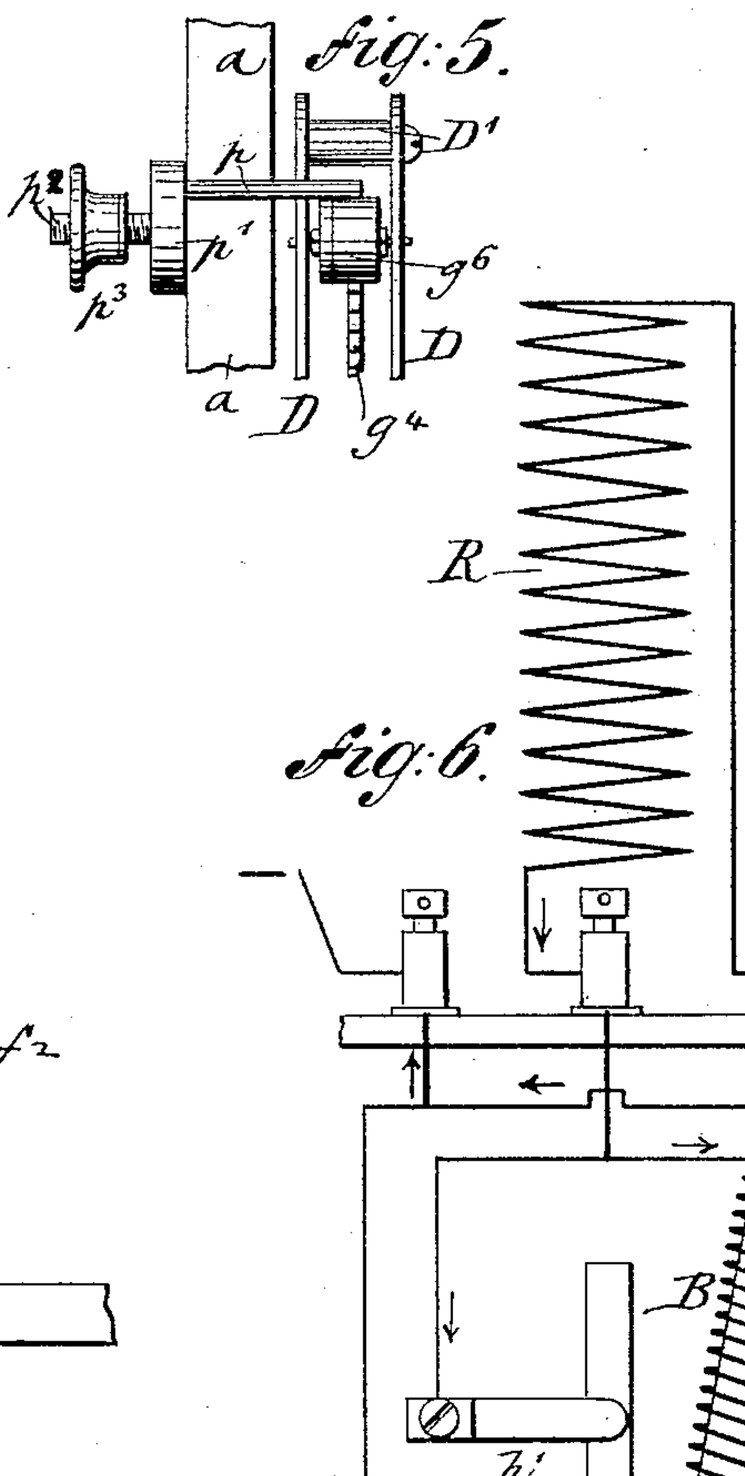
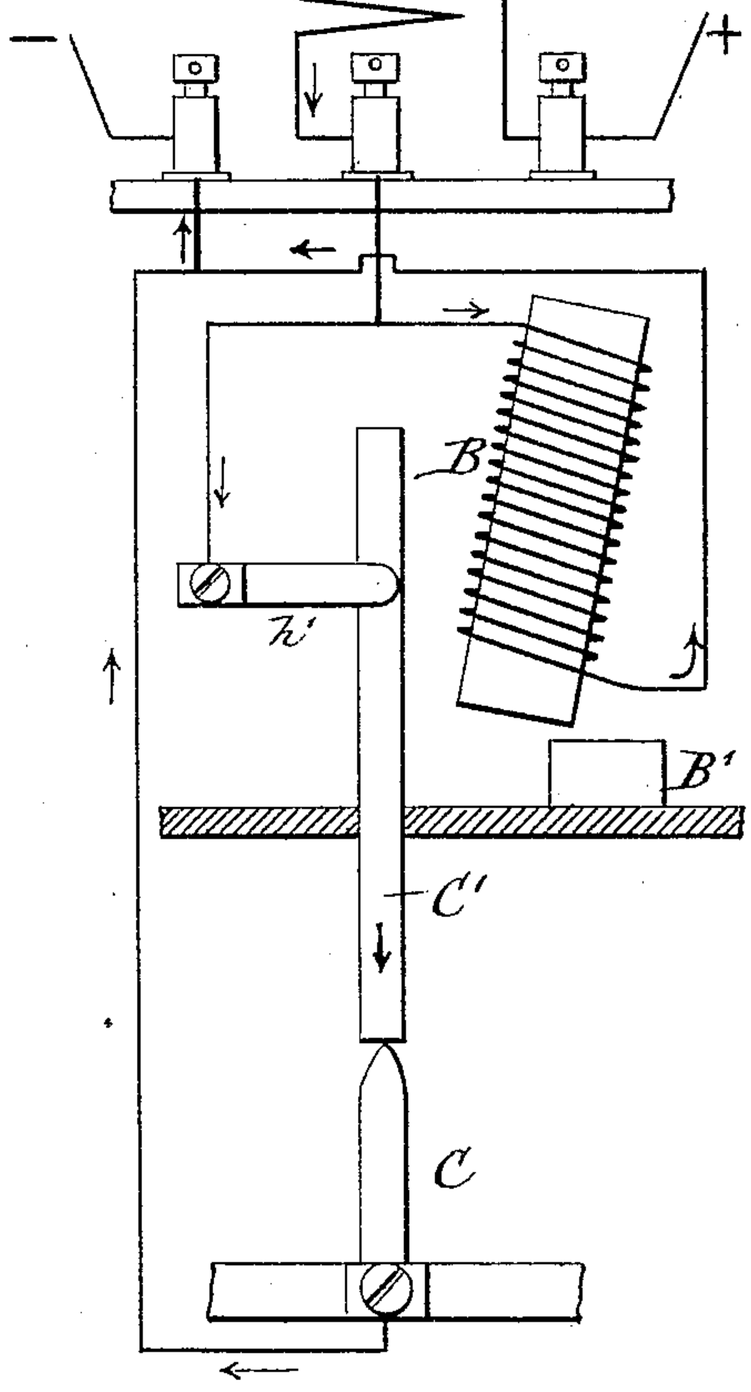


Fig: 6.



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UNITED STATES PATENT OFFICE.

RUPERT SCHEFBAUER, OF PATERSON, NEW JERSEY, ASSIGNOR TO THE UNIVERSAL ARC LAMP COMPANY, OF NEW YORK.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 451,309, dated April 28, 1891.

Application filed October 3, 1890. Serial No. 366,976. (No model.)

To all whom it may concern:

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

This invention relates to certain improvements in the electric-arc lamp for which Letters Patent were granted to me, No. 420,314, dated January 28, 1890, the improvement being designed with a view to simplify the construction of the lamp, bring the operative parts of the same within a smaller space, and render the lamp still more sensitive in responding to the varying strength of the current, so that an arc of uniform size is kept up between the carbons; and the invention consists of certain novel combinations of parts and details of construction, as will be fully described hereinafter, and finally pointed out in the claims.

In the accompanying drawings, Figure 1 represents a side elevation, partly in vertical section on line 1 1, Fig. 2; Fig. 2, also a side elevation, partly in section on line 2 2, Fig. 1; Fig. 3, a horizontal section on the line 3 3, Fig. 2; Fig. 4, a detail of the carbon-actuating mechanism drawn on a larger scale, some of the parts being broken away. Fig. 5 is a detail end view of a portion of Fig. 4, and Fig. 6 is a diagrammatic view 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 the supporting-frame of my improved arc lamp, which frame is composed of two vertical pillars *a* and the disk-shaped top and bottom *b b'*, which latter are cast integral with the pillars *a a*. To the pillars *a* are applied the screw-pivots *d d*, the inner conically-tapering ends of which engage conical tapering bearings on the axle of an oscillating electro-magnet B, the coil of which is placed in a shunt of the main line. The coil of the electro-magnet may be so wound as to be either in the main line or in a shunt of the same in such a manner that a lamp on the differential principle may be obtained. The projecting pole ends of the electro-magnet B are attracted when the electro-magnet is energized by the current by fixed pole-pieces B' B', which are cast, respectively, to the top and bottom *b* and *b'* of the supporting-frame A. The pole ends of the electro-magnet B are preferably made slightly convex, so that they are attracted easier by the stationary pole-pieces B' B'. The pole-pieces B' are arranged between the upright pillars *a* of the frame A, as shown clearly in Fig. 2. The lower carbon C of the lamp is made stationary, while the upper carbon C' is made movable and supported by a carbon-holder C^2, that is provided with rack-shaped teeth *e*, that engage with a pinion *e'* on the axle of the oscillating electro-magnet B, as shown in Fig. 3.

To the axle of the electro-magnet B and sidewise of the same are further applied two fixed arms D, which are connected at their upper ends by a screw-post D', said arms forming a swinging frame, which follows the motion of the oscillating electro-magnet. From a central band *f*, which extends around the electro-magnet B, extends an arm *f'* to the hook or eye, at the outer end of which is applied a spiral spring f^2, the opposite end of which is applied to the bottom disk *b'* of the frame A, said spring serving as a tension-spring for regulating the resistance of the electro-magnet B. A gear-wheel *g* is placed loosely on the axle of the electro-magnet between the arms D D and locked to the same in one direction by a pawl-and-ratchet mechanism *g' g²*, which is clearly shown in Fig. 4, so that the gear-wheel *g* is compelled to follow the oscillating motion of the electro-magnet B in one direction without following the motion of the same when it moves in the opposite direction. The gear-wheel *g* engages a pinion g^3, the shaft of which is supported by the arms D D, said shaft carrying an escapement-wheel g^4, the teeth of which are engaged by the pallets of an escapement g^5, that is applied to a balanced escapement-lever g^6, fulcrumed to the arms D D, as shown in Figs. 4 and 5. The escapement-lever g^6 is provided with enlarged and weighted ends, so as to impart thereby a high degree of sensitiveness to the escapement g^5. The lever g^6 is stopped by contact with a stop-pin *p*, that is applied

eccentrically to a disk p', located on a fixed screw-pin p^2 of the upright pillar a, adjacent to the arms D D, said disk being clamped by a screw-nut p^3, which serves to hold the stop-pin rigidly in position after adjustment. The carbon-holder C^2 is extended through a central cylindrical bushing b^2 of the top disk b in upward direction into a tube b^3, that is screwed into said bushing b^2. To the upper end of the tube b^3 is applied a cap b^4, which is provided with a ring b^5, by which the lamp is suspended. The tube b^3 is made of brass or other suitable non-magnetic material and surrounded by a resistance-coil R, which is inclosed by a perforated tubular shell A', which serves to give access of air to the resistance-coil R for keeping the same cool. The resistance-coil protects the lamp against too strong a current and serves for adjusting it for the required number of ampères.

The line-wires are connected by a suitable binding-post with the top disk b of the supporting-frame A, one of the line-wires being connected to a downwardly-extending rod h, which is insulated from the top disk b of the frame A. To the lower end of the rod h is applied a bent contact-spring h', the free end of which is placed in contact with the vertically-movable carbon-holder C^2, as shown clearly in Fig. 3, so that the line-current is conducted to the carbon-holder C^2. The current enters at one of the binding-posts and passes then through the resistance coil R, and from the same to a second binding-post, which forms the connection with the contact-spring h' of the carbon-holder C^2. The current passes then from the upper-carbon holder to the upper carbon and from the same to the lower carbon, and then along the supporting-frame A to a third outgoing binding-post and then to the line, as shown clearly in Fig. 6. The shunt-circuit branches off from the main-line wire leading from the second binding-post to the contact-spring of the upper carbon, passes around the coil of the oscillating electro-magnet, and is then connected to the outgoing wire, as shown in Fig. 6.

The operation of my improved electric-arc lamp is as follows: When the lamp is switched out of circuit, the upper and lower carbons are immediately separated, as the tension-spring of the oscillating electro-magnet returns the latter into its normal position of rest with its pole ends at some distance from the stationary pole-pieces B', as shown in Fig. 4. The motion of the electro-magnet B lifts, by the action of the pinion e on the rack of the carbon-holder, the latter to such an extent that the arc is interrupted and the lamp extinguished. When the lamp is switched into circuit, the entire current is first passed through the shunt-circuit, as the resistance between the carbon points is too great to permit the immediate formation of the arc. As the current flows through the coil of the electro-magnet B the poles of the same are magnetized, so that they are attracted by the stationary pole-pieces B' to such an extent that the tension of the spring f^2 is overcome. Simultaneously the escapement g^5, supported on the balanced escapement-lever g^6 of the frame D, is free to be oscillated by the gear-wheel g, pinion g^3, and escapement-wheel g^4, owing to the clearing of the stop-pin p by the enlarged end of the escapement-lever g^6. The gravity of the upper-carbon holder C^2 accelerates the downward motion of the same, while the escapement mechanism retards the too rapid motion of the same. By the lowering of the upper-carbon holder the contact of the carbon points takes place, upon which 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 same to be drawn quickly away from the stationary pole-pieces by the action of the tension-spring f^2. This lifts the upper-carbon holder by the action of the pinion e on the rack of the same, so that the points of the carbons are separated and the arc is formed. On the formation of the arc the current passes simultaneously through the main circuit and the shunt-circuit, so that the electro-magnet is energized and the pole ends of the electro-magnet B attracted to the pole-pieces B', and thereby the electro-magnet oscillated on its pivots and the proportionate downward feeding of the upper carbon produced by the action of the gear-wheels and escapement. As the resistance of the arc increases by the burning off of the carbons, a greater quantity of current passes through the coils of the electro-magnet, so that the electro-magnet is drawn more and more inward by the stationary pole-pieces until the enlarged end of the escapement-lever g^6 clears the stop-pin p, so that the escapement g^5 can play and the upper-carbon holder can freely move in downward direction by gravity. By the downward motion of the upper carbon the resistance of the arc is diminished and a smaller quantity of current passes through the shunt, so that the electro-magnet B is moved away from the pole-pieces by the action of its tension-spring, and thereby the upper carbon lifted again. This produces the motion of the fixed arms D away toward its normal position of rest until the weighted end of the escapement-lever is re-engaged by the stop-pin p, so that the pallets of the escapement are prevented from releasing the teeth of the escapement-wheel, and produces thereby the arresting of the escapement of the gear-wheel g and of the upper-carbon holder C^2. The gradual burning away of the upper carbon produces again the drawing in of the electro-magnet until the train of gear-wheels is again released and the upper carbon lowered, and so on. The oscillating motion of the electro-magnet, caused by the varying resistance of the carbons and the varying strength of the current in the main and shunt circuits, serves to keep up the arc in a uniform and reliable manner.

The escapement is very sensitive, owing to the arrangement of the weighted and balanced escapement-lever and the adjustability of the stop-pin relatively to the end of said lever. The pawl-and-ratchet connection of the transmitting gear-wheel *g* with the axle of the electro-magnet B also serves for the purpose of permitting the inserting of a carbon into the upper-carbon holder, as thereby the upper-carbon holder can be raised by means of the pawl-and-ratchet mechanism without interfering with the transmitting-train of gear-wheels.

The advantages of my improved electric-arc lamp are, first, that parts of the same are arranged in a more compact manner within the frame of the lamp than in my former construction; secondly, the Z-shaped armature with its segmental ends is dispensed with, and an oscillating instead of a stationary electro-magnet used in place thereof, whereby the construction is greatly simplified; thirdly, that the escapement mechanism is rendered more sensitive, so as to respond more quickly and reliably to the requirement of the lamp, and, fourthly, that by the arrangement of the resistance-coil a better functioning of the entire mechanism takes place.

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

1. The combination of an oscillating electro-magnet located in a shunt-circuit, a tension-spring acting on said electro-magnet, stationary pole-pieces applied to the supporting-frame of the lamp, a pinion on the axle of the electro-magnet, fixed arms on the axle of the oscillating electro-magnet, a train of gear-wheels and an escapement supported by said arm, an upper-carbon holder provided with a rack meshing with said pinion, and a stop device for said escapement, substantially as set forth.

2. The combination, with a supporting-frame having upright pillars, an oscillating electro-magnet pivoted to said pillars and located in a shunt-circuit, a tension device for said electro-magnet, a pinion on the axle of the electro-magnet, arms constituting a swinging frame attached to said axle, a gear-wheel placed loosely on said axle, a pawl-and-ratchet mechanism connecting said gear-wheel with the axle, an escapement mechanism for said gear-wheel, an upper-carbon holder having a rack meshing with the pinion on the axle of the electro-magnet, and a stop device for said escapement, substantially as set forth.

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

RUPERT SCHEFBAUER.

Witnesses:
PAUL GOEPEL,
W. REIMHERR.