(No Model.) 3 Sheets—Sheet 1.

R. SCHEFBAUER.

ELECTRIC ARC LAMP.

No. 480,968. Patented Aug. 16, 1892.

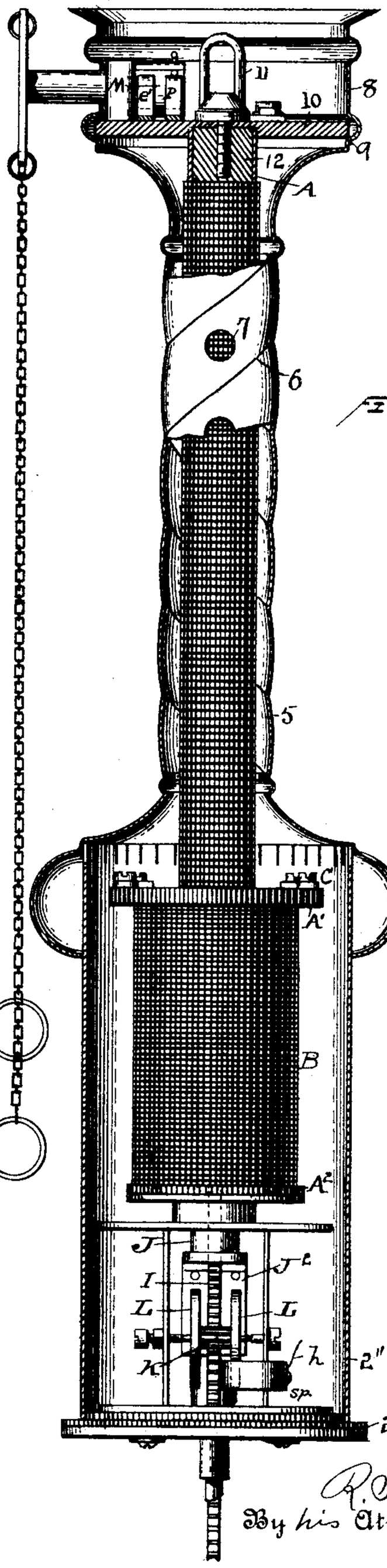
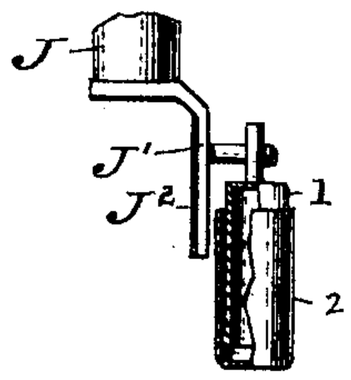


Fig. 1.

Fig. 9.



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(No Model.) 3 Sheets—Sheet 2.

R. SCHEFBAUER.

ELECTRIC ARC LAMP.

No. 480,968. Patented Aug. 16, 1892.

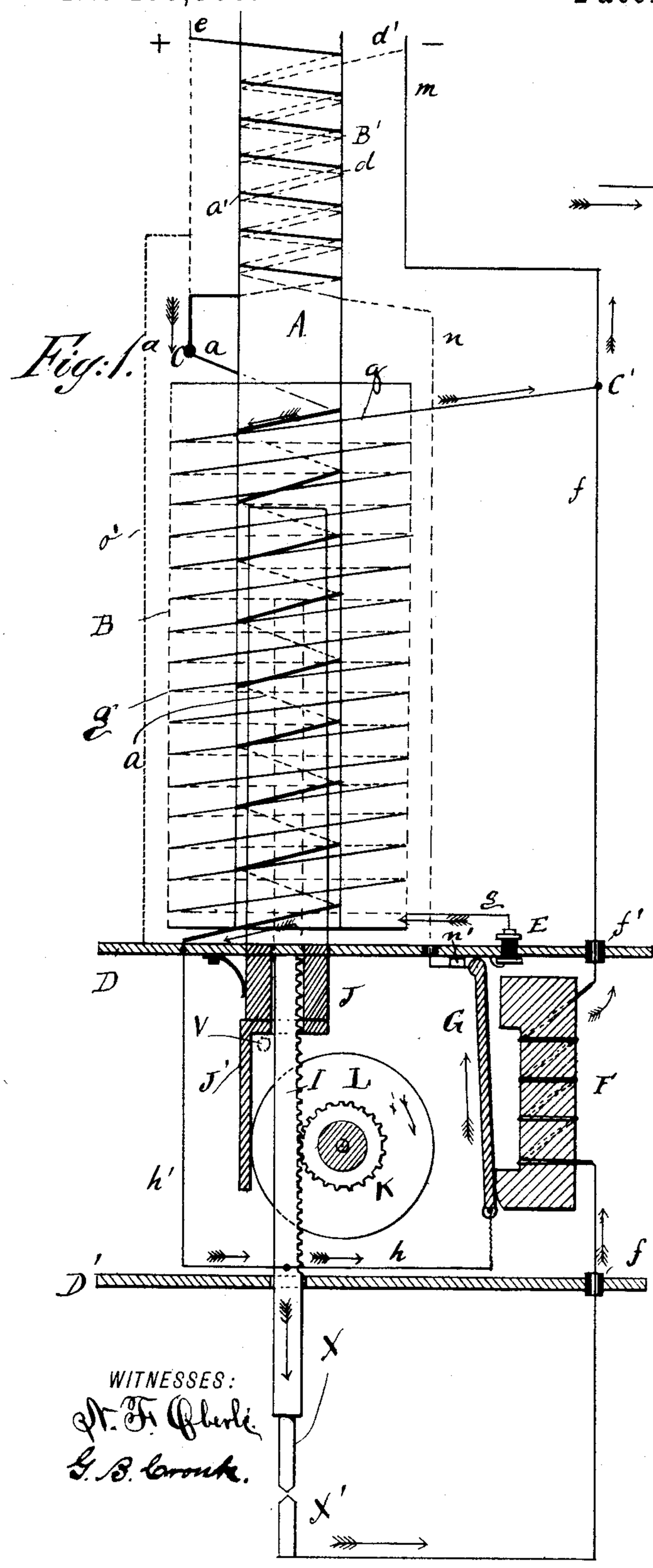

Fig: 1.a

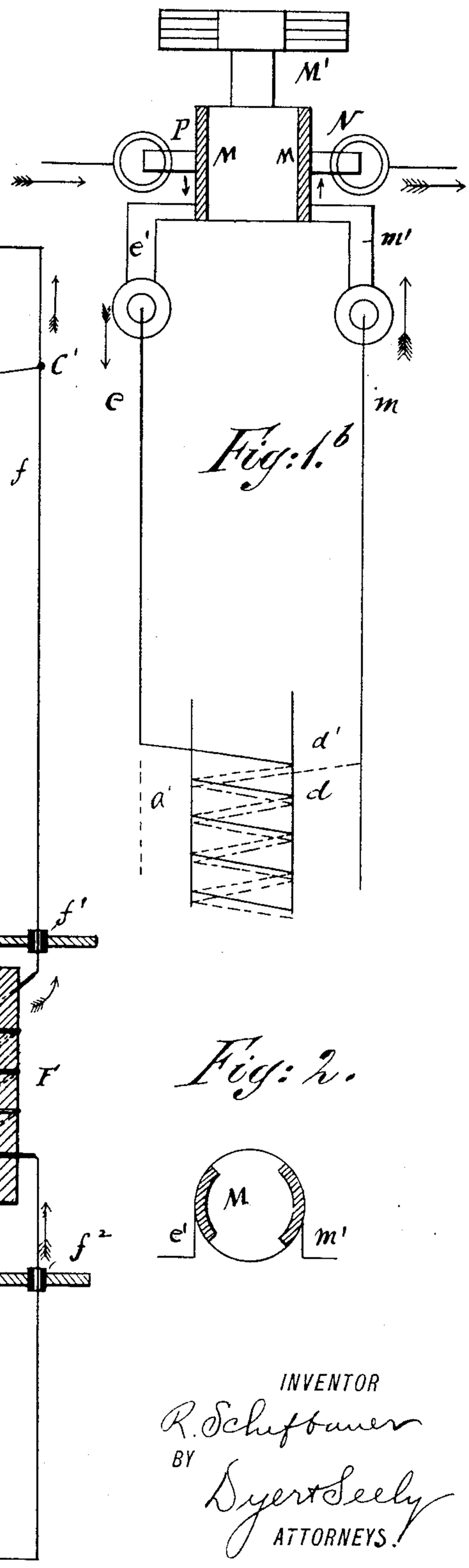

Fig: 1.b

Fig: 2.

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(No Model.) 3 Sheets—Sheet 3.

R. SCHEFBAUER.

ELECTRIC ARC LAMP.

No. 480,968. Patented Aug. 16, 1892.

Fig: 3.

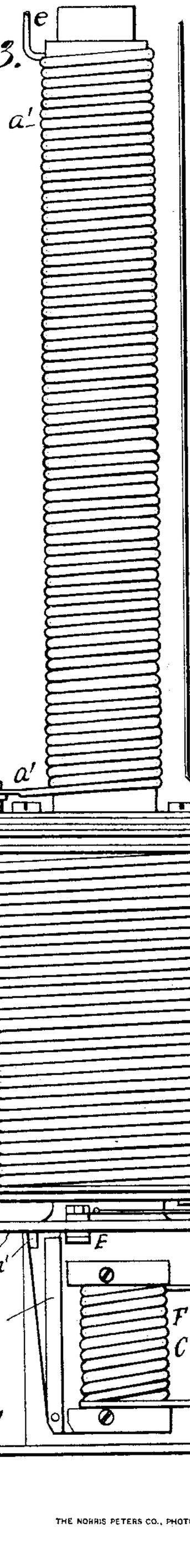


Fig: 4.

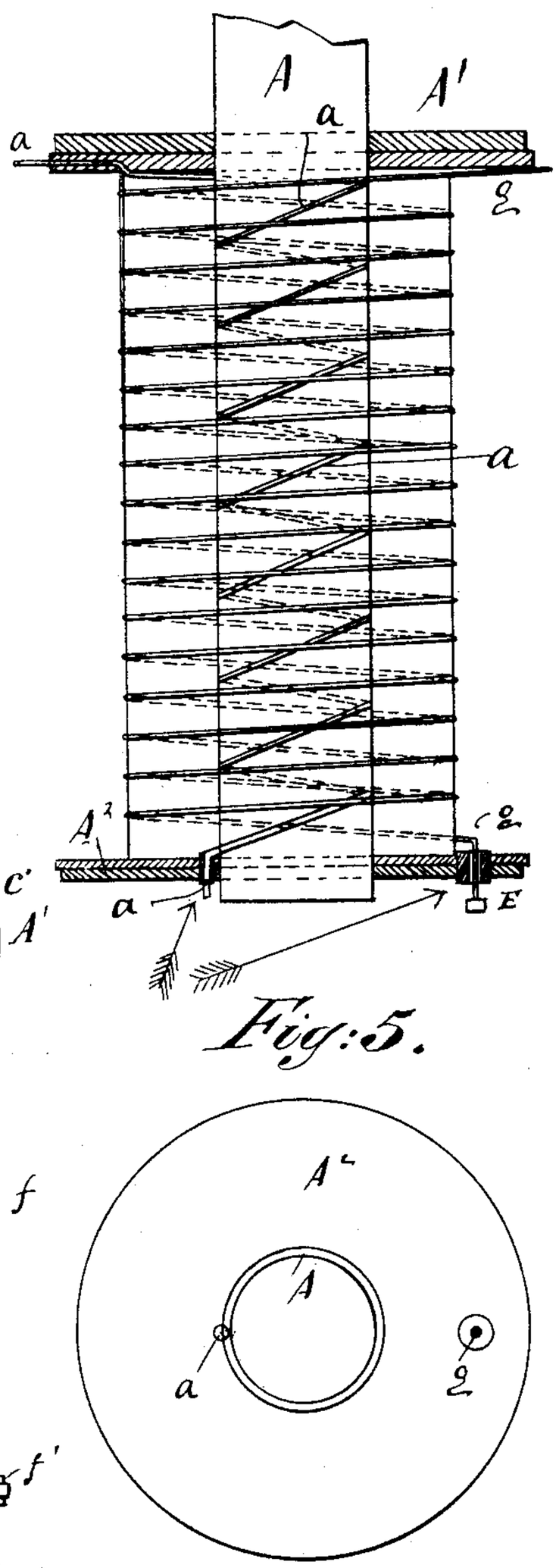


Fig: 5.

Fig: 6.

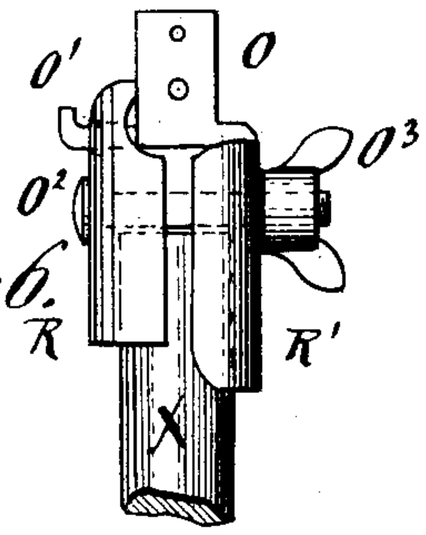


Fig: 7.

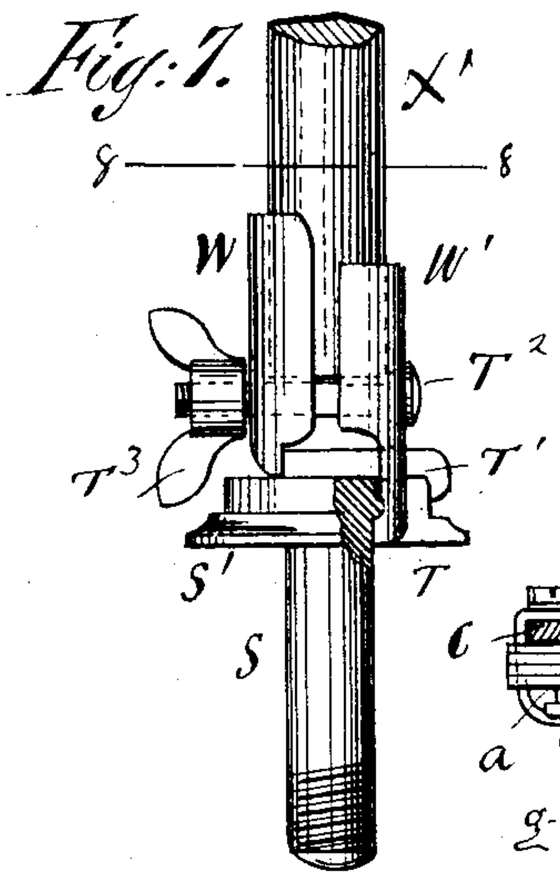
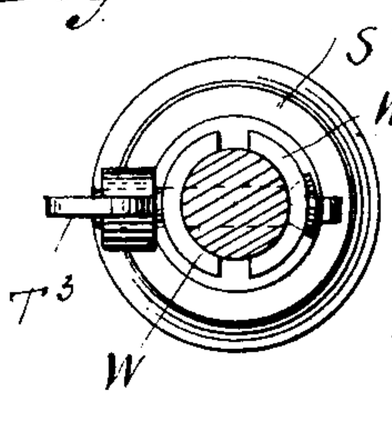


Fig: 8.



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UNITED STATES PATENT OFFICE.

RUPERT SCHEFBAUER, OF PATERSON, NEW JERSEY, ASSIGNOR TO THE EDISON GENERAL ELECTRIC COMPANY, OF NEW YORK, N. Y.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 480,968, dated August 16, 1892.

Application filed November 24, 1891. Serial No. 412,959. (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, have invented a certain new and useful Improvement in Electric-Arc Lamps, of which the following is a specification.

This invention relates to a new and improved electric-arc lamp, hereinafter specifically described, which can be arranged in series or in multiple-arc circuits.

The invention consists in an improved electric-arc lamp constructed with a differential solenoid containing a suction-core, into which the carbon-carrier extends, which suction-core has an extension for checking the downward movement of the upper-carbon holder, said extension also serving to move the upper carbon holder upward by means of a suitable gearing.

The invention further consists in an electric-arc lamp of special construction having a resistance-coil and means for automatically cutting off the solenoid of the lamp and bringing said resistance-coil in circuit when the carbons have been consumed, thus adapting said lamp for use in series of high-tension currents without interfering with the remaining lamps.

The invention further consists in a carbon-clamp composed of two stamped and punched sheet-metal sections and made as hereinafter described and claimed.

The invention also consists in the construction and combination of parts and details, which will be fully described hereinafter, and finally pointed out in the claims.

In the accompanying drawings, Figure 1 is a side view, partly in section, of one form of my lamp. Fig. 1ª is a diagrammatic view of my improved lamp, showing the various circuits. Fig. 1ᵇ is a diagrammatic view of the switch. Fig. 2 is a horizontal sectional view of the switch, also diagrammatic. Fig. 3 is a side elevation of the lamp, parts being omitted. Fig. 4 is an enlarged detail view of the solenoid, showing the construction of the same. Fig. 5 is an end view of the same. Fig. 6 is a side view of the clamp for the upper carbon. Fig. 7 is a side view of the clamp for the lower carbon, parts being broken out and others in section. Fig. 8 is a horizontal plan view on the line 8 8 of Fig. 7, and Fig. 9 is a view of the lower end of the solenoid-armature and a dash-pot connected thereto.

Similar letters and figures of reference indicate corresponding parts.

The lamp is constructed with a central tube A, on which are fixed the disks A^2, of vulcanized fiber or other suitable insulating material, at the lower end and, like disks A′, some distance from the lower end, and between said upper and lower disks the coarse wire *a* of the solenoid B is wound on said tube A, the upper end of the wire *a* being connected with the binding-screw C on the upper disks A′, and the lower end is connected with the frame-plate D of the lamp, as shown in Fig. 1ª.

In Fig. 1ª the armature-lever is shown enlarged at the upper end. This enables the lever to make better contact with the circuit-terminals *n*′ and E, said lever being pivoted at its lower end, as in Fig. 3. On said coarse wire *a* the fine wire *g* of the shunt-coil is wound, one end of said wire being connected with the binding-screw C′ on the upper disks A′ and the other end being connected with the insulated contact-piece E in the frame-plate D. A resistance-coil B′ is formed of fine wire *d*, wound on the tube A above the upper disks A′, and the ends of the wire *d* are connected, as set forth hereinafter.

On the coil B′, formed by the wire *d*, the coarse wire *a*′ is wound, the upper end of which is connected with the terminal wire *e*, and the other end is connected with the binding-screw C, said wire *a*′ forming a resistance-coil for the lighting-current. The terminal *m* is connected with the binding-screw C′. The wire *f*, also connected with the screw C′, passes through an insulating-sleeve *f*′ in the frame-plate D and is wound around the core of an electro-magnet F and then carried down through the insulating-sleeve f^2 in the lower frame-plate D′ to the holder of the lower carbon X′. The ends of the coil formed by the

wire d are adapted to be connected at d' with the terminal wire m and with a wire n, the lower end of which is connected with an insulated contact-piece n' in the upper frame-plate D.

The electro-magnet F, Figs. 1[a] and 3, has an armature G pivoted on the frame of the lamp and in electrical connection therewith, which armature is adapted to form contact with the contact-pieces n' and E. These parts are omitted in Fig. 1.

The wire h is the shunt-wire and connects the upper-carbon holder with the armature G by means of said wire and the spring which bears lightly against one side of the rack-bar. The wire h' (shown in Fig. 1[a]) is not provided in the lamp proper and is only used to show in said diagrammatic view that the current passes from the frame of the lamp to the upper-carbon holder.

In the lamps brushes (not shown) are used to conduct the current from the frame to the upper-carbon holder or rack.

The solenoid B contains a suction-core J, that can move freely up and down in the same and swing laterally a slight distance. Said suction-core has a central aperture in which the rack-bar I can move freely up and down, said rack-bar engaging a pinion K, fixed on the same shaft, with one or more iron brake-disks L, against the rim or rims of which a downwardly-projecting tongue J′ of the core J can act. The inner surface of said tongue is covered with a non-magnetic metal J[2], Fig. 9, to keep the core and wheels from sticking when it is desired to release the disk or disks L. This layer of non-magnetic material is thin enough to allow the tongue and wheels to stand quite near together, so as to act magnetically on each other. The upper carbon X is held on the lower end of the rack-bar I′, preferably by the clamp shown in Fig. 6.

The switch consists of two segments M, having a suitable handle M′ for turning them. The switch may have a handle to be grasped by the hand, as in Fig. 1[b], or it may be operated by suitable chains, as indicated in Fig. 1. The two brushes or sliding contacts e' and m' of the terminals e and m rest against the outer surfaces of said segments, as do also the two brushes or sliding contacts N P of the main-line wires.

To the lower end of the rack-bar I a piece O is fastened, that is provided with a laterally-projecting hook O′.

The clamping devices for the carbon consist of the two jaws R and R′, made segmental in cross-section, so as to adapt them to rest against the carbon X, and are stamped or punched out of sheet metal.

The clamping-jaw R is provided at its upper end with an aperture through which the hook O′ can be passed. A screw-bolt O[2] projects from said jaw R through an aperture in the other jaw R′, said screw-bolt being provided with a winged nut O[3]. The upper end of the carbon X is inserted between the two jaw-pieces R R′, and the same are pressed and clamped against the outward end of the carbon by drawing up the winged nut O[3]. The holder for the lower carbon X′ is similarly constructed. The stem S, screwed in the base of the lamp-frame, is provided on its upper end with a disk S′, having a notch T and a laterally and downwardly projecting hook T′.

The clamp is constructed with two jaws W and W′, the jaw W′ having an aperture through which the hook T′ can pass. The screw-bolt T[2] passes from the jaw W′ through an aperture in the jaw W and is provided with a winged nut T[3]. After the carbon has been inserted it can be easily held tight and clamped by drawing up the winged nut T[3].

When the lamp is to be burned in multiple arc, the terminal m remains connected with the screw C′ and the wires n and o are omitted. When the lamp is to be arranged in series, the terminal e is connected by the wire o' (shown in dotted lines in Fig. 1[a]) with the plate D and the wire n connects the lower end of the wire d and the contact-piece n', and the upper end of the wire d' is connected with the wire m.

In Figs. 1[a] and 1[b] the arrangements of the connections for multiple arc are shown in full lines and the arrangements of the connections for series are shown in dotted lines.

In order that the core of the solenoid shall move gradually and shall not cause sudden and great changes in the arc, I connect to the core, preferably to a post on the tongue J′, the inverted cup 1, which fits into the second cup 2, the cups together forming an air dash-pot, from which the air requires an appreciable time to escape, thereby giving a slow downward movement to the upper carbon when the magnetization of core J falls. The dash-pot, being arranged as described, can readily be reached for adjustment, if necessary.

To protect the mechanism of the lamp and to add to its ornamental appearance, whereby it is better fitted for interior lighting, I surround the upper part of the lamp with a brass or other suitable casing consisting of a cylinder 2″, which rests on the base-plate 2′. A section 4 rests on this tube and forms an enlarged ornamental head. A small tube 5 fits onto the upper end of the cap. This tube preferably has ornamental spiral grooves 6 and ventilating-holes 7, admitting air to circulate around the resistance-coil. An end cap 8, having a shoulder 9, on which an insulating-disk 10 may rest, is placed above tube 5, and, finally, a screw with a ring-head 11 is screwed into the plug 12 in the end of tube A. The screw serves to support the

lamp, and at the same time it securely holds the several parts of the casing in position and is the only securing device required. The disk 10 supports the switch and the lamp-terminals.

The operation is as follows: When no current whatever passes through the lamp, the hollow iron core J is in its lowest position, as is also the rack-bar I. J rests on the check-screw V, Fig. 1ª, and the carbons X and X′ are in contact. Assuming that the lamp is arranged in multiple arc and that the current is admitted by turning the switch M in such a manner that the switch-brushes P and e' and N and m' are brought in contact with the switch-segments M, the circuit in the lamp will be as follows: through the positive wire e, through the resistance-coil formed of the wire a' and the wire a of the solenoid to the positive carbon, and thence to the negative carbon and terminal of the lamp. The hollow iron core J and its tongue J′ become highly magnetic, and by magnetic attraction the latter is drawn in firm contact with the disk or disks L, which form an armature for the same. At the same time the hollow core J is drawn upward by the solenoid. As the said core is moved upward the disks L are rotated in the direction of the arrow x' and the pinion K is rotated in like direction, which moves the rack-bar upward, whereby a break is formed between the two carbons X and X′ and the arc is established. The current passing through the lower carbon and coil of the magnet F attracts its armature G and brings the same in contact with the contact-piece E, thereby closing the circuit of the shunt-coil formed by the wire g, and the current passes around the solenoid in the reverse direction to that in the main winding of the same and then passes to the negative terminal m and to the negative terminal of the switch. The main winding and the shunt-winding constitute a differential solenoid, in which when the lamp is made or set up the magnetic equilibrium is established for a certain number of ampères and volts and a cer tain weight of the rack-bar, so that the upper carbon is permitted to gradually descend as the carbons are consumed. The arc is thus regulated very nicely, as the only friction that is present is dependent upon the magnetism developed by the differential solenoid, and this primarily depends upon the resistance in the arc. When the carbons are consumed so that little or no current passes through the arc and main winding of the solenoid, the armature G of the magnet F is released, and thereby the shunt-circuit is broken and the upper-carbon rod is allowed to move slowly downward.

When the lamp is adjusted for use on series circuits, the operation is as follows: When the carbons are consumed and the armature G rests against the contact-piece n', the current passes from the positive switch-pole through the termimal e and wire o' to the casing of the lamp, the armature G, the contact-piece n', the wire n, the resistance-coil formed by the wire d, and the terminal m to the negative contact of the switch. When a lamp is provided with carbons and the current passes through the lamp to produce an arc, the armature G is attracted and the current passes through the lamp, as stated above—namely, through the wires $e\ a'\ a$, the upper carbon, the lower carbon, the electro-magnet F to the terminal m, and also through the shunt-coil.

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

1. An electric-arc lamp constructed with a differential solenoid and a suction-core in the same, a carbon-carrying rod passing into said core, and a magnetic friction device, one part of which is connected to the core and one part of which is geared to the carbon-carrying rod for raising the upper carbon and retarding the descent of the same, substantially as set forth.

2. In an electric lamp, the combination, with a differential solenoid, of a suction-core in the same, a carbon-holding rack passed into said core, one or more iron disks on which the core or part of the same can act frictionally, and a pinion connected with said disk, which pinion engages the carbon-holding rack, substantially as set forth.

3. In an electric lamp, the combination, with a differential solenoid, of a suction-core in the same, an extension on the lower end of the said core, which extension is covered with non-magnetic material, a rotative iron disk with which said extension can come in frictional contact, a pinion connected with said disk, and a carbon-holding rack engaged with said pinion and passing into said core, substantially as set forth.

4. In an electric-arc lamp, the combination, with a central tube, of a differential solenoid formed on the lower part of said tube, a resistance-coil formed on the upper part of said tube, and a second resistance-wire connected with the main wire of the solenoid and wound on said tube, substantially as set forth.

5. The combination, in an arc lamp, of gear for controlling the movable carbon, a solenoid and core for moving the same, a tube above the solenoid, a wire coiled thereon, and a casing for the lamp mechanism, consisting of a large metal tube around the lower part of the mechanism, an enlarged sheet-metal head resting directly on said large tube, the upper end of the head being made approximately the diameter of the tube above the solenoid, a tube fitting the end of the head, a cap fitting the upper end of the last-mentioned tube and containing a suitable disk or cross-piece, and a single screw in said piece and extend-

ing into the upper tube of the lamp-body for securing all parts of said casing together, substantially as set forth.

6. In an electric lamp, a carbon-clamp formed of two segmental stamped and punched sheet-metal pieces, of which one is provided with an aperture and the other of which is provided with two apertures, a screw-bolt passed through said two pieces, a nut on said screw, and a body-piece having a hook that is passed through one of the apertures in one of the said segmental pieces, substantially as set forth.

This specification signed and witnessed this 21st day of November, 1891.

RUPERT SCHIEFBAUER.

Witnesses:
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A. WEBER.