

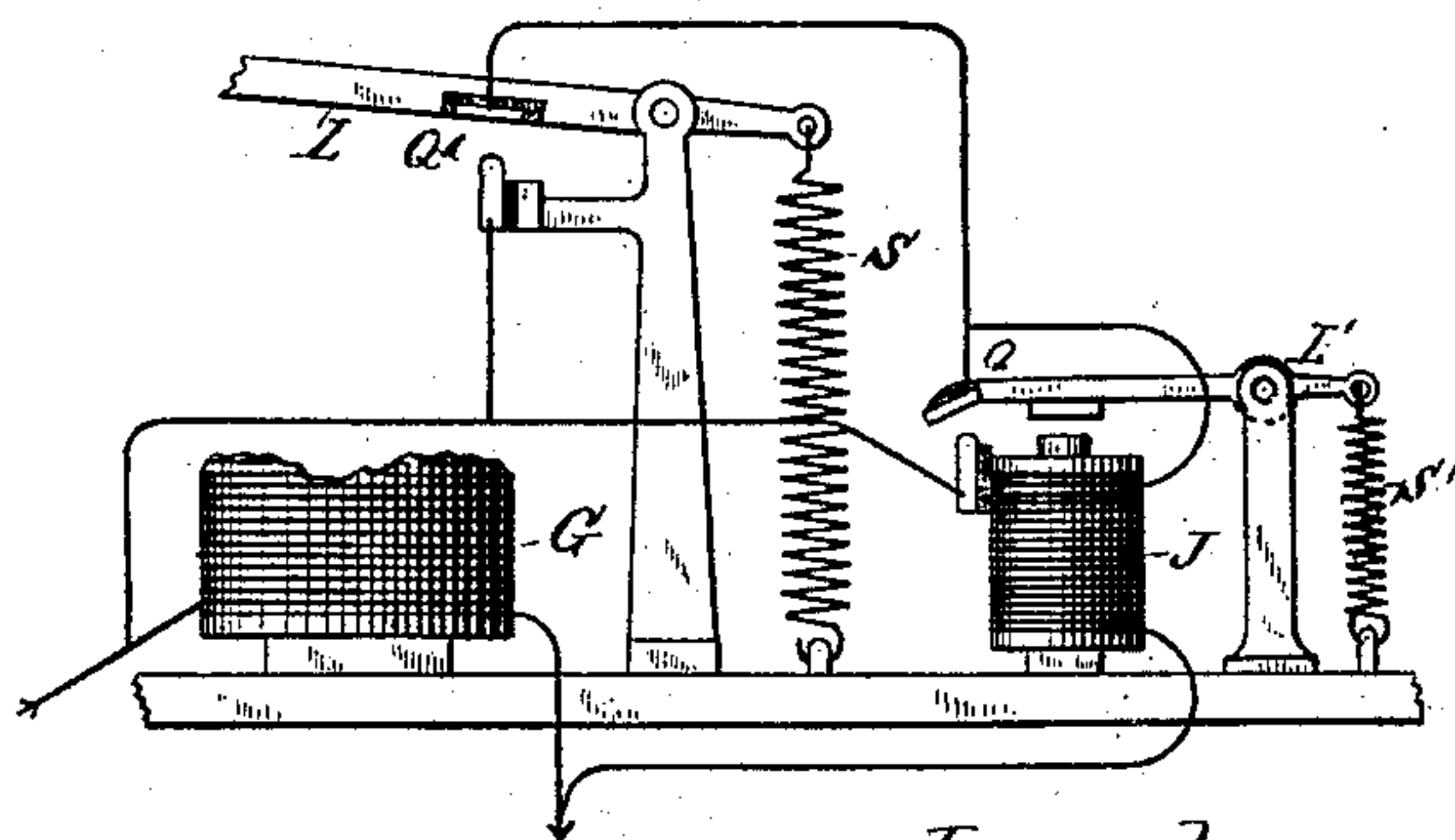
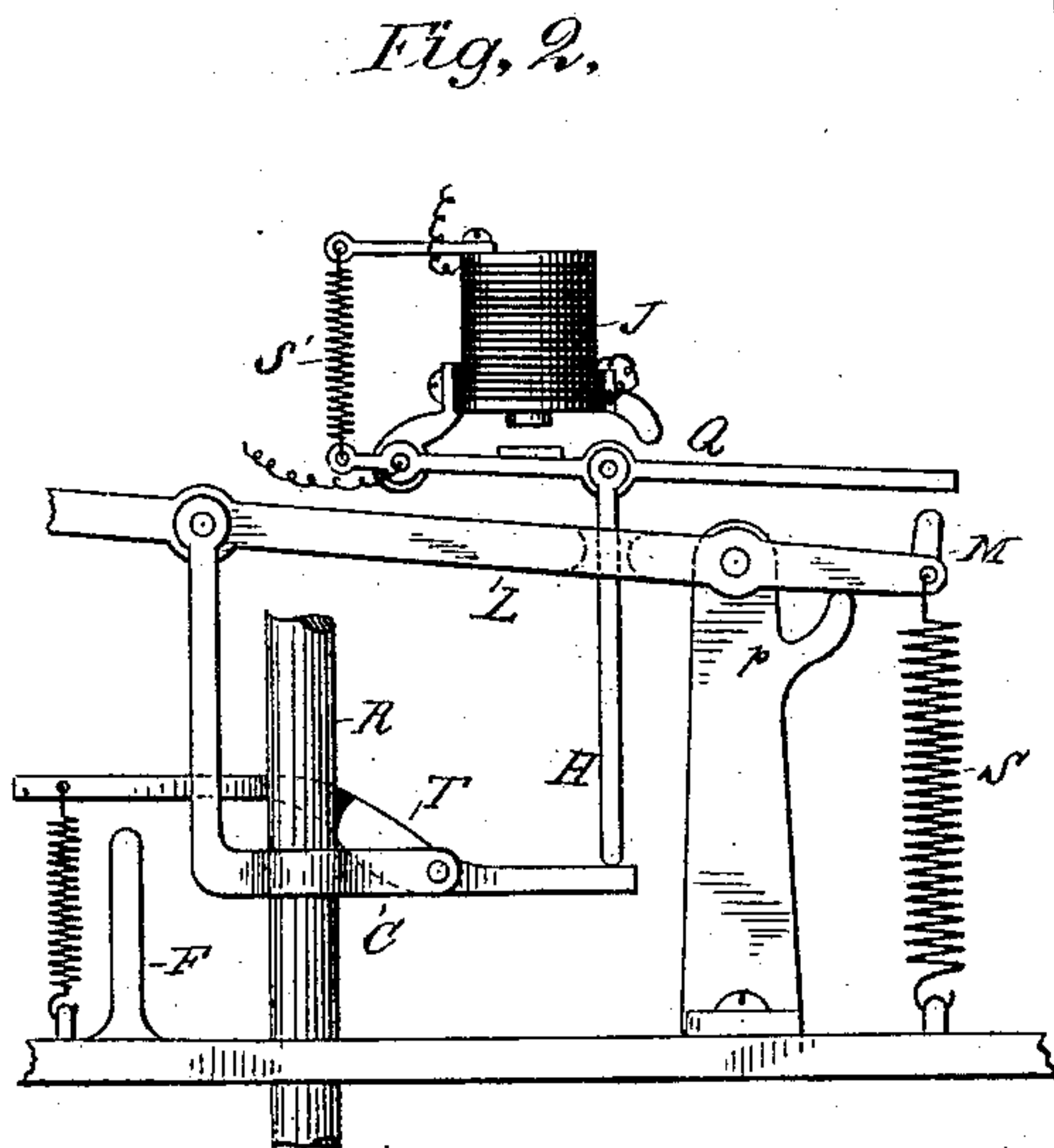
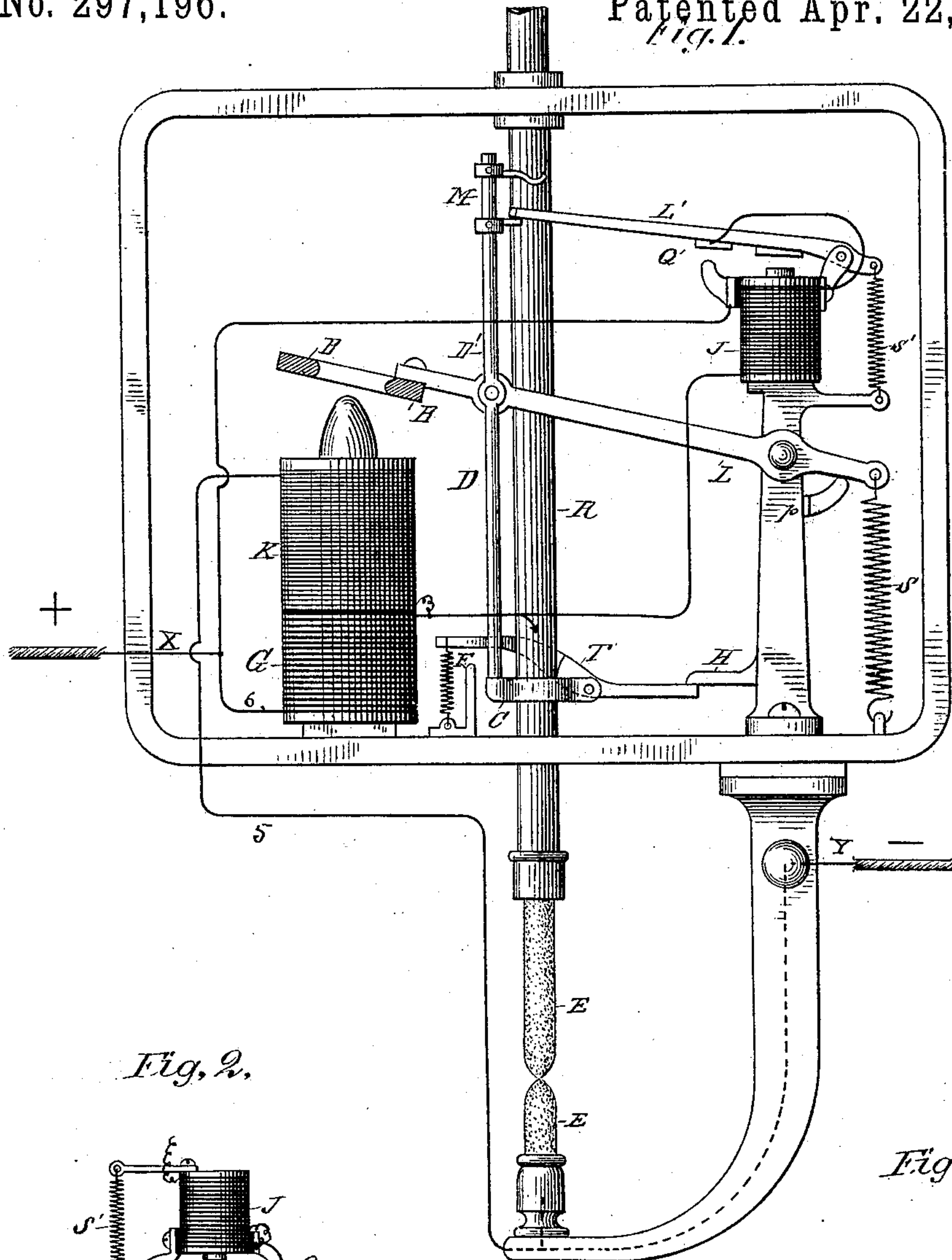
(No Model.)

2 Sheets—Sheet 1.

E. THOMSON.
ELECTRIC ARC LAMP.

No. 297,196.

Patented Apr. 22, 1884.



Witnesses:

Ernest Alshagen
Thor Jorney

Inventor:

Elihu Thomson
By his Attorney *W. B. Townsend*

(No Model.)

2 Sheets—Sheet 2.

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Fig. 4,

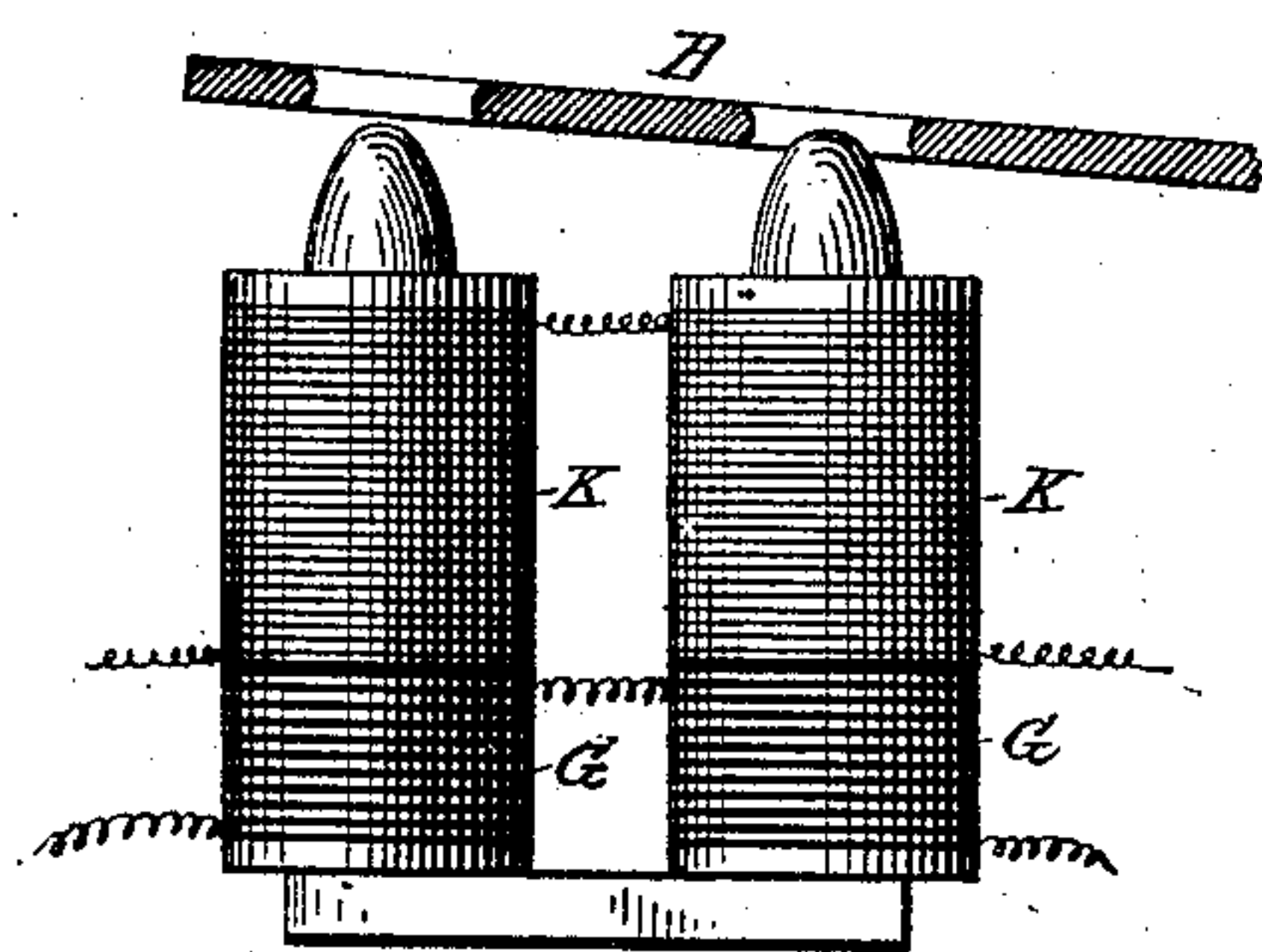
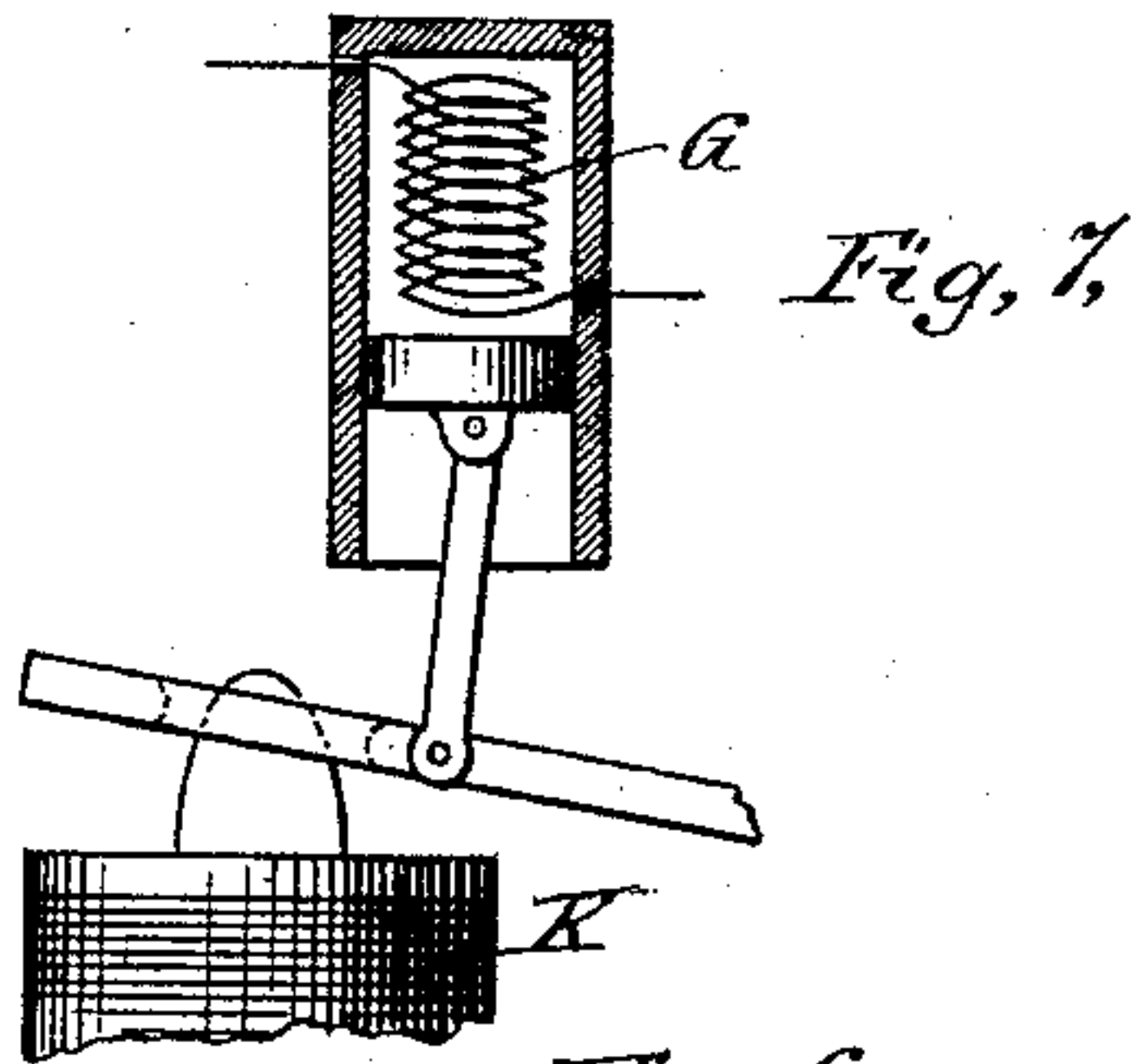
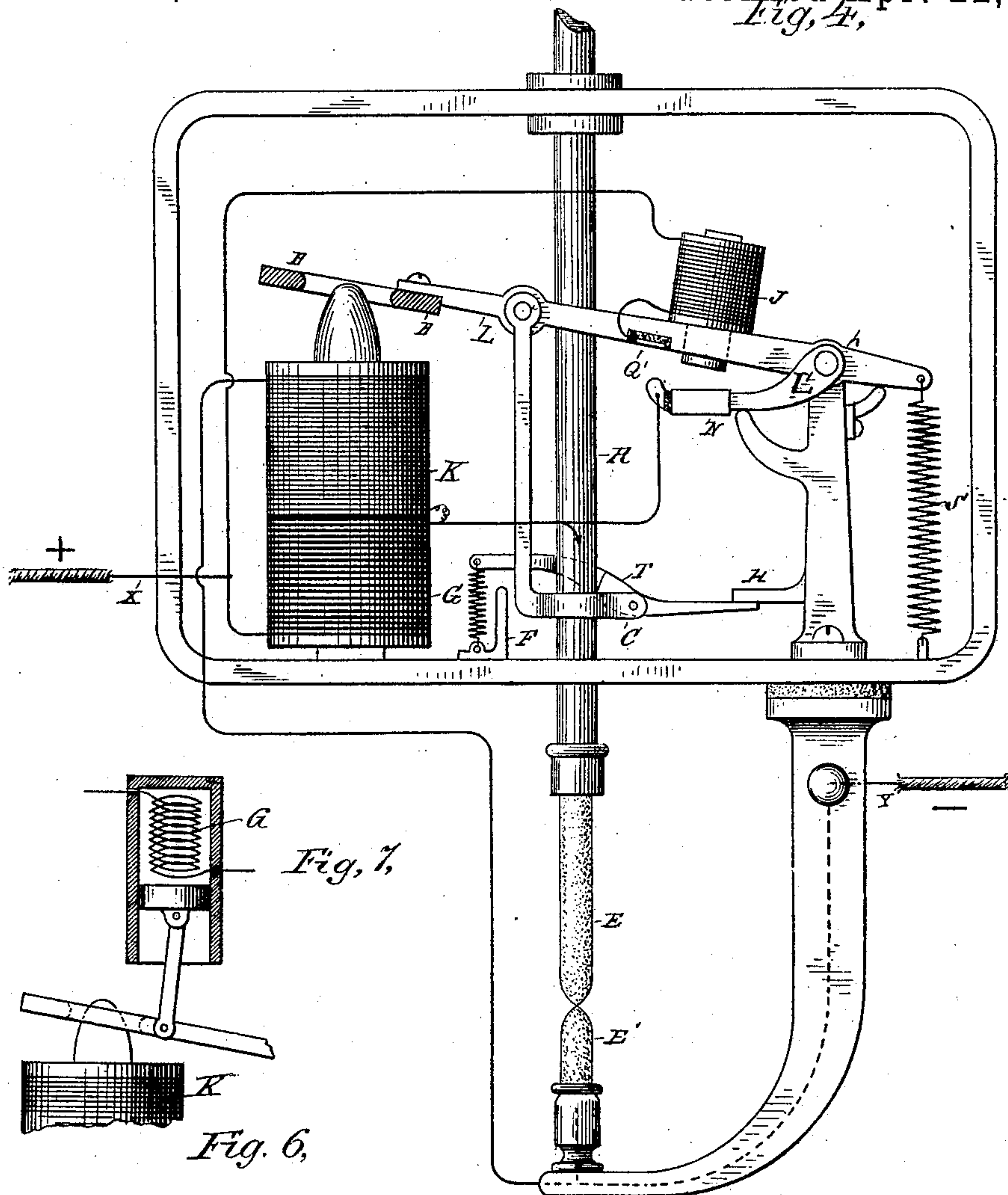
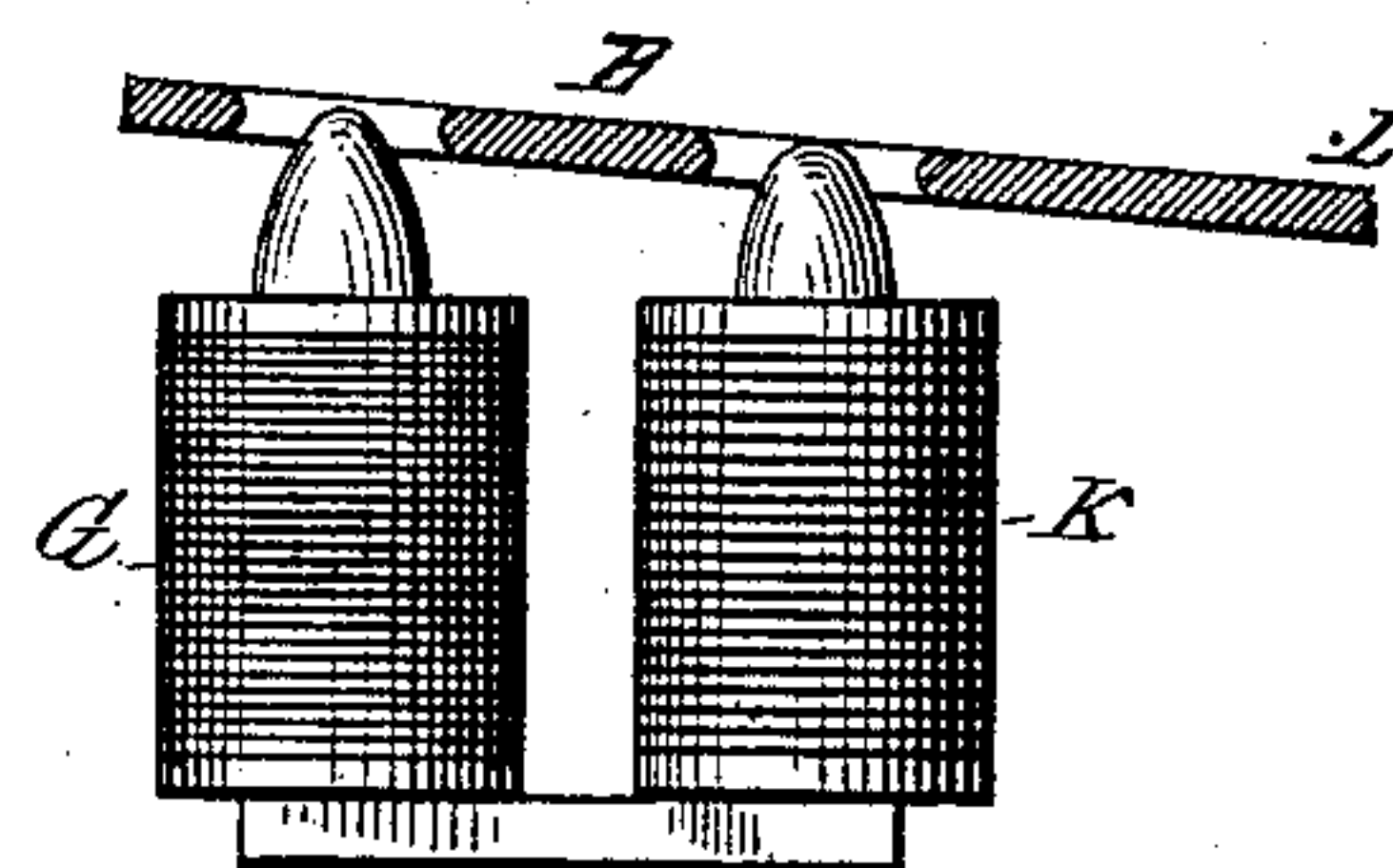


Fig. 5.



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Inventor:

Elihu Thomson
By his Attorney: *W. L. Townsend*

UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF LYNN, MASSACHUSETTS, ASSIGNOR TO THE THOMSON-HOUSTON ELECTRIC COMPANY, OF CONNECTICUT.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 297,196, dated April 22, 1884.

Application filed January 4, 1884. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

My invention relates to the combination of magnets and circuits whereby the proper separation and feed of the carbons in an electric-arc lamp are effected, and is more especially designed to furnish a simple and effective lamp in which the proper feed-regulating operations shall progress under the regulating action of a derived-circuit coil only acting in opposition to a suitable retractor. In another application for patent filed by me January 4, 1884, No. 116,405, I have described a lamp in which an auxiliary or starting coil of low resistance in circuit with the carbons is employed for bringing the feed mechanism of the lamp into proper feed-regulating position, and is then automatically cut out and kept out, so that the feed-regulating operations may progress under the control of the derived-circuit coil alone. In said application I have shown and claimed a mechanically-controlled circuit-closer for effecting a continued cut-out of the starting-coil, and have also claimed the broad combination consisting of the starting-coil in the circuit with the carbons and means for cutting out said coil automatically at the proper point and holding it cut out while the lamp is in action, so that the feed may progress under the control of the derived-circuit magnet only.

My present invention relates more especially to an improved means of keeping the cut-out circuit of the starting-coil, arranged as stated, closed; and it consists, broadly, in the combination, with such cut-out circuit, of a coil or magnet or other device, whereby the magnetizing or heating effects of the current may be utilized for preserving the cut-out circuit.

My invention consists, also, in certain novel combinations of devices, that will be specified more particularly in the claims.

In carrying out my invention any desired form or construction of feed-regulating mechanism may be employed, consisting either of

a clutch, a gear-train, or other device. In the present case I have shown a clutch, and I have illustrated my invention as applied to the same general construction that I have illustrated in my application before referred to. 55

In the accompanying drawings, Figure 1 is an elevation of an electric lamp embodying one form of my present invention. Figs. 2, 3, and 4 illustrate modifications of the invention. Figs. 5 and 6 illustrate forms of the lamp-magnet. Fig. 7 shows how the heating effects of the current may be made to operate the switch. 60

K indicates a coil of high resistance in a derived circuit around the carbons, and acting, by means of a core and armature, B, upon a lever, L, in opposition to a retracting-spring, S, or other retractor. These parts are of any desired construction, and are designed to control the position of the carbons in any usual way. The armature may be a perforated armature and the pole end of the core conoidal, as shown, and as described in a patent already issued to me, for the purpose of giving a uniform magnetic pull in all positions of the armature for the same strength of current. The parts might be otherwise constructed or arranged to give the same result. The above is the preferred construction. The lever L, through a link, D, or otherwise, gives motion to a feed-controlling mechanism of any desired kind—such, for instance, as a clamp or clutch properly arranged to raise the carbon when the retractor S prevails, and to permit a release of the carbon when, through an increase of arc length, the coil K receives an increased proportion of the current, and its magnetic effects consequently prevail over the retractor. I have herein shown the lever as acting on a clutch or clamp such as is contained in prior patents granted to me, and consisting, briefly, of a clamp or clutch body, C, through which the carbon or carbon-carrier R passes, and a clamping toe or jaw, T, pivoted on the body C, and normally held by a spring, Z, against the carrier or carbon, so as to prevent the same from moving downward through the body C. 85 90 95

F is the usual releasing-stop, arranged in the path of an arm extending from the toe T, so 100

as to release the latter and permit the carbon to feed when the magnet or coil K is sufficiently energized, owing to increase in the length of arc.

5 H is an auxiliary stop arranged in the path of the clamp or clutch, to permit a release of the carbon when the armature B and lever L are drawn back or retracted to an abnormal extent in the opposite direction by the spring
10 S. The stop H is placed at such a point that during ordinary or normal movements of L in adjusting the carbons the stop will not strike it, (the clamp;) but when the current is turned off and the retractor pulls the lever to its extreme
15 position the clamp is released by H, and remains released, so that at again starting the lamp the carbons will be in contact.

G indicates the auxiliary or starting coil, wound in the present case upon the same core
20 with K, and in the same direction, so as, when current flows in it, to assist the coil K in pulling the lever L down into proper position to start the lamp. The coil G might be on a separate core, as indicated in Fig. 5, and act upon
25 the same armature or another armature connected to L, or other device controlling the feed mechanism.

The placing of the assisting-coil upon the same core with the derived-circuit coils and in
30 circuit with the carbons is claimed in my prior application before referred to—in an application filed by E. W. Rice and myself as joint inventors January 3, 1884, No. 116,300.

The magnet formed by the core of coils K
35 and G might obviously be a horseshoe-magnet, as indicated in Fig. 6. The coil G is in a circuit, 6, with the carbons, as indicated, while the derived circuit of coil K is indicated by the numeral 5, which is a circuit
40 around the carbons, as is obvious. The positive and negative conductors of the main circuit are indicated by X Y. The coil G is shunted or cut out by means of a suitable circuit-controller, consisting in the present in-
45 stance of a lever, L', which in Fig. 1 is operated by projections M, attached to or formed upon a rod, D', extending upward from the link D. The upper one of the projections M is elastic, if preferred, and is properly arranged
50 to strike the lever L' and depress it against the action of a spring, S', so as to complete a cut-out circuit by the contacts Q' when the lever L is lowered from an extreme retracted position to such a point that the clamping-toe T
55 is relieved from engagement with the rod R by the stop F. The circuit completed by contacts Q' is a cut-out circuit of low resistance around the coils G, and includes the coils of an electro-magnet, J, which acts upon an ar-
60 mature attached to the lever L', and serves in obvious manner to keep the contacts Q' closed during action of the lamp. The lower of the projections M is arranged so that during the ordinary feed-regulating movements of lever
65 L it will not impinge upon lever L'. When, however, the lever is retracted to its extreme position by the action of spring S, said pro-

jection will strike lever L' and open the con-
tacts Q', if they have not already been opened
by the action of the spring S'. The form of 70
the circuit-closer is immaterial, as is also the manner of mounting or arranging the devices whereby the lever shall be actuated to close the contacts simultaneously with the move-
75 ment of lever L under the action of the current in coil G.

The operation is as follows: When no current is passing through the lamp, the parts are in the position shown in the figure. The
80 jaw T is released by stop H, so that the rod R is free, and the contacts Q' are held open by the spring S' or the lower of the projections M. When the current is turned on, the current flows through coil G, which is of low re-
85 sistance, and draws down the lever L against the action of retractor S, thus lowering the clutch away from stop H and into engagement with the stop F. Simultaneously with such engagement the upper projection M brings
90 the contacts Q' together, thus shunting the coil G, which thereafter remains shunted, because the magnet J holds the contacts Q' closed. The influence of coil G is now no longer felt, and the clutch is left to the control of the de-
95 rived-circuit coil K and retractor S, which latter lifts the clutch and the rod R, separating the carbons to a point where the effects of the current in coil K balance the retractor. The feed is produced in obvious and well-
100 known manner by the increased action of coil K, due to increase in length of arc, said coil then acting to lower the clutch until a release of the rod R is produced. The stop H is, as
105 before stated, placed at such a height that during the ordinary feed-controlling operations the clutch will not engage with it. When, however, the lever L is retracted to an extreme position, the clutch is released by said
110 stop and the carbons run together, ready for a new operation. In Fig. 2 the parts are so arranged that when the contacts Q are closed, the stop H, which is here supported by lever
115 L', is removed, so that it cannot produce a release of the carbon after the lamp starts into action. In other respects the construction and arrangement will be obvious from an in-
120 spection of the figure. In Fig. 3 mechanical devices for producing the closure of the shunt-contacts Q when the coil G acts are dispensed with, and circuit-closing devices Q', actuated
125 by lever L, employed in their place. These contacts primarily close the circuit through magnet J at the proper point in the downward movement of the clutch, and said magnet, being energized, immediately closes the
130 shunt-contacts Q and holds them closed, thus keeping coil G cut out, and permitting the lever L to move backward and forward in the feed-regulating operation and to break the circuit at Q' without deranging the apparatus. In this case the parts must be so adjusted
that the contacts Q' will not be closed until the clutch has been released by the stop F; otherwise the contacts at Q' would have to be

made elastic, so as not to limit the downward movement of the lever.

In Fig. 4 the magnet J is carried by the lever L, and the circuit-closing lever L' is placed 5 beneath said magnet, and is free to swing on a pivot and with the lever L. In this case one of the contacts, Q', is carried by the lever L, and the shunt is closed thereby when the lever L descends to a determinate point, thus 10 closing the shunt around G and through magnet J. Magnet J is thus energized and attracts armature N, secured to L', thus maintaining the contact at Q', after which the armature N, contacts Q', magnet J, and lever L move together as one piece and act in all respects as 15 in Fig. 1. It is important here that the retraction in forming the arc be less than sufficient to cause T to strike H. By connecting H to the circuit-closing lever, as in Fig. 2, 20 this precaution is not required. The shunt-contacts Q' and circuit through J should be of such low resistance as compared with that of the coil G as to effectually render inactive the said coil G when the contact Q' is closed.

25 In another application for patent filed by me January 8, 1884, No. 116,746, I have claimed, broadly, a starting-circuit, a circuit-controller, whereby the flow of current in the starting-circuit may be governed, said controller being actuated 30 by the regulating armature or lever of the lamp, or by other device moving therewith, and an electro-magnet, whose circuit is at the same time opened or closed, keeping the circuit closed by the circuit-closer in proper condition 35 while the lamp operates. I therefore make no such broad claim in this case. In this specification I have described how the desired movements or control of the parts may be secured by electro-magnets—that is, by the magnetizing 40 effects of an electric current; but I wish it to be understood that I regard as an equivalent of such devices any device responding to the heating effects of the current—as, for instance, a thermostat or any other means whereby the 45 effects of an electric current may be transformed into mechanical energy. In my claims, therefore, although I have specified electro-magnets and electro-magnetic coils, because these devices offer the best known means of 50 producing the desired mechanical operations, I wish it to be understood that under such claims I mean to include any and all equivalent devices—as, for instance, well-known thermostatic devices, whereby mechanical effects, varying or not, may be obtained from an 55 electric current, varying or constant.

Fig. 7 of the drawings illustrates how the heating effects of the current in the starting-circuit may be made to do the same work as 60 the magnetizing effects. In this instance the coil G is inclosed in a chamber containing an expansible gas or liquid, which acts upon a piston so as to move the lever L in obvious manner when the current passes through 65 coil G and heats the same. In this instance the coil G is a resistance-coil; but it is placed in circuit and its circuits are controlled in

precisely the same manner as the coil G of the other figures.

What I claim as my invention is—

1. The combination, in an electric lamp, of 70 a starting circuit or coil, a shunting device therefor actuated by the regulating-lever, and a magnet or coil or other device affected by electric current whose circuit is governed 75 by said shunting device for holding the shunt-circuit closed while the lamp is in operation.

2. The combination, in an electric lamp, of a starting coil or magnet in the carbon circuit, a shunting device for shunting said coil 80 when the feed mechanism has been brought to normal or feed-regulating position, and an electro-magnetic coil in the shunt-circuit for holding said shunt-circuit closed.

3. The combination, in an electric lamp, of 85 a starting coil or magnet in the carbon circuit, a shunting device for shunting said coil when the feed mechanism has been brought to a predetermined position, and a coil or magnet in the shunting-circuit for acting on 90 said shunting device and keeping the shunting-circuit closed while the lamp is in operation.

4. The combination, in an electric lamp, of a derived-circuit regulating-magnet, an assisting-coil for assisting the same in pulling the 95 regulating-lever from an extreme retracted position to a normal or feed-regulating position, a shunting device for shunting said coil when the lever has reached a predetermined position, 100 and a magnet or coil in the shunt-circuit for holding the latter closed, as and for the purpose described.

5. The combination, in an electric lamp, of a derived-circuit regulating-magnet, feed-regulating mechanism having stops or releasing 105 devices which release the same at either extreme of movement, a starting coil or circuit, means for rendering said coil or circuit ineffective when the feed-regulating armature is 110 moved from an extreme retracted position, and a magnet or coil for keeping said coil or circuit inoperative, as and for the purpose described.

6. The combination, in an electric lamp, of 115 a high-resistance derived-circuit feed-regulating magnet, an auxiliary coil in circuit with the carbons for moving the feed-regulating mechanism to a point from which it may, when retracted, raise the upper carbon, means for 120 automatically cutting out said coil and holding it cut out, so that the operations of forming the arc and controlling the feed may progress under the control of the derived-circuit magnet only, and a coil or magnet in the cut-out circuit for holding the cut-out circuit closed. 125

7. The combination, in an electric lamp, of a feed-regulating-magnet core carrying two coils—one in a derived circuit of high resistance around the carbons and the other in a circuit with the carbons—means for shunting said 130 latter coil when it shall have brought the feed-regulating mechanism into normal position for separating the carbons, and a magnet in

the shunt-circuit for holding said shunt-circuit closed.

8. The combination, in an electric lamp, of a feed-regulating-magnet core carrying two
5 coils—one in a derived circuit around the carbons and the other in a circuit with the carbons—feed-regulating mechanism which permits a release of the carbon when no current is circulating in the derived-circuit coils, as
10 well as when said coils carry an increased proportion of current due to lengthening of the arc, a circuit controller or switch actuated directly or indirectly by the feed-regulating lever when the same is operated by means of the
15 coil in the carbon circuit, for cutting out said coil when the feed-regulating devices reach their extreme of movement, and an electromagnet in the cut-out circuit for acting on the circuit-controller and keeping it in proper position while the current flows through the carbons.
20

9. The combination, in an electric lamp, of the two coils K G, wound and connected as described, an armature-lever actuated by the
25 core of said coils, a clutch carried by said lever, and provided with upper and lower releas-

ing-stops, a cut-out circuit-closer for shunting said coil G, means for mechanically acting on said circuit-closer when the armature-lever is drawn forward and when it is abnormally re- 30 tracted, so as to open or close the cut-out circuit, and a coil in the cut-out circuit, and acting on said circuit-closer, as and for the purpose described.

10. The combination, in an electric lamp 35 whose carbons are at the start in contact, of a starting-coil in circuit with said carbons, and means for automatically shunting or cutting out said coil when the feed mechanism has been brought by the action of said coil into 40 the proper feed-regulating or carbon-separating position, and a magnet in the cut-out circuit for holding the same closed, as and for the purpose described.

Signed at Lynn, in the county of Essex and 45 State of Massachusetts, this 21st day of December, A. D. 1883.

ELIHU THOMSON.

Witnesses:

E. WILBUR RICE,
HARRY B. ROGERS.