

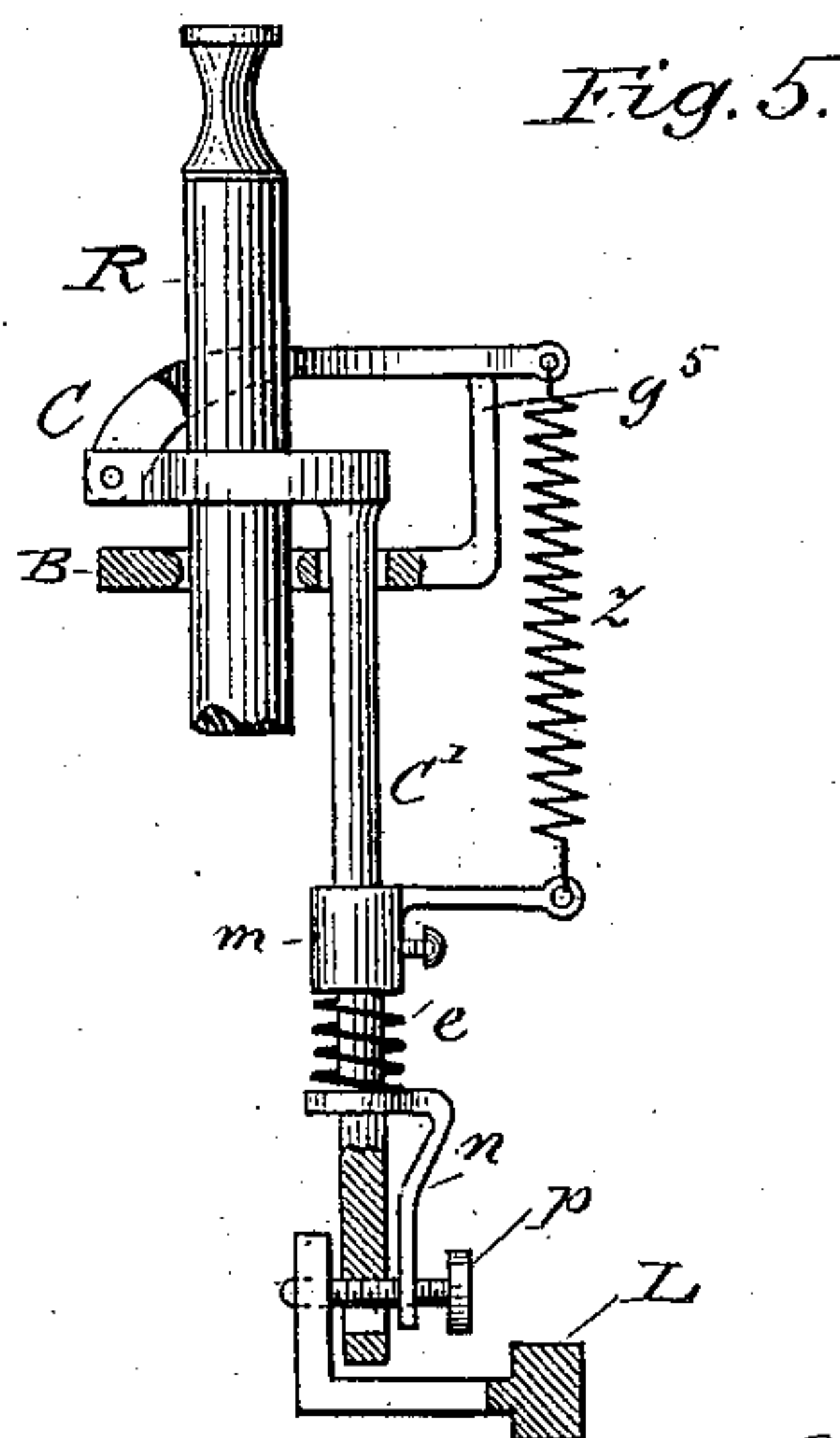
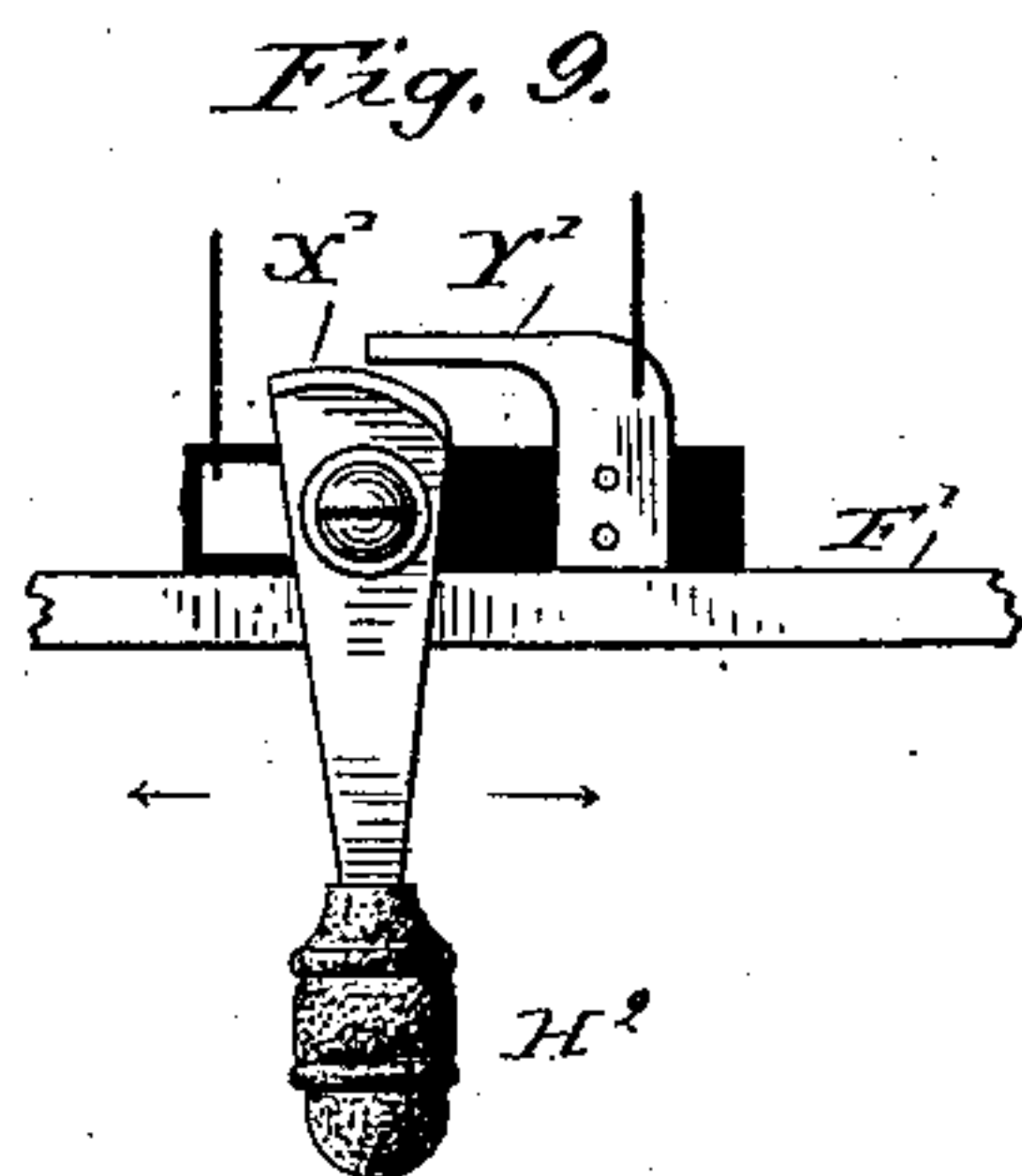
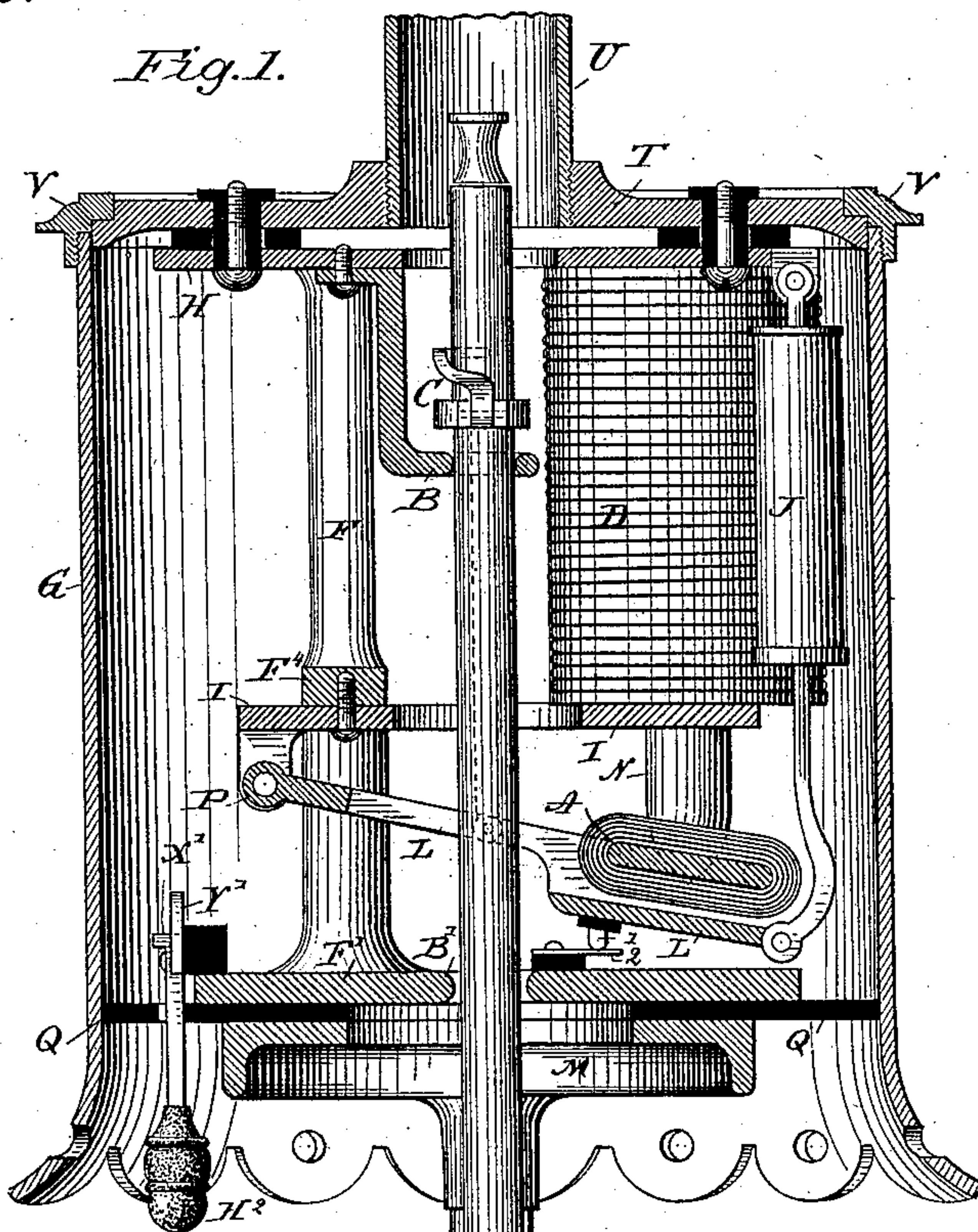
(No Model.)

3 Sheets—Sheet 1.

E. THOMSON.
ELECTRIC ARC LAMP.

No. 365,553.

Patented June 28, 1887.



Witnesses:

Ernest Abshagen
Chas. Torrey.

Inventor:

Elihu Thomson

By his Attorney: H. B. Townsend

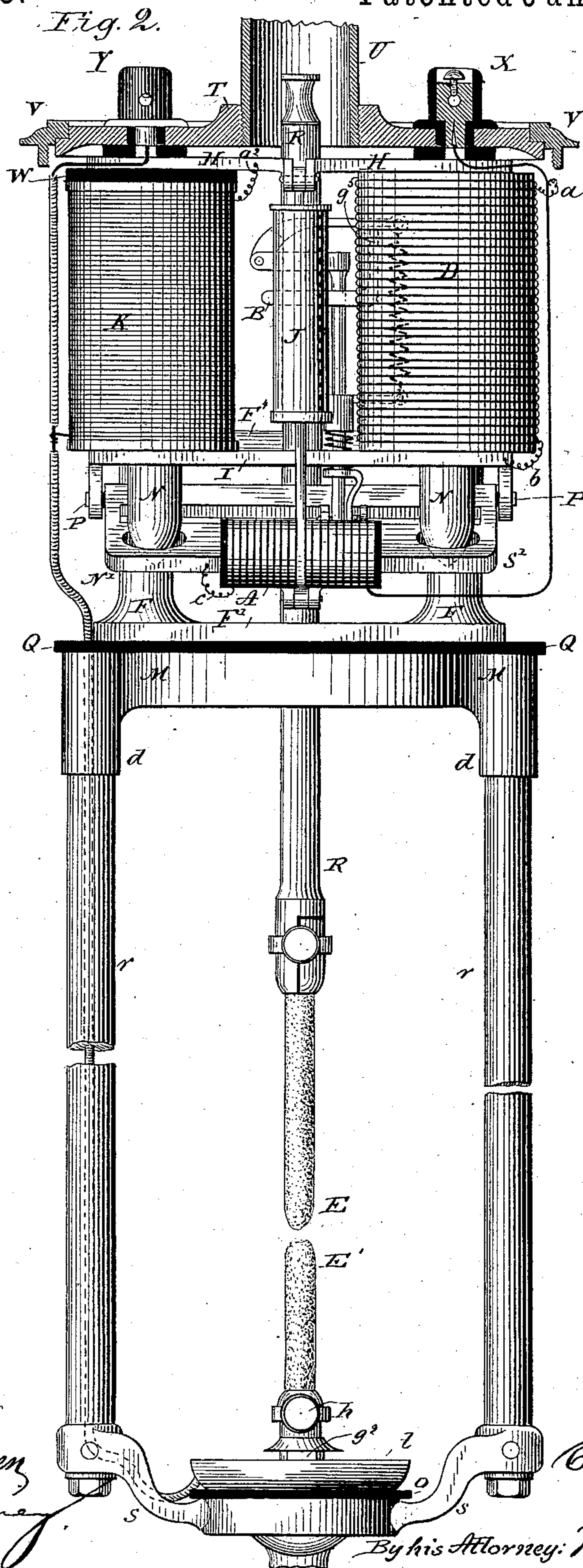
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3 Sheets—Sheet 2.

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3 Sheets—Sheet 3.

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Fig. 3.

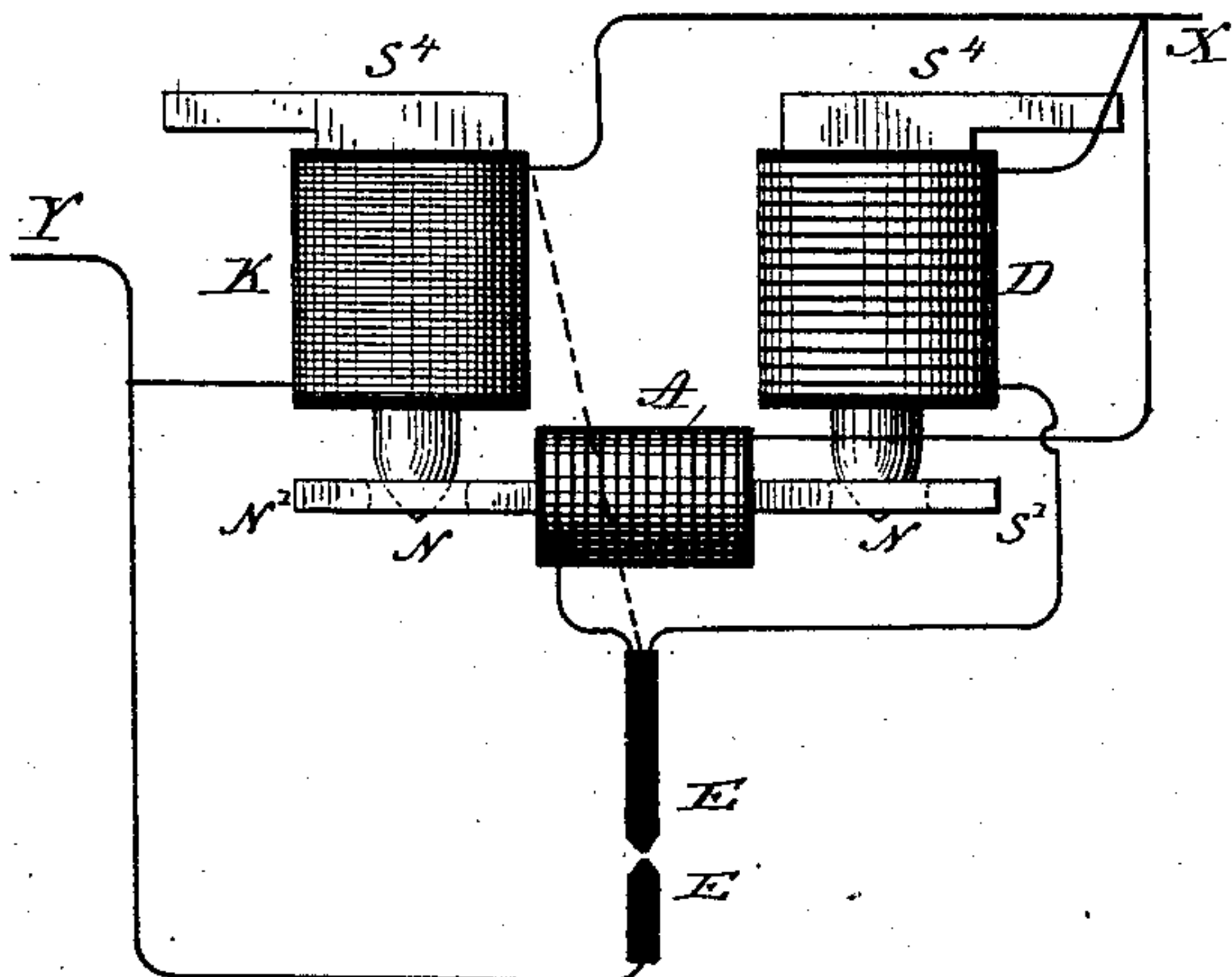


Fig. 4.

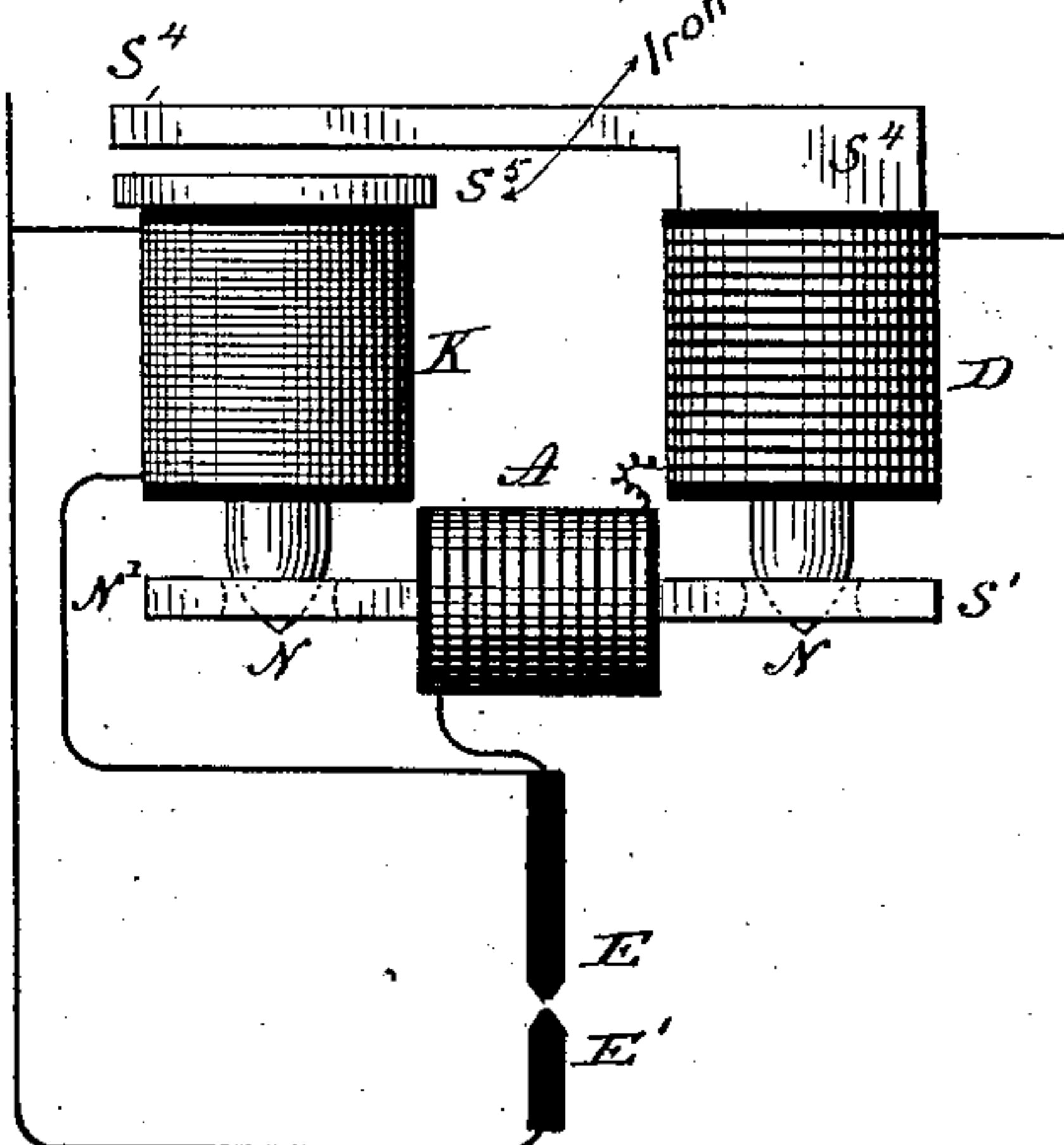


Fig. 6.

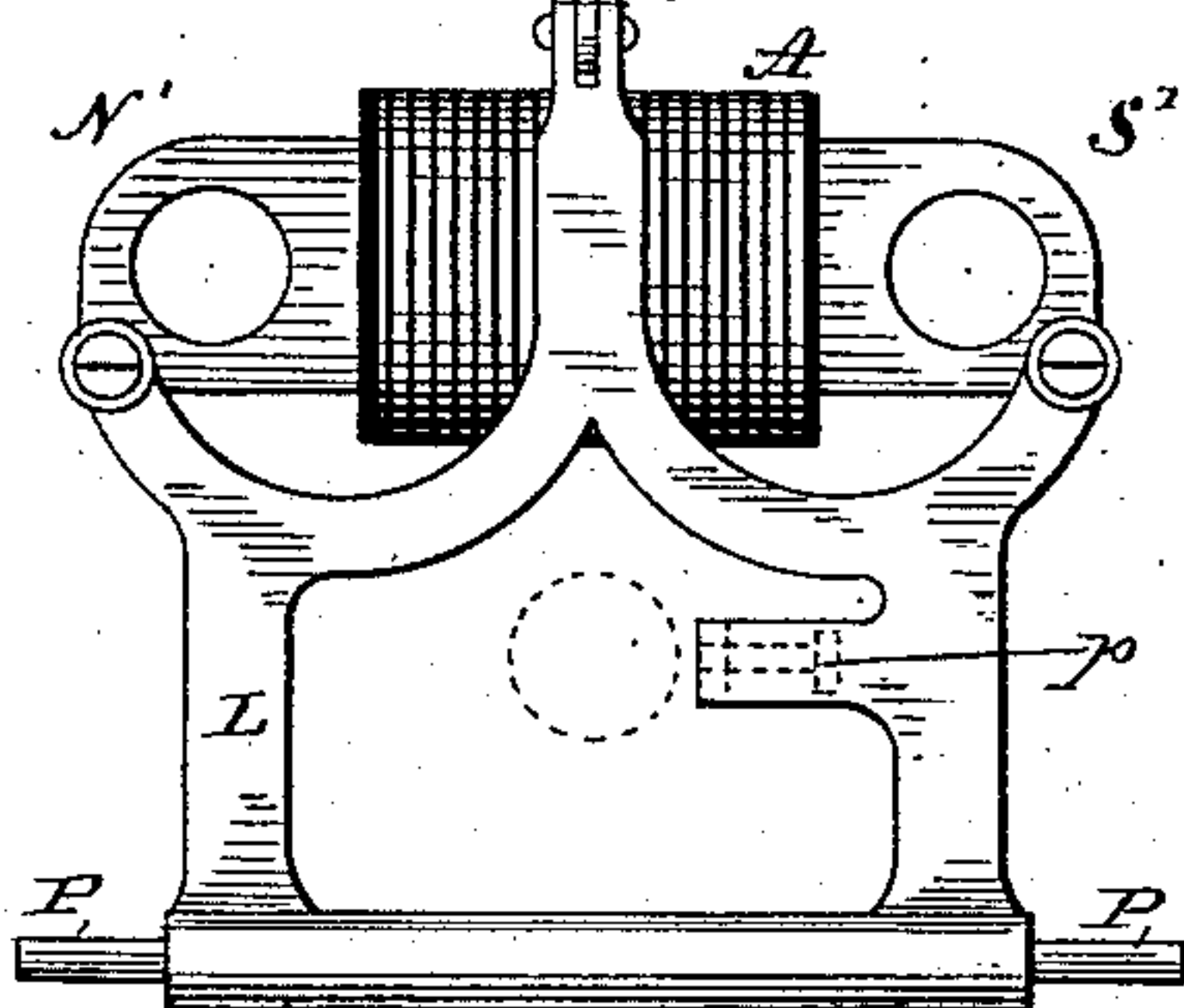


Fig. 7.

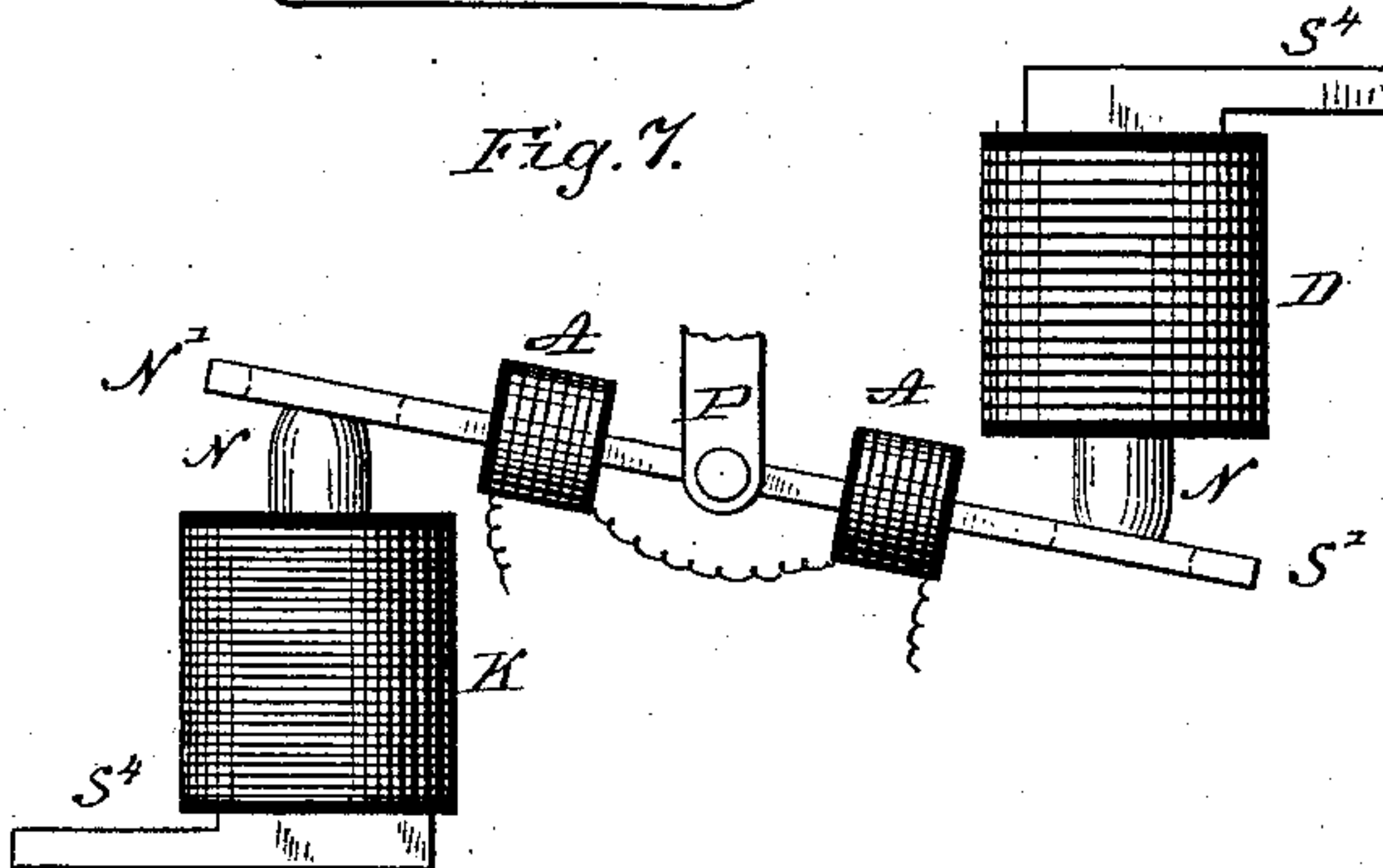


Fig. 8.

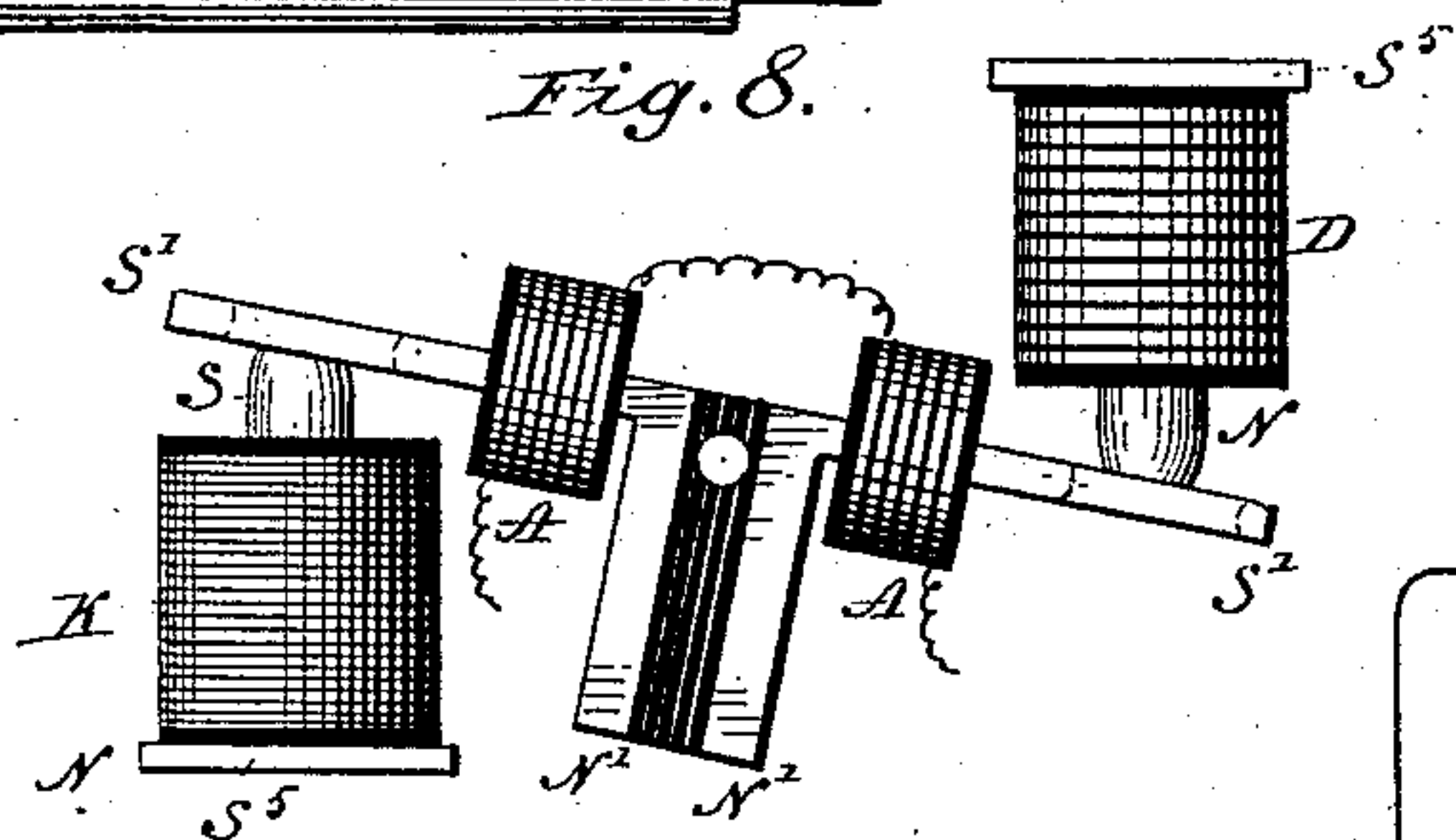
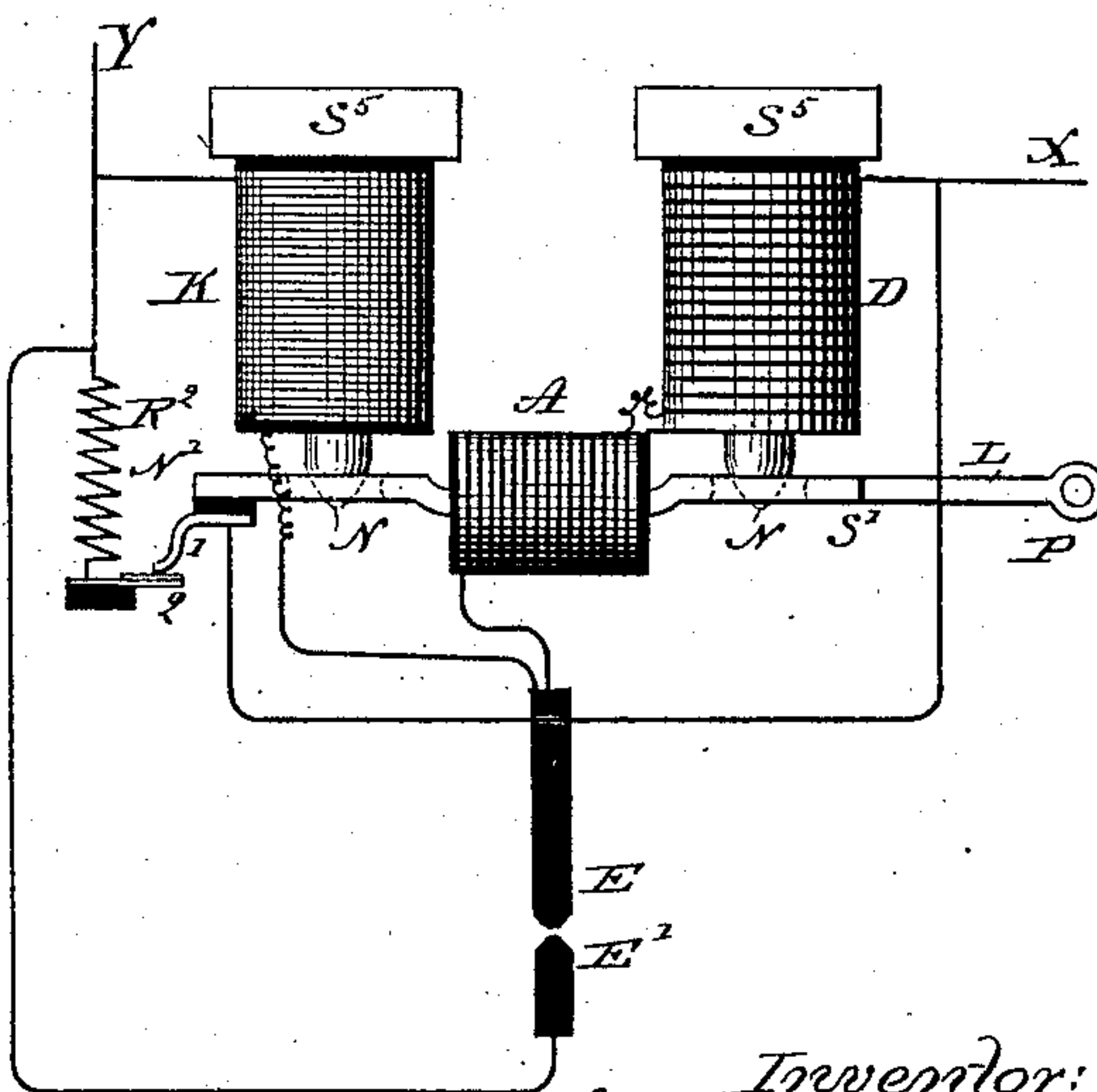


Fig. 10.



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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. 365,553, dated June 28, 1887.

Application filed September 10, 1884. Serial No. 142,704. (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 consists in a novel construction of arc lamps and appurtenances, securing economy of construction and durability.

My invention consists in the details of construction and combinations of parts, that will be specifically enumerated in the claims, after being fully described in connection with the accompanying drawings, in which—

Figure 1 is a vertical section of a lamp embodying my invention, parts being shown in side elevation. Fig. 2 is a front elevation, parts being shown in section. Figs. 3 and 4 are diagrams of connections. Fig. 5 shows the clutch in detail. Fig. 6 is a bottom view of the regulating-armature and supporting-lever. Figs. 7 and 8 illustrate modifications in the construction and arrangement of the armature by which the clutch or other regulating mechanism is operated. Fig. 9 shows the hand shunting-switch in detail. Fig. 10 illustrates the automatic switch indicated in Fig. 1, and connections therefor.

In Figs. 1 and 2, T indicates the top plate of the lamp box or casing, from which plate rises the tube U, serving as a casing for the carbon rod or carrier R, and made in one piece with or attached to the plate. The top plate T, though not shown as one piece, might be made so. I prefer, however, to make it, as shown, with a separate ring, V, fitting around it and constituting its edge. This ring or edge carries the cover or outside cylinder, G. By this construction the cover or casing G may be raised at any time to permit examination of the interior mechanism, while a firm and ornamental edge is given to the cylinder G by the ring V when said cylinder is made, as usual, of sheet-iron or brass. The cover G extends below the plate Q Q of insulating material, and is close to its edges. The plate Q is secured in any desired manner to the lower portion of the frame-work for the lamp.

In the casing so formed is suspended an open frame-work, H F F' F', preferably cast in one

piece, H being a top plate or frame, F' a bottom plate or table, and F F' connecting standards or rods. The top plate H H is made somewhat as a flat plate, though it is sufficient to only have it contain enough metal to form a firm support for the parts hung thereto and permit secure hanging to the top T T. Between the frame H H and top T T a few insulating disks or washers are inserted at intervals.

Secured to the plate H, as shown, is a step-piece bearing the upper bushing, B, for the carbon feed rod or carrier R. The magnets D K are supported from the plate or frame H H in any suitable way. These magnets act upon a common armature, N' S', wound with a coil of wire, A, traversed by a portion or the whole of the main or line current. The magnets D K are separate, and are wound with wire, so that when energized both form poles N N of the same polarity. To insure this, when the plate H is of iron, I hang one of them, as D, directly to the plate and separate the other magnet, K, by a non-magnetic washer, W. Other modifications are shown in succeeding figures. The magnet D is traversed by the whole or part of current of the main line while the magnet K is in a derived circuit about the arc itself. The armature N' S' and coil A are carried upon a lever, L, hung at the pivots P P, these latter being supported in a frame, I I, to secure rigid relations of parts.

The bearings are formed in depending ears from the frame I, and the latter is firmly supported by the frame H F F', through attachment to a cross-piece, F', between the standards F F, as indicated in Fig. 1.

The armature is a perforated armature, and the poles N N of the magnets are paraboloidal or conoidal, as described by me in prior applications. A dash-pot, J, hung as shown, and having its piston-rod connected to an arm of the frame L, is used to check too sudden movements of the lever and armature. The coil A is wound so as to produce at S' a polarity of the opposite name to the pole N of magnet D. Consequently it produces a pole at N' of the same name as N of the magnet K. The lever L raises and lowers a clutch, C, which engages with the carbon rod R, and is constructed as hereinafter more fully described. The bushed

hole B' guides the rod R, and is carried by the plate F' F', which is, as before stated, a part of the general frame containing the mechanism. Beneath the insulating-plate Q, and insulated by said plate from the frame-work of the lamps, is an open frame, M M, with bosses *d d*, into which are fitted the side tubes or bars, *r r*, which are continued downward to the yoke S S, as shown. These parts are supported from the general frame-work by attachment to the lower plate or table, F, in any desired manner. The yoke S carries an insulating-washer, O, and metallic tray *t* above, resting on said washer. The tray is connected to the negative post Y of the lamp by a cable through the left-side bar *r*. The whole frame M M, *r r*, and S S may be cast in one piece, in which case the cable is carried outside of and parallel thereto, as usual in such cases.

E E' indicate the carbon electrodes, and *h* a holder, of any desired kind, for the lower carbon.

The holder *h* is carried on a stem or rod which passes through an enlarged hole in the tray, and is provided at its lower end with a flange or head bearing against the lower surface of said tray. After the lower carbon is brought into alignment with the upper by moving the stem or rod sidewise, the parts are clamped by means of the lever *g*² and operating-screw *g*, said lever resting at one end on the floor of the tray and being arranged to engage beneath a boss, *h'*, on the stem. The tray and washer are firmly secured to the yoke S S by any suitable means. The globe-holder and accessories are omitted, but are usually the same as those of United States Patent No. 303,762. A shunting-switch, X', and handle H² therefor are shown in Fig. 1, and more fully described hereinafter.

Before describing the parts further in detail, the operation of the lamp as thus constituted will be set forth.

The binding-posts X and Y, which are externally covered, as at X, with insulating material, furnish the means for inserting the lamp into an electric circuit. Assuming the switch X' open, the current entering at X passes to the point *a*, Fig. 2, by a wire suitably connected to binding-post X, where it divides, part passing through coil D and part through coil A. That part going through D passes to the frame I by a suitable connection, *b*, and that part going to A passes by a connection, *c*, to the armature. Both the frame I and the armature N' S' being in connection with the rod R, through the general frame-work, the guides B B', the clutch, or other devices, the current passes the arc E E', and to *h t*, and out at Y. One end of the coil of magnet K is in connection with the frame H through a wire, *a*², and its other end is connected to the cable leading to Y. The passage of current in the coils of magnet D and A causes the armature and the poles N S' of magnets D and armature to be attracted toward each other, and thereby the lever L to be raised, which in

turn raises the clutch C, thus lifting the carbon rod R and carbon E to form an arc. The lifting action continues until by the increased current diverted to K in derived circuit around the arc the magnet K N repels the armature at N' with sufficient force to prevent further lift. Further increase repels N' with such force as to cause a feed of the carbon by lowering of the armature, the lever L, and clutch C. During normal separation and burning the magnets D and K manifest the same polarity at their lower poles, N N.

The construction of parts as above set forth gives an insulated outer casing and simple constructions to the working parts. The further advantages secured are neatness of design and lightness.

Fig. 3 shows diagrammatically the practical relation of the magnets and circuits of the lamp, except that the connection indicated in dotted lines, which is the same as was described with relation to Fig. 2, has been altered so as to branch the current at X through K.

The winding of magnets D and K is, as before stated, such that like polarities are produced upon their lower poles, N N. To assist this I sometimes lengthen the magnets by extensions S' S' upward and outward. This adds somewhat to the length of magnet and to its magnetic moment. The pole S' of the armature is of opposite name to the pole N of magnet D, and consequently attracted, while pole N of magnet K is of the same name as pole N' on the armature, and is consequently repelled.

In Fig. 4 the circuits are modified so as to place the coils of D and A in series, while magnet D alone has the extension S' S', a circular washer of iron, S³, being used as a magnetic extension for K. In fact, large circular washers or masses of iron suffice for either or both magnets, and serve to diffuse the poles at the end of the magnet to which they are connected and to help the force of the poles N N. Consequently less current is required to properly energize the magnets D and K, where they are present.

In Fig. 5 the clutch mechanism is shown more in detail. The clutch C is of substantially the construction set forth by me in prior applications and patents, and consists of a clutch-body, hinged jaw, and a stop, *g*³, with spring Z. The stop *g*³ is formed preferably on the bracket B. An extension, C', downward from the clutch-body, is provided, upon which is a collar, *m*, adjustable upon the extension, and capable of being set in any desired position. A small stiff spring, *e*, rests beneath the collar upon a table, consisting of a bent piece, *n*, having an eye, through which the extension C' passes, and a hole fitting the pin *p*, as shown. The pin *p* is carried by an arm or lug projecting from or supported by the lever L or armature. The lower end of the extension C' is slotted for the passage of pin *p*, and a little vertical play is permitted to the pin in the slot. The parts are set so that

when the clutch is raised to lift the rod R the pin *p* shall not strike the upper part of the slot in C'. The arrangement so constituted gives an elastic connection between the lever 5 L and the clutch C of simple construction and easy of adjustment. The elastic connection broadly forms a feature of prior patents. In the arrangement described in this application I have secured adjustability and increased ef- 10 fectiveness.

Fig. 6 is a bottom view of the regulating-armature N'S', attached to L, and bearing the coil A, the whole swinging upon the pivots P P, as shown in other figures.

15 Fig. 7 shows how the construction can be modified. In this instance the armature is swung upon its center, and its ends move in opposite directions, the magnets D and K being placed on opposite sides of the armature.

20 In Fig. 8 the armature itself is shown as divided into two parts, each with extensions N' N', and the polarity of K is reversed, the armature corresponding thereto presenting, however, a like pole, as in the other instances already described. The winding may be easily 25 arranged to suit these cases.

In Fig. 9 the construction of the shunting-switch which I prefer to use is shown. A wire from each post X and Y, Fig. 2, leads to two 30 insulated pieces, X' Y', respectively, one of which, X', is movable as a cam under the projecting end of Y', as shown, and is moved by a handle, H², so as to make contact with Y' when the handle is thrown to the left, and to 35 open contact upon a reversed movement. The parts X' Y' are suitably mounted upon the lower portion, F', of the frame-work of the lamp, or upon other portion thereof, and insulated from one another. The part, as Y', con- 40 nected with the negative binding-post Y of the lamp is insulated from the frame F'. The upper or contact surface of X' is preferably enlarged laterally in a general horizontal plane, so as to give a considerable surface for 45 the collection of any melted metal formed, as will be presently mentioned, and is so arranged that when turned out of contact with Y' it will nevertheless be underneath the contact-surface of the latter. Should such a switch be opened 50 and an arc be formed by accident between X' Y', the only effect is to melt the end of Y', which drops down and forms a metallic contact with X', thus locking the switch firmly until repaired, but not so as to permit damage 55 to any other part of the lamp.

The position in which the switch is placed is seen at X' H², Fig. 1, the handle H² projecting below the case, but not so as to be easily moved by accident. In connection with 60 Fig. 10, which shows an evident modification in the position of the magnets D and K, I show in detail the connections of a very simple automatic switch or cut-out whose connecting-wires are purposely left out of the former 65 figures to save complexity. To the under side of armature N' S' is affixed an insulated contact-piece, 1, connected to the entering wire or

post X. This contact, when the armature is down, falls upon a second contact-piece, 2, fixed 70 in position upon plate F' or other support, and suitably insulated, but connected through a resistance of one fourth or one-half ohm, R², to the terminal Y. Should the carbon fail to feed in the lamp and the armature be so far 75 depressed as to bring 1 and 2 into contact, the circuit will be completed through from X to Y by R². At the start of the lamp, should no carbons exist in the lamp, or no contact exist 80 between the carbons E E', the lamp will be short-circuited through R², and remain so.

I make no claim herein to the special construction of the shunting-switch that is illustrated in Fig. 9, as the same will form the subject of another application for patent.

What I claim as my invention is— 85

1. The combination, with the top or closing plate for an electric lamp, of a detachable ring forming the edge or periphery of said plate and carrying a depending casing or boxing, as 90 and for the purpose described.

2. In an electric lamp, the combination, with the top plate, T, of a ring, V, supported thereby and adapted to be lifted from said plate, and a sheet-metal casing depending from 95 said ring and inclosing the working parts of the lamp, as and for the purpose described.

3. The combination, in an electric lamp, of the top plate, T, carrying the working parts of the lamp, a finishing ring or edge, V, resting on and supported by the edge of the top 100 plate, and the depending casing G, secured to said ring and inclosing the working parts of the lamp, as and for the purpose described.

4. In an electric-arc lamp, the combination, as a magnet system, of a main and a derived 105 circuit magnet and a polarized armature, having its one pole of the opposite sign to the pole of the main-circuit magnet to which it is presented, and its other pole of the same polarity as the pole of the derived-circuit mag- 110 net acting upon it.

5. The combination, substantially as described, of a main-circuit magnet, a derived-circuit magnet, and an armature having poles, one of the same polarity as the derived-circuit 115 magnet, the other of the opposite polarity to the main-circuit magnet.

6. The combination, in a controlling-magnet system, of a main-circuit magnet, a derived-circuit magnet, and polarized armature- 120 poles presented thereto, and polarized by the current on the circuit, as described, so that a pull upon the armature by a main-circuit magnet will be opposed by a force due to the repulsive action of the derived-circuit magnet. 125

7. The combination, in a controlling-magnet system, of main and derived circuit magnets, an armature consisting of a plate of iron presented at one end to the pole of the main-circuit magnet and at the other to a pole of 130 the derived-circuit magnet having the same sign as the pole of the main-circuit magnet, and a polarizing coil of wire wound on said armature, as and for the purpose described.

8. The combination, with the clutch, of a supporting or actuating lever, and an interposed spring communicating motion to the clutch through an adjustable collar, as and for the purpose described.

9. The combination of the clutch having a downward extension, the collar adjustable thereupon, a spring beneath the collar, and a support for the spring encircling the extension and having a pivotal connection with actuating devices.

10. The combination, with the clutch having the slotted extension C', of a supporting-spring, a pivoted platform for said spring, and a pin on the actuating-support, said pin passing through the slot and having free play therein.

11. The combination, with the clutch having the downward extension, of guiding devices upon the lower end of the latter and upon the actuating-lever, and a supporting-spring engaging at one end with the extension

and at the other resting on a pivoted table supported on the actuating-lever.

12. The combination, with the clutch, of the actuating-lever, the support *n*, pivoted on the latter independently of the clutch, and the spring interposed between the clutch and the support *n*.

13. The combination, with the separate main and derived-circuit magnets and their common polarized armature carrying a coil in the derived circuit, of a safety-contact carried by the armature or its lever and a safety circuit-contact in the path thereof, said circuit containing an artificial resistance.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 6th day of September, A. D. 1884.

ELIHU THOMSON.

Witnesses:

W. O. WAKEFIELD,
A. L. ROHRER.