

(No Model.)

2 Sheets—Sheet 1

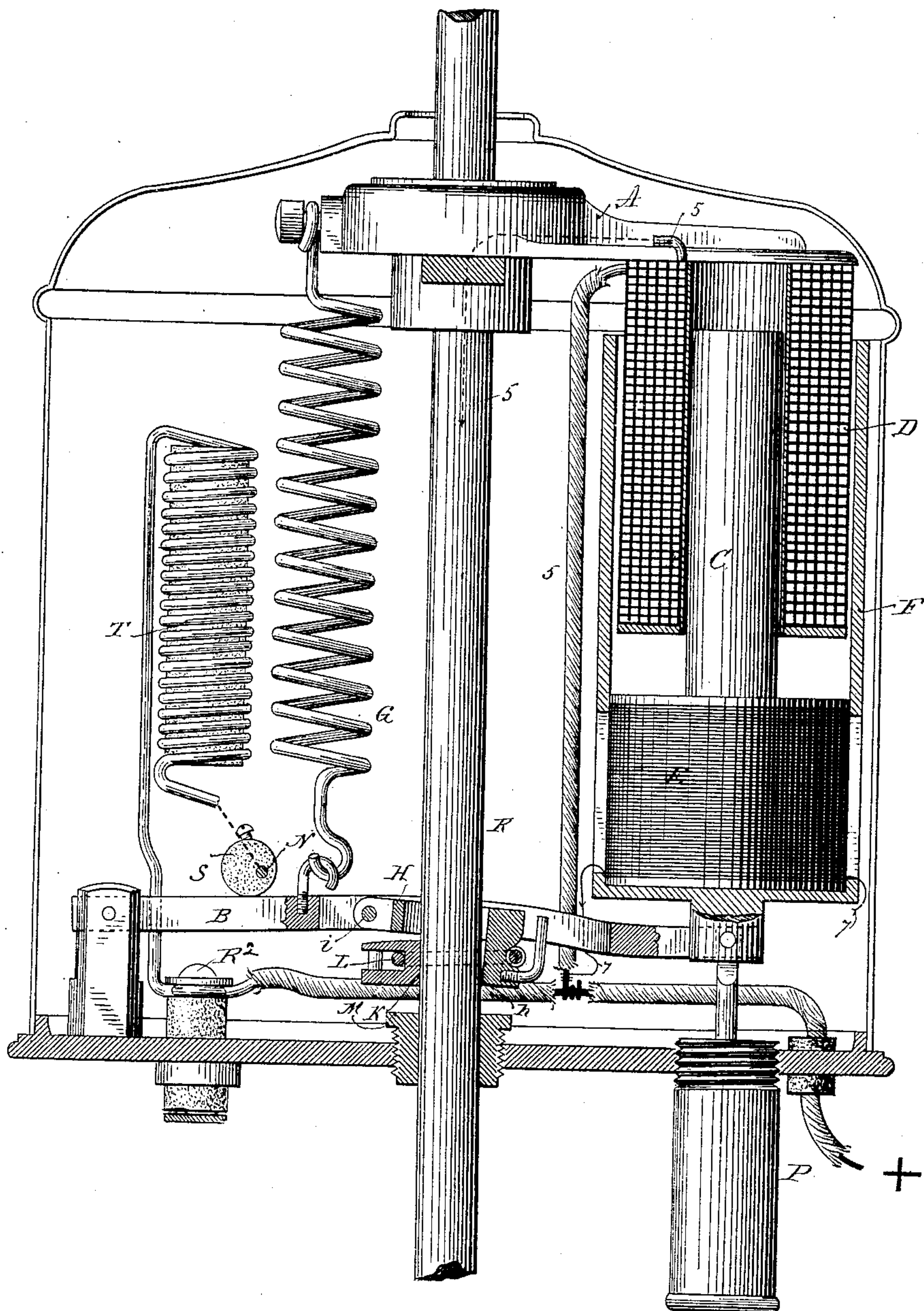
A. G. WATERHOUSE.

ELECTRIC ARC LAMP.

No. 336,503.

Patented Feb. 16, 1886.

*Fig. 1,*



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(No Model.)

2 Sheets—Sheet 2

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Fig. 2.

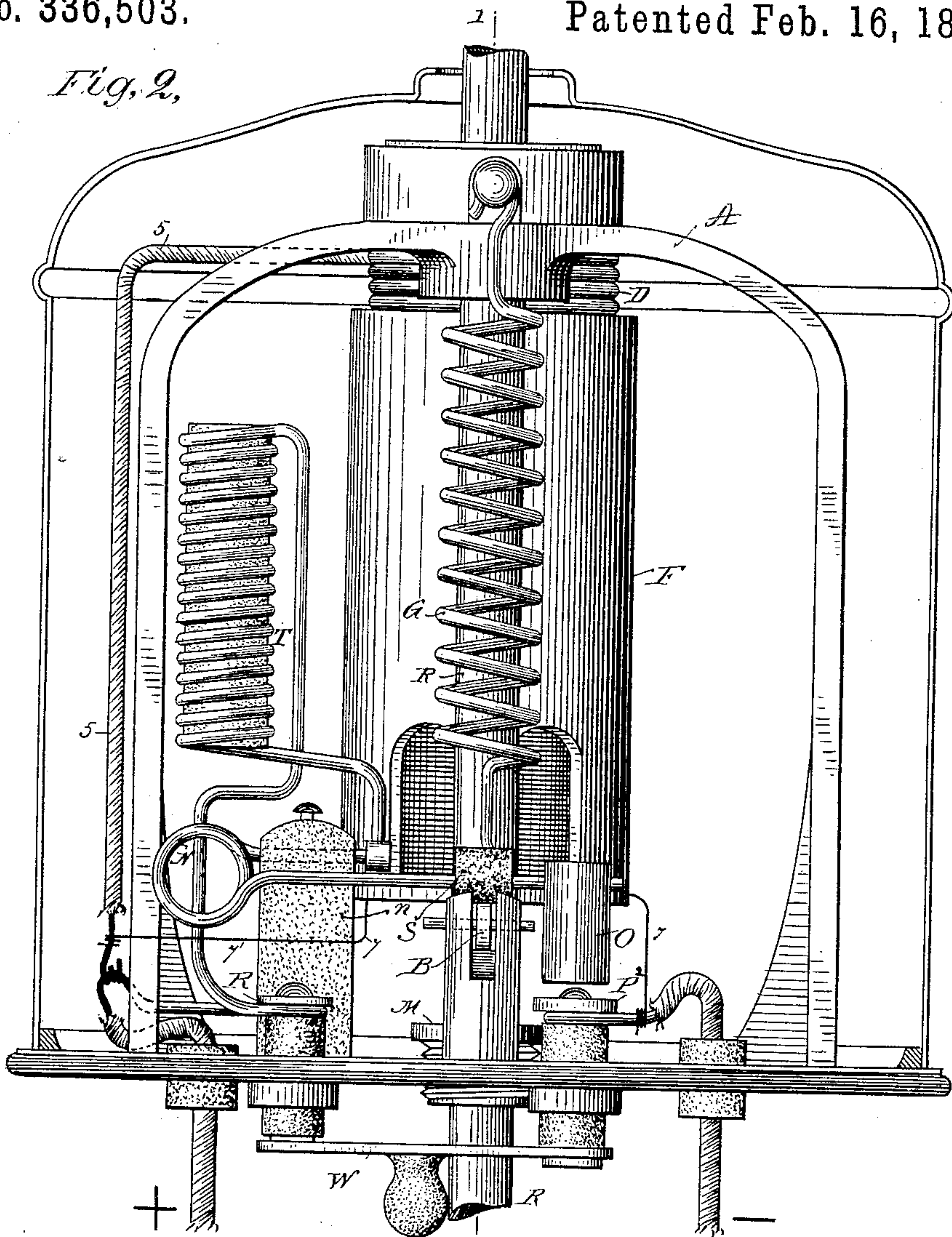
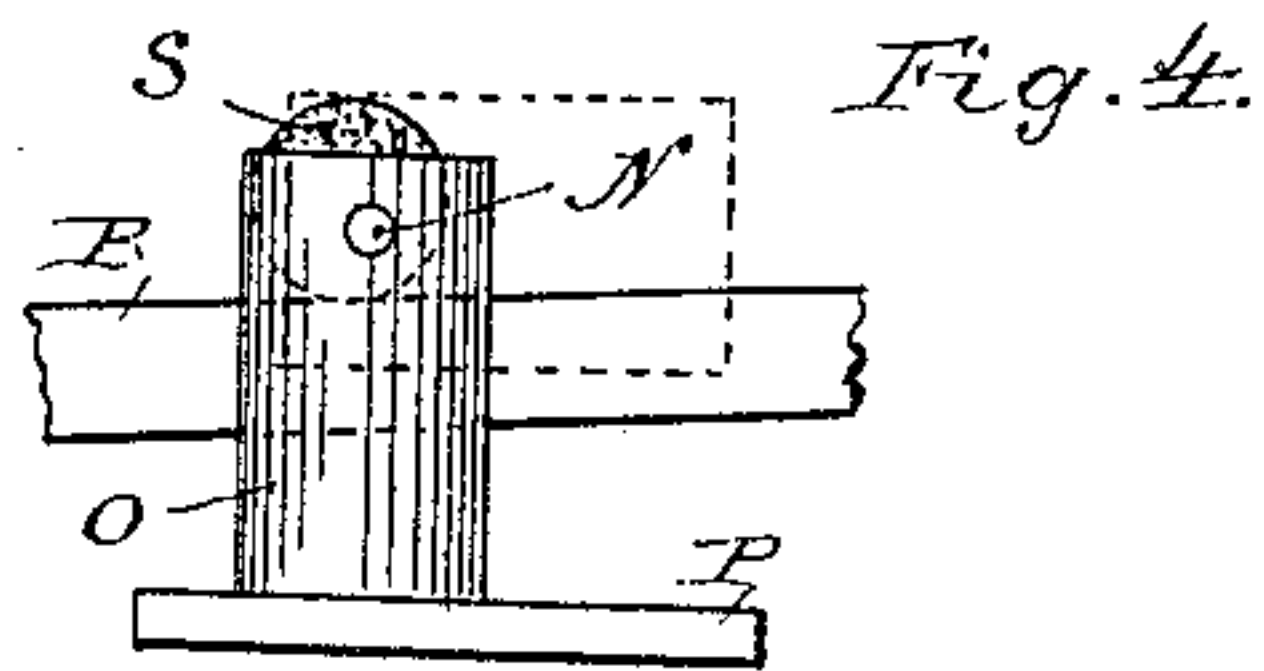
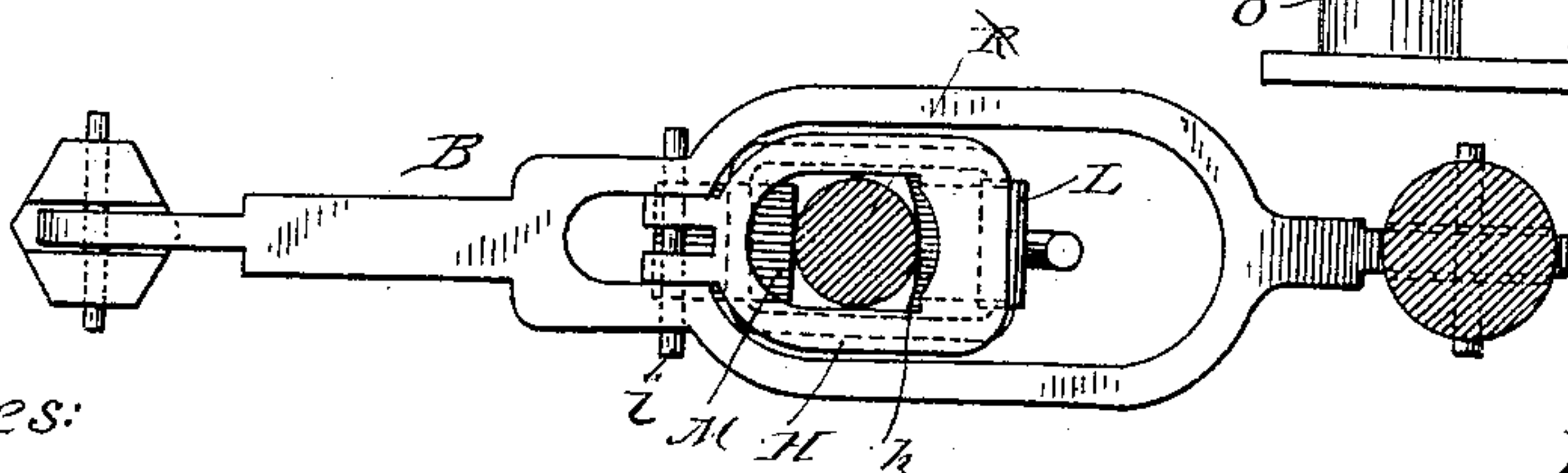


Fig. 3.



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# UNITED STATES PATENT OFFICE.

ADDISON G. WATERHOUSE, OF HARTFORD, CONNECTICUT.

## ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 336,503, dated February 16, 1886.

Application filed January 23, 1884. Serial No. 118,360. (No model.)

*To all whom it may concern:*

Be it known that I, ADDISON G. WATERHOUSE, a citizen of the United States, and a resident of Hartford, in the State of Connecticut, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

My invention relates to the construction of electric-arc lamps; and its object is, among other things, to increase the power and delicacy of operation of the magnet system, to improve the efficiency and certainty of action of the clutch or clamp, and to simplify and improve the devices, whereby a safety or branch circuit around the lamp may be automatically closed in case of derangement in the lamp mechanism and failure of the carbon to feed properly.

My invention consists in certain details of construction and combination of parts, that will be herein described in connection with the accompanying drawings, and will be set forth in the claims.

The feed-regulating magnet herein described, consists, briefly speaking, of a movable magnet-core actuated by coils in the main circuit, in combination with a high-resistance derived-circuit coil wound upon an extension of the core and moving therewith, and a bell-extension from the core arranged to surround the main-circuit coils, and acting in the combination to increase the power and delicacy of operation. An additional element of importance in such a combination is, that the feed-regulating mechanism is actuated in one direction by the main-circuit magnet-coils, and in the other by a spring or by the weight of the parts only, and that the derived-circuit coil serves merely to permit the action of the spring or weight to prevail, and has no positive action of its own either in drawing the core in a direction to permit a feed to take place or in the same direction with the main-circuit coil. To the latter circumstance is due the important result that the current in the derived-circuit coils cannot, in case of an abnormally long arc, act to keep the carbons separated. This novel and important feature will be more clearly manifest from the following detailed description of the lamp, taken in connection with the accompanying drawings, in which—

Figure 1 is a front elevation, partly in section, of a lamp embodying my invention. Fig. 2 is a side elevation. Fig. 3 is a top view of the clutch or clamp. Fig. 4 illustrates a detail of construction.

A indicates a frame, of any suitable or usual construction, for supporting the magnet and working parts of the lamp, and B the feed regulating or governing lever actuated by the governing and feed-controlling magnet, and connected in any suitable manner with any proper or ordinary feed-regulating devices of such nature that when said lever is moved in one direction, as upward, the carbons will be drawn apart, and when moved in the opposite direction a release or feed of the carbons will be permitted to take place. The construction of the devices herein employed for such purpose will be described further on.

R indicates the ordinary carbon holder or carrier, with which the feed-regulating mechanism engages.

Lever B is connected with the movable core C of an electro-magnet, the coils for which latter are indicated at D, and, as is obvious, will act on said core to draw it up within the coils when a current of electricity of sufficient strength flows through them. The coils D are in the main or principle circuit with the carbons, as usual, which circuit is indicated by the numeral 5, and passes from the point marked + through the coils D to the frame, and thence to the upper-carbon carrier R in the usual way, and the core C, when raised by the action of current in said coils, raises the end of lever B and imparts the proper movement to the feed-regulating mechanism to separate the carbons. The coils of fine wire in a high-resistance derived circuit, 7, around the carbons are indicated at E, and surround an extension of the core C, as indicated. They are suitably mounted or supported so as to be carried by or to move with the core, and as said core and coils are not capable of independent movement, the latter (the coils) can never produce a positive downward pull upon the feed-regulating lever, but their action must be confined to the function of neutralizing or counteracting the magnetism induced in the core C by the current in coils D to such extent as to permit the lever B to be lowered by the action of gravity or a spring when a feed of the car-



bon rod downward becomes necessary. It is of course to be understood that the coils E are properly wound or connected, so that the current circulating in them shall tend to give to the core C a magnetism the opposite of that induced by the current in coils D.

F indicates what I term a "bell-extension" from the core C, and consists simply of a cylinder or case of iron magnetically connected with the core C and arranged to surround the coils D, as indicated. This extension increases the sensitiveness and strength of the magnet and improves the delicacy and certainty of action of the lamp.

G indicates a spring, which serves to assist the magnet-core C in overcoming the weight of B and connected parts.

P indicates a dash-pot of any usual or desired construction.

The clamp or clutch herein shown consists of a jaw, H, connected with lever B by a joint, i, and bearing upon one side of rod R with its toe or engaging surface h, and a loose friction dog or block, K, arranged to bear against the rod R at a portion thereof opposite h, and connected by a link, L, with the jaw H, as shown, so that when the latter is lifted at one end by the lever B the dog K will be tightened on the rod, and will prevent it from moving downward through the clutch. When the clamp is lowered so that the block K rests upon the table M, the clamp releases its hold upon the rod R and permits it to move downward.

N indicates a rather stiff coiled spring, fastened at one end in an insulating-block, n, and carrying upon its extended opposite end a contact-making block, O, adapted to make contact, when the spring is free, with an insulated contact-piece, P<sup>2</sup>. The contacts O and P<sup>2</sup> are normally, or when the lamp is in action, held out of connection by the lever B, upon which the spring N bears, through an insulating-piece, S, mounted on the extended end of N. The piece S is an eccentric or irregular in outline, and may be turned upon the spring so as to raise or lower the block O, and thus determine the point in the downward movement of B at which contacts O and P<sup>2</sup> shall be closed. Block O is mounted on the end of spring N, so that it may be turned into the position shown in Fig. 4, and thus permit the lamp to be operated without closing the contacts O P<sup>2</sup>. Block O, when turned into such position, is held by friction.

T indicates an artificial resistance of German silver or other suitable material, coiled upon a suitable form or support and connected at one end with a post, R<sup>2</sup>, and from the latter directly with the main conductor on one side of lamp and at the other end with spring N. Contact P<sup>2</sup> is connected with the main conductor on the opposite side of the lamp, and the circuit formed through T, N, O, and P<sup>2</sup>, when O and P<sup>2</sup> are in contact, constitutes a safety or cut-out circuit, to be closed when, through abnormal arc resistance or extinction

of arc, the lever B is permitted to recede by the action of gravity or a spring to a sufficient extent, determined by the adjustment of the parts. The resistance T serves to force current into the main-circuit coil D when the current is turned on, so as to enable coils D to lift the core C and start the lamp. A hand-switch, W, serves, at pleasure, to connect P<sup>2</sup> and R directly, and to thus short-circuit the lamp.

When the lamp is out of action and no current is passing, the rod R is freed from the clutch, the carbons are in contact, and the safety or cut-out circuit is closed through T N O P<sup>2</sup>. When current is turned on, it passes in large measure through coils D, the frame A, and the carbons, being forced into this path by the resistance T and the high-resistance coils E. A portion passes through coils E, but produces no effect. The current in coils D raises core C and lever B, and at first rocks jaw H upon its point h, thus tightening the clamp upon the rod. Further movement results in lifting the rod against the action of gravity and forming the arc in the well-known way. At the same time the cut-out circuit is broken by the lifting of the contacts O from P<sup>2</sup>. The current in coils E increases in amount as the arc lengthens, and by tending to neutralize the magnetism of the core decreases the strength of the magnetic pull of coils D upon said core, so that the coils D finally become ineffective to raise the parts further against the action of gravity, and an arc of a certain determinate length is thus formed. As the arc lengthens by wasting of the carbons, the current in coils E still further weakens the magnetic pull upon the lever B, and gravity lowers the latter until a slight feed is produced by the release of the clamp. In these actions the coils E exert no pull upon the parts, but the action is simply the varying action of a magnet pulling on the lever in one direction against the force of a spring or weight pulling on it in the other. If the carbons fail to feed and the arc becomes excessively long, the current in coils E will become so great that the lever B will be lowered still farther by gravity, and beyond the point at which the clutch is released, and will thus permit the spring N to close the contacts O P<sup>2</sup> and cut out the lamp.

What I claim as my invention is—

1. The combination, in an electric lamp, of a feed-regulating mechanism and a governing electro-magnet consisting of main-circuit coils, a movable core therefor, derived-circuit coils moving with the core, and a bell-extension from the core surrounding the main-circuit coils.

2. The combination, in an electric-arc lamp, of a feed-regulating mechanism, a movable magnet-core actuated in one direction by main-circuit coils and in the other by the weight of the parts, a derived-circuit coil moving with said core, and a bell-extension surrounding the main-circuit coils.

3. The combination, in an electric lamp, of a feed-regulating lever, B, core C, coils D in the



main circuit, coils carried by the core and in a derived circuit of high resistance around the carbons, and bell-extension F, as and for the purpose described.

5 4. The combination, in an electric lamp, of a cut-out switch bearing on a movable portion of the regulating mechanism, and an adjustable cam or eccentric at the point of bearing.

10 5. The combination, in an electric lamp, of the cut-out switch and the adjustable contact-piece O, arranged in the manner described, so that it may be turned up to prevent closing of the cut-out circuit.

15 6. The combination, with the feed-regulating lever in an electric lamp, of the spring N, bearing on said lever and having a contact block or hammer, O, through which it may close a cut-out circuit.

20 7. The combination, in an electric lamp, of the lever B, the core C, connected therewith and carrying derived-circuit coils, main-circuit coils D, jaw H, hung from the lever, and the loose friction dog or block connected with the jaw by a link, as and for the purpose de-  
25 scribed.

8. The combination, in an electric lamp, of a movable magnet-core, fixed main-circuit coils, movable derived-circuit coils moving with said core, and a clutch or clamp consisting of a pivoted jaw bearing against one side of the carbon 30 or carrier, a loose friction dog or block bearing against the opposite side of the carbon or carrier, and a connecting link or bar, L, as and for the purpose described.

9. The combination, with the carbon-carrier, 35 of a tilting dog or jaw bearing against the carrier at the side opposite from that which the dog or jaw is fulcrumed, a friction block or piece bearing on the carrier on the side opposite to that on which the dog or jaw bears, and a 40 connecting-link between the two parts bearing on the carrier, as and for the purpose described.

Signed at Hartford, in the county of Hartford and State of Connecticut, this 14th day 45 of January, A. D. 1884.

ADDISON G. WATERHOUSE.

Witnesses:

CHAS. E. DUSTIN,  
W. H. NEWELL.