(No Model.)

4 Sheets—Sheet 1.

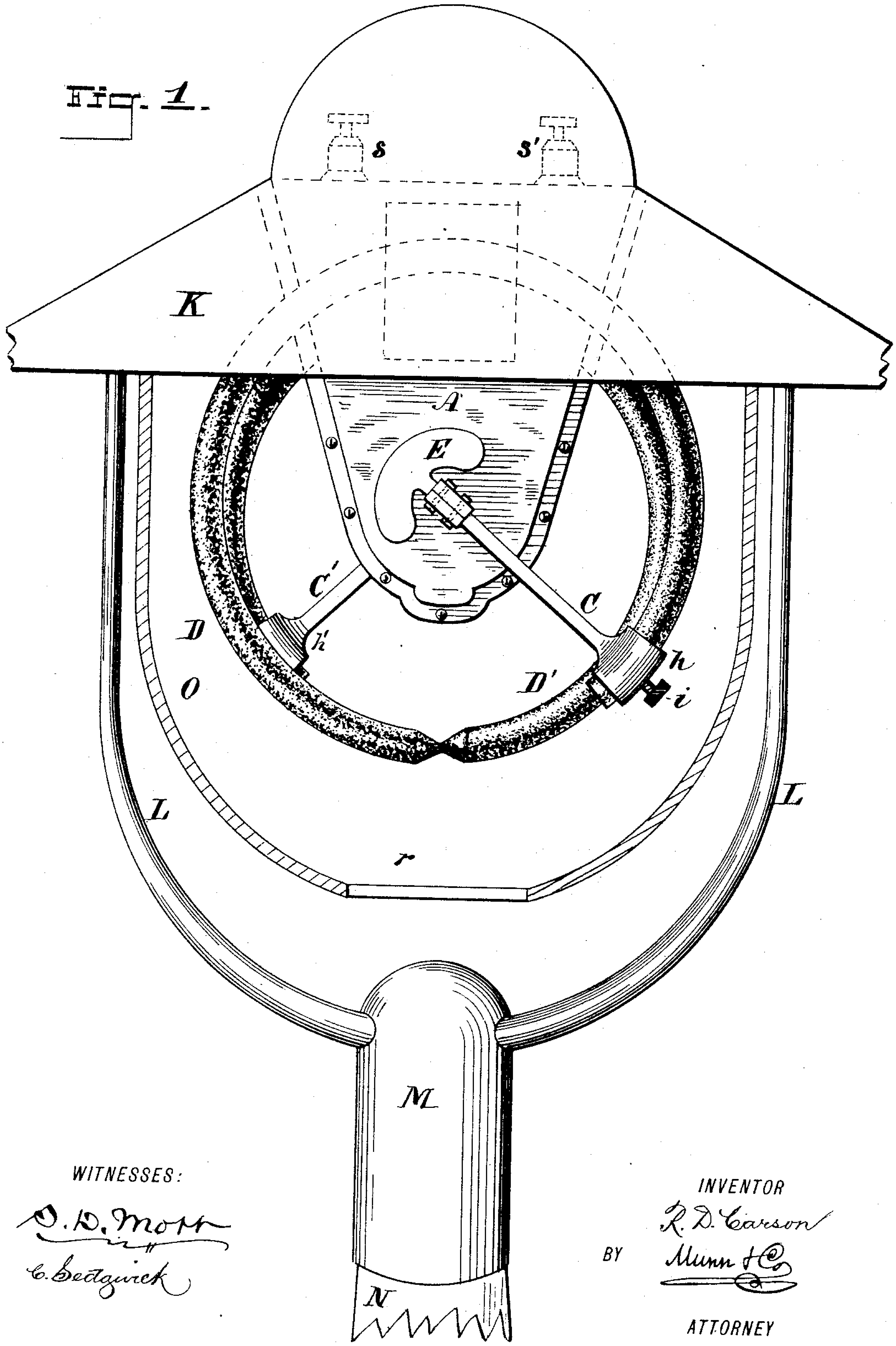
R. D. CARSON.

ARC LAMP.

No. 409,390.

Patented Aug. 20, 1889.

Fig. 1.



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(No Model.)

4 Sheets—Sheet 2.

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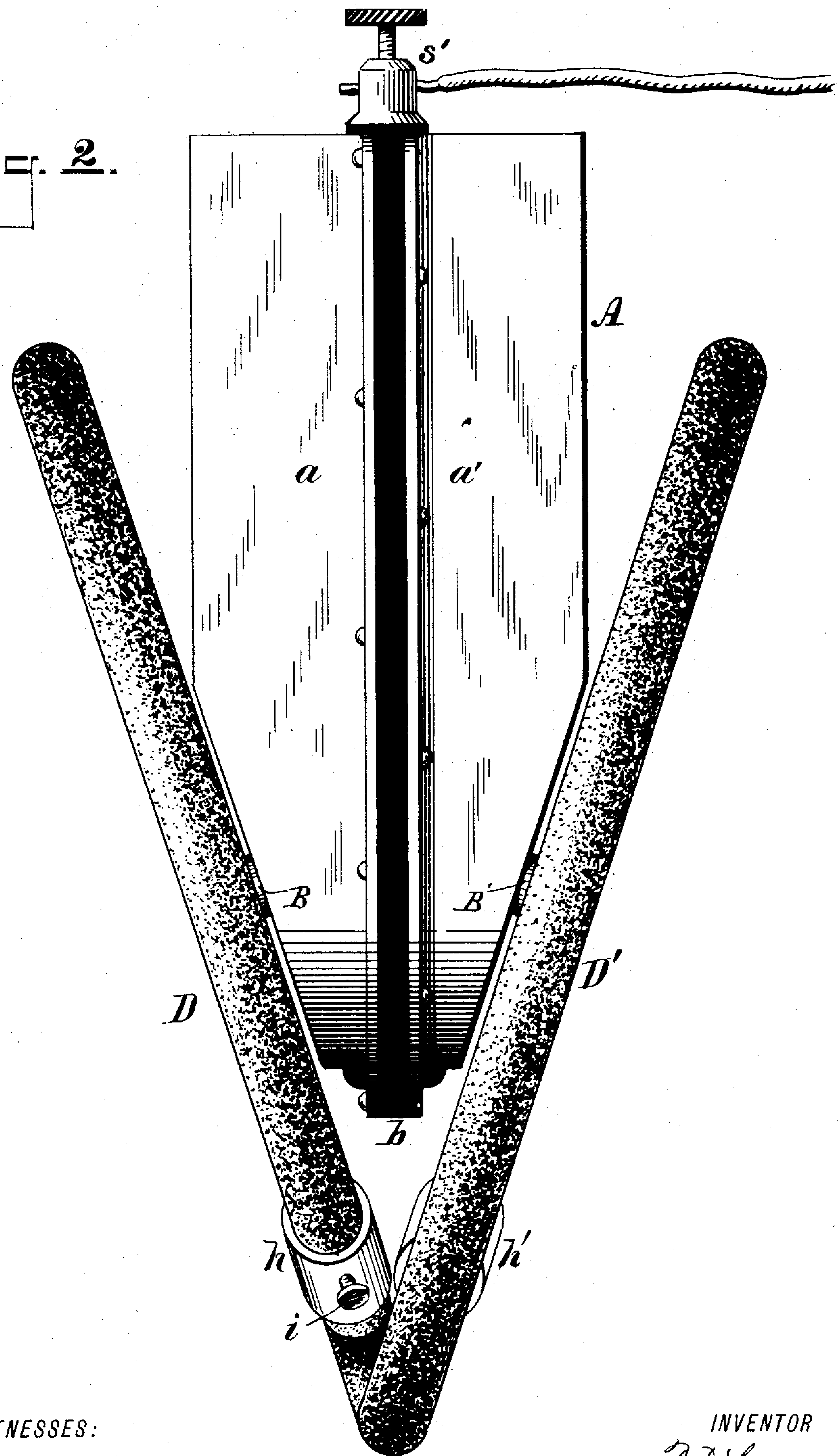
Fig. 2.



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(No Model.) 4 Sheets—Sheet 3.

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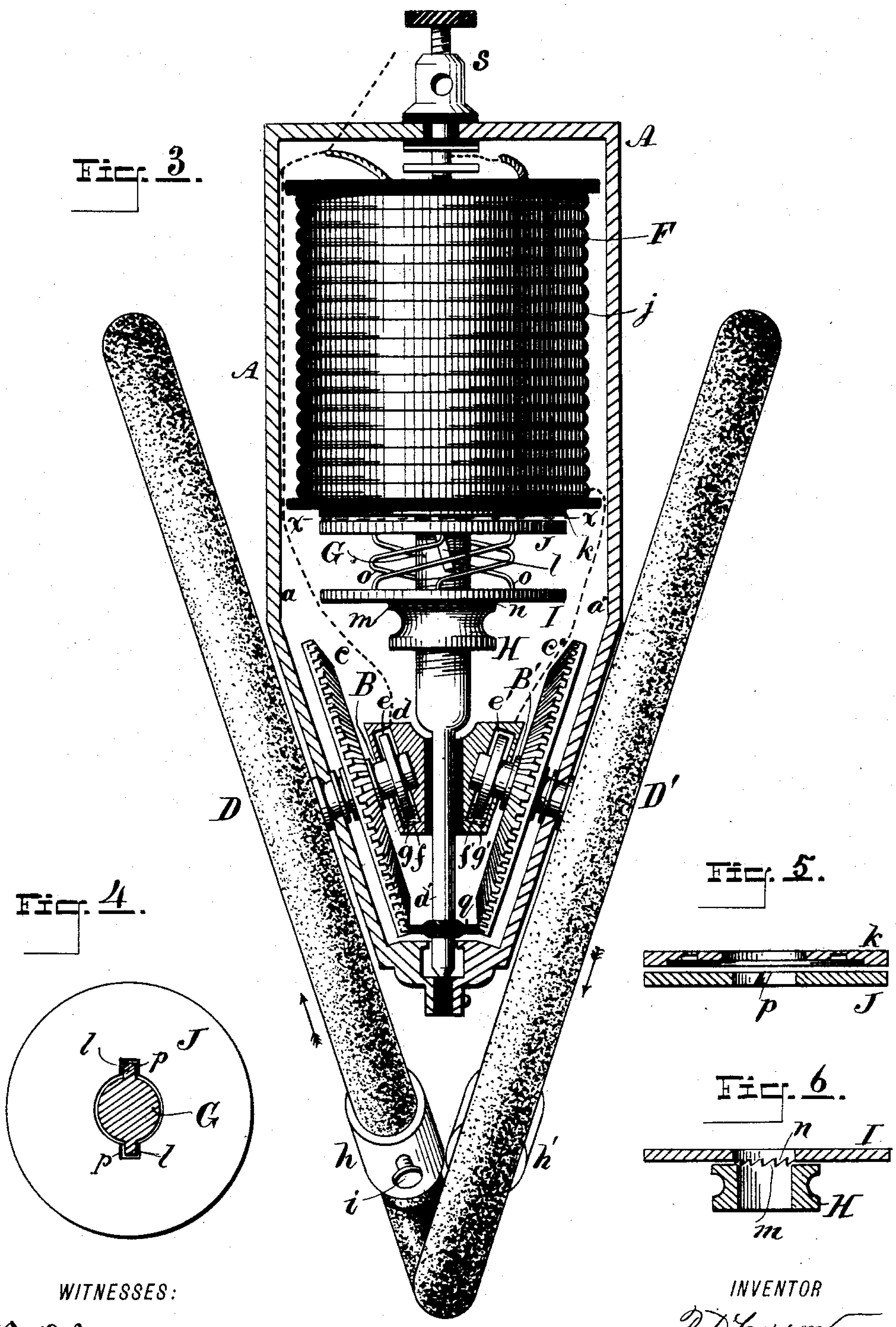

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ARC LAMP.

No. 409,390. Patented Aug. 20, 1889,

Fig. 7.

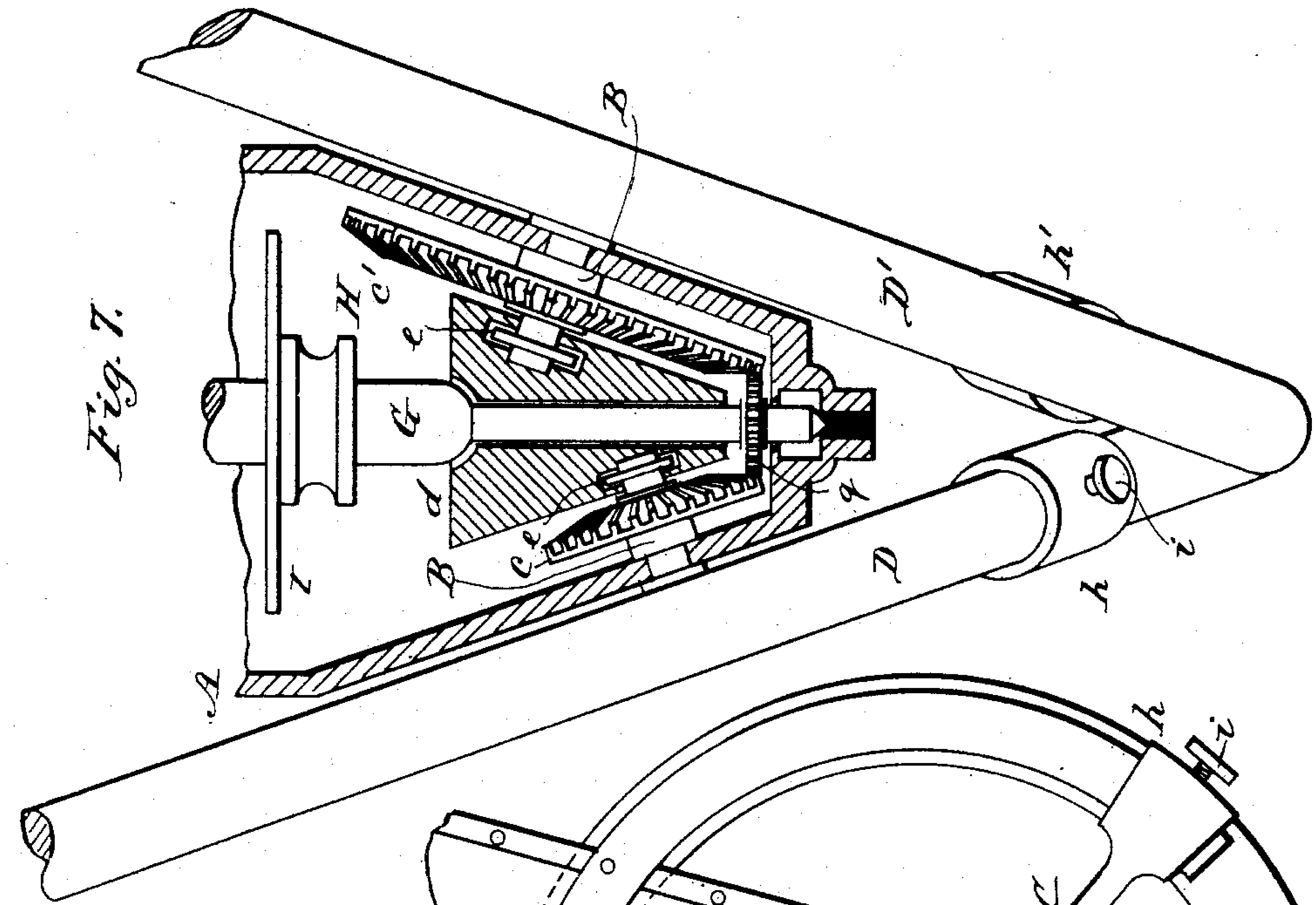


Fig. 8.

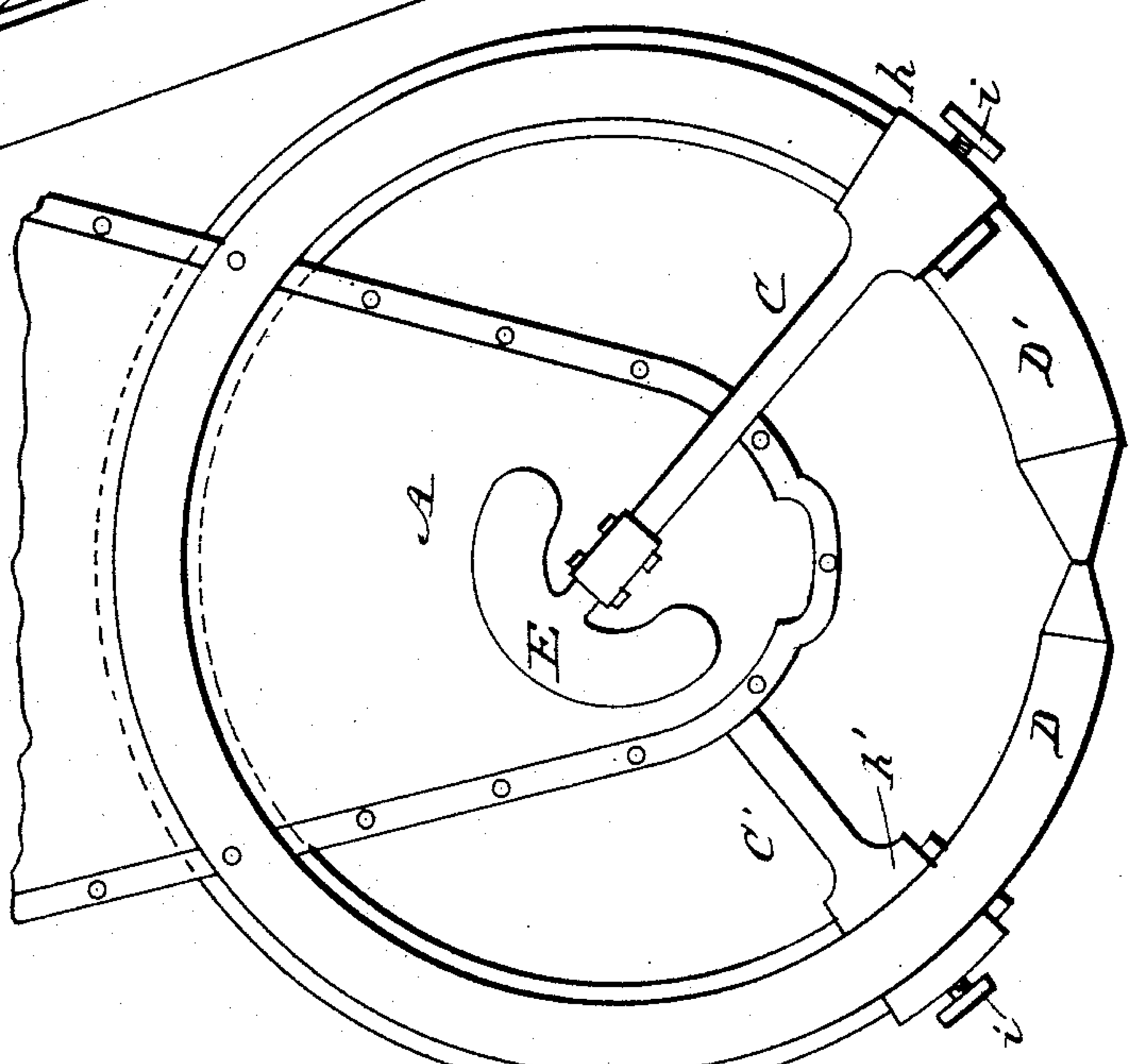
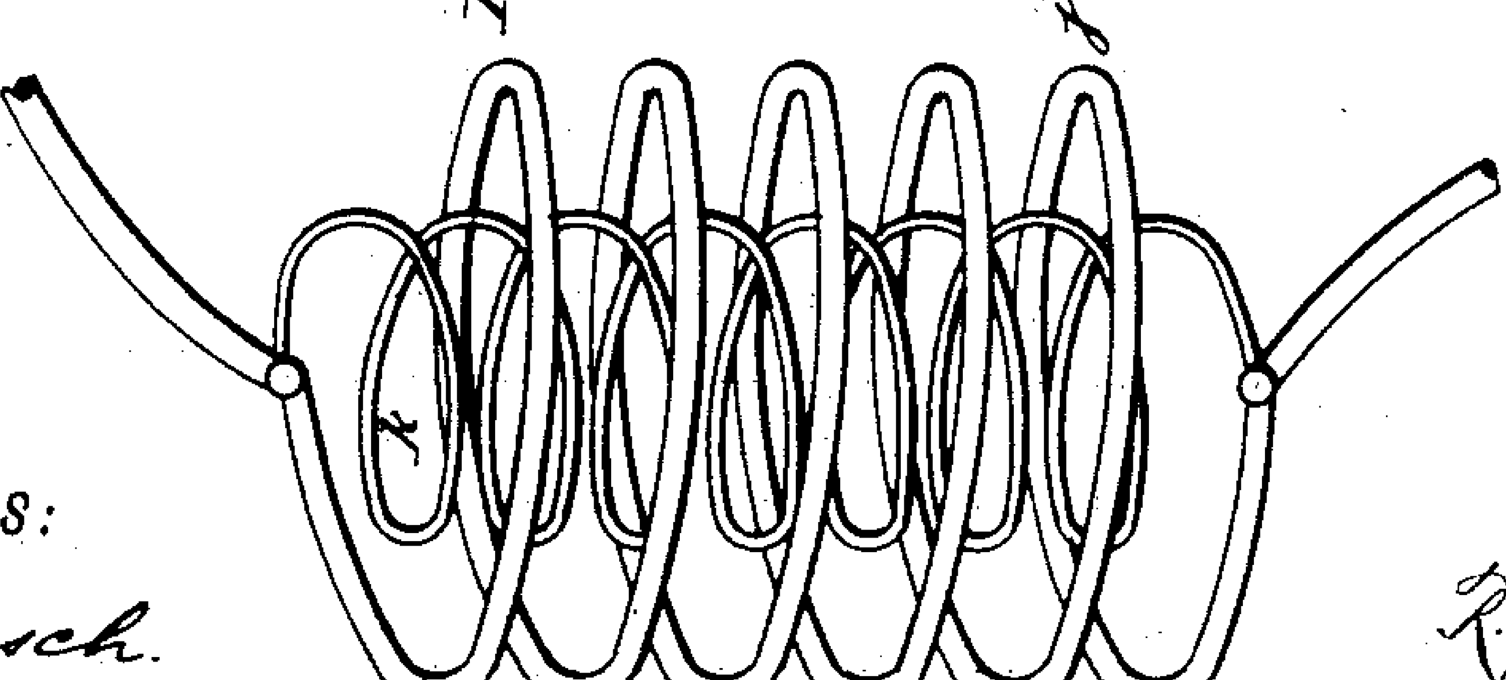


Fig. 9.



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UNITED STATES PATENT OFFICE.

ROBERT D. CARSON, OF PHILADELPHIA, PENNSYLVANIA.

ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 409,390, dated August 20, 1889.

Application filed March 25, 1889. Serial No. 304,581. (No model.)

To all whom it may concern:

Be it known that I, ROBERT D. CARSON, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and Improved Arc Lamp, of which the following is a specification, reference being had to the annexed drawings, forming a part thereof, in which—

Figure 1 is a front elevation of my improved arc lamp. Fig. 2 is an enlarged side elevation of the same. Fig. 3 is a side elevation with a portion of the regulator-casing removed to show the internal parts. Fig. 4 is a horizontal section taken on line *x x* in Fig. 3, looking downward. Fig. 5 is a vertical diametrical section of the friction-disk. Fig. 6 is a diametrical section of the spring-support. Fig. 7 shows an arrangement of the carbon-feeding mechanism for feeding the positive carbon faster than the negative carbon. Fig. 8 shows a lamp in which the positive carbon is made of double the sectional area of the negative carbon to compensate for the difference in the burning of the two carbons, and Fig. 9 is a diagrammatic view of the solenoid.

Similar letters of reference indicate corresponding parts in all the views.

The object of my invention is to construct an arc lamp in which a great length of carbon may be contained in a small space, thereby enabling me to construct a compact and symmetrical lamp which will burn throughout the night without the necessity of employing two pairs of carbon rods and shifting mechanism for transferring the regulator from one pair of carbons to the other.

My invention consists in the combination, as hereinafter described and claimed, of a pair of curved carbon rods and mechanism for supporting the same at an angle in relation to each other. In the present case the angle is such that each carbon covers an arc of three hundred degrees.

My invention further consists in the combination, with the carbon-supporting devices, of feeding mechanism actuated by gravity and controlled by a solenoid, and of an arc-forming device operated by the solenoid, all as will be hereinafter more fully described.

The casing A, which contains the regulating mechanism, is formed of two parts *a a'*, insulated from each other by a septum *b* of insulating material extending through the entire casing; but I do not limit myself to this particular way of insulating the lamp, as it may be accomplished in different ways which are well known and in common use.

In the part *a* of the casing A is journaled the shaft B, which extends into the casing and carries a bevel-wheel *c*. The said shaft is insulated from the said bevel-wheel, and is prolonged inward and journaled in the cross-bar *d*. The said cross-bar at this point is insulated from its opposite half. In the present case in the said cross-bar *d* is formed a cavity *e*, adapted to contain a quantity of mercury *f*, and the shaft B is furnished with a flange *g*, which dips into the mercury. The object of this arrangement is to provide a nearly non-frictional electrical connection between the said cross-bar *d* and the said shaft B; but I do not limit myself to this method, as electrical connection can be made with the shaft B by means of a flexible conductor, or in other ways.

To the outer end of the shaft B is attached an arm C, provided at its outer extremity with a sleeve *h*, which is furnished with a clamping-screw *i*, and is adapted to receive the end of the curved carbon rod D. The arm C is prolonged beyond the shaft B and provided with a weight E, the use of which will presently be described.

In the part *a'* of the casing A is journaled a shaft B', which carries a bevel-wheel *c'*, and is provided with a flange *g'*, which is immersed in a body of mercury *f'* in a cavity *e'*, as in the other case. The shaft B' is also provided with an arm C', carrying a sleeve *h'*, adapted to receive the curved carbon rod D', and the said arm C' is prolonged beyond the shaft and provided with a weight, as in the other case. In the present case the shafts B B' are arranged in relation to each other at an angle of about one hundred and fifty degrees, thereby causing the planes of rotation of the carbons D D' to intersect each other at an angle of about forty degrees. It will be observed that by this arrangement the length of the curved carbon rods may be such as to cover an arc of more than three hundred degrees. I do not confine myself, however, to any particular angle of inclination of the said shafts B B′.

In the upper portion of the casing A is supported a solenoid F, formed of two parts—one part j being formed of coarse wire and arranged in the main circuit, the other part being made of fine wire and connected in the shunt around the arc in the usual way; but the two coils of the solenoid are connected so as to produce opposing effects upon the soft-iron core G. Attached to the lower end of the solenoid is the flange k. The core G is prolonged downward and reduced in diameter, forming a spindle d', which passes through the cross-bar d and is journaled in an insulated bearing in the lower part of the casing A.

The core G, at a point adjacent to the lower end of the solenoid F, is provided on diametrically-opposite sides with spirally-arranged wings l. Below the wings l the core G is screw-threaded to receive the nut H, which is provided on its upper surface with ratchet-teeth m, adapted to engage ratchet-teeth n upon the under surface of the disk I. The disk I is provided with a number of spiral springs o, which are inserted in an apertured friction-disk J, placed loosely upon the core G, and provided with slots p for receiving the wings l. The disk J is adapted to be brought into frictional contact with the flange k. By means of the nut H the disk J may be adjusted with reference to the flange k so as to increase or diminish the distance between the said disk and flange. By turning the disk I upon the nut H the torsion of the springs o may be varied so as to regulate the pressure of the notched disk J upon the wings l for the purpose of adapting the lamp to currents of different intensities. The lower end of the spindle d' carries a pinion q, which engages both of the bevel-wheels c c'.

The casing A is attached to a hood K, which in the present case is supported by rods L, projecting from the socket M, attached to the upper end of the pole N; but I do not limit myself to this method of supporting the lamp, as it may be suspended from above. To the hood K is attached a glass globe O, having a cylindrical upper portion and a spherical lower portion, an opening r being formed in the lower part of the globe to allow of the circulation of air through the lamp. Other openings in the upper portion of the globe or in the hood, or in both, may be formed for the same purpose. The upper portion of the casing A is provided with binding-posts s s', for receiving the conductors which convey the current to the lamp.

The course of the current through the lamp is from the binding-post s through the solenoid F; thence through one half of the cross-bar d and the mercury contained therein, through the shaft B′, arm C′, carbon rod D′, carbon rod D, arm C, shaft B, the other half of the cross-bar d and mercury therein, to the binding-post s', the conductor extending to the said binding-post being connected with the remaining terminal of the solenoid. In the drawings the circuit-wires are indicated by dotted lines.

The operation of my improved lamp is as follows: The carbon points being in contact, a current is sent through the lamp, which results in energizing the solenoid F and magnetizing the core G, and the said core, being drawn up into the solenoid, carries with it the disk I, and also the disk J, supported by the said disk I through the springs o. When the disk J comes into contact with the flange k at the lower end of the solenoid, its motion is arrested, and at the same time the friction between the flange and the disk J prevents the said disk from turning. The further upward movement of the core G through the disk J causes the core to turn slightly by virtue of the engagement of the spiral wings l with the notches p of the disk J. The turning of the core in this manner rotates the shafts B B′ by virtue of the engagement of the pinion q on the spindle d' with the bevel-wheels c c' on the said shafts. The direction of the rotation of the shafts B B′ under these circumstances is such as to cause the carbon points to separate and form the arc. The arc being thus formed, the carbon burns away, lengthening the arc and increasing the resistance of the lamp, the first result of which is to increase the power of the shunt, and thus slightly diminish the power of the series part of the solenoid. When the shunt-coil has sufficiently neutralized the power of the series-coil to allow the core G to drop, the wings l of the said core, following the notches p in the friction-disk J, cause the said core to turn and the carbon points to approach each other, but not in proportion to their consumption, until the arc is of a normal length and the said core has dropped enough to allow the said friction-disk to turn. The carbon points then approach each other by their own gravity, when the power of the shunt becomes weaker, and the said core is again drawn upward, bringing the disk J into contact with the flange k, thus arresting the rotation of the core and parts connected therewith. When the resistance to the current is again increased by the lengthening of the arc, the power of the series-coil is again weakened by the shunt-coil and the disk is again released, and so on. The counter-weights E, one of which is shown, serve to balance the arms C C′, and thus maintain a preponderance of the weight upon the feeding side of the shafts B B′.

Although I have described a lamp having two equal carbon rods used with an alternating current, I do not limit myself to the use of such rods or currents, as with a continuous-current dynamo, where the positive carbon is consumed twice as fast as the negative, a positive carbon of double the sectional area of the negative carbon may be used, as shown in Fig. 8; or by a slight alteration in the proportion of the bevel-wheels c c' and the pinion q, as shown in Fig. 7, the engagement between the said bevel-wheels and pinion may be such that the bevel-wheel controlling the feed of the positive carbon will revolve twice as fast as the bevel-wheel controlling the negative carbon.

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

1. In an arc lamp, the combination, with carbon-carriers, of a solenoid, a magnetic core entering the solenoid, a friction-disk carried by the core, a friction-flange adapted to be engaged by the friction-disk, and the spiral wings carried by the magnetic core, substantially as specified.

2. In an arc lamp, the combination, with rotating carbon-carriers, of a double solenoid formed of series and shunt coils, a magnetic core entering the solenoid, a friction-disk carried by the core and a friction-flange adapted to be engaged by the friction-disk, and the spiral wings l, substantially as specified.

3. In an arc lamp, the combination of the shafts B B′, inclined to each other and provided with arms C C′ and bevel-wheels c c', the core G, carrying wings l, pinion q, friction-disk J, flange k, and solenoid F, substantially as specified.

4. In an arc lamp, the combination, with the core G, provided with carrying-wings l, and notched friction-disk J, of the supporting-disk I and springs o, substantially as specified.

5. In an arc lamp, the combination, with the core G, provided with the spiral wings l, of the friction-disk J, provided with the notches p, for receiving the wings l, and the yielding support formed of the springs o and disk I, substantially as specified.

6. In an arc lamp, the combination, with the threaded core G and friction-disk J, of the nut H, provided with ratchet-teeth m, the disk I, having ratchet-teeth n, and the springs o, substantially as specified.

ROBERT D. CARSON.

Witnesses:

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CHAS. LESLIE JEFFERSON.