(No Model.) 2 Sheets—Sheet 1.

E. THOMSON.

ELECTRIC LAMP.

No. 283,437. Patented Aug. 21, 1883.

Fig. 1.

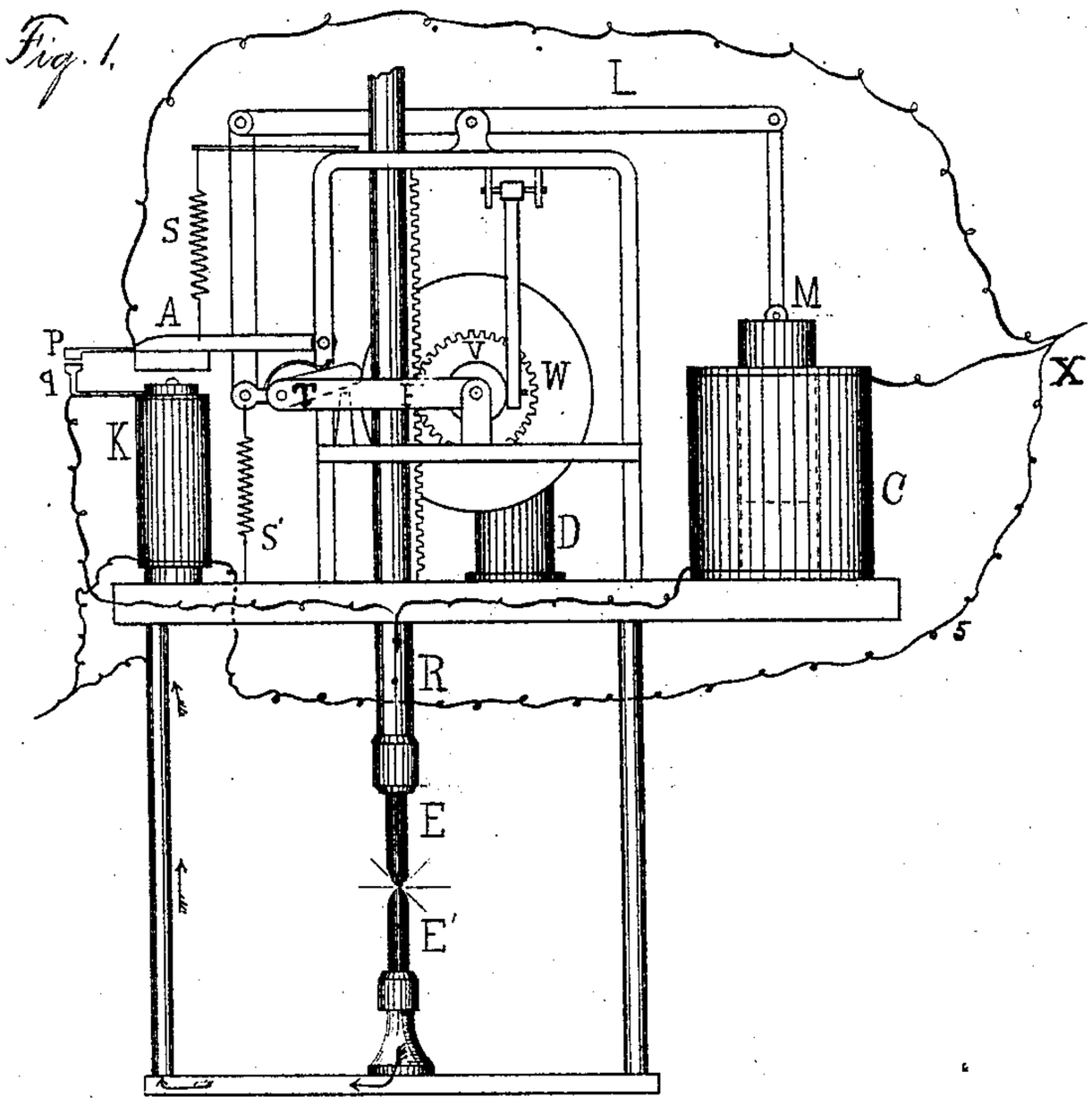


Fig. 2

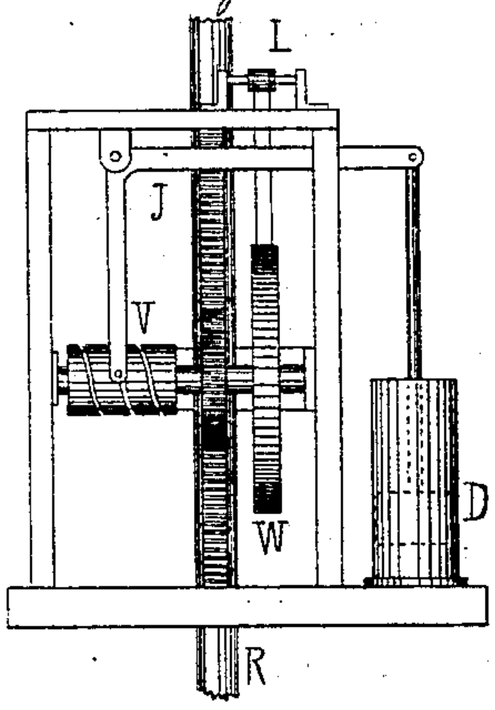


Fig. 3.

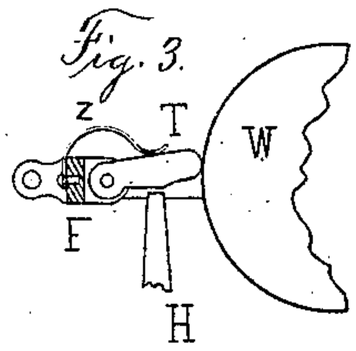


Fig. 4.

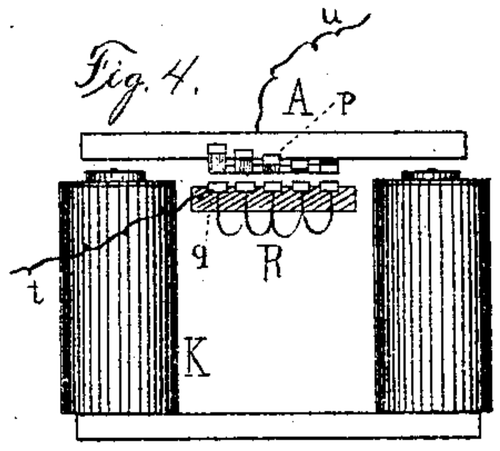
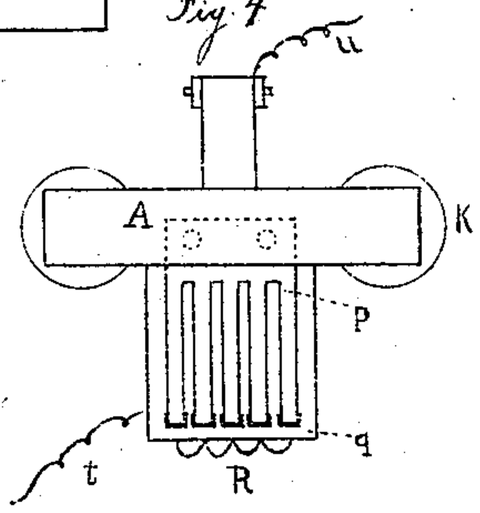


Fig. 4'



Witnesses:
W. B. Thomson
E. W. Rice.

Inventor,
Elihu Thomson.

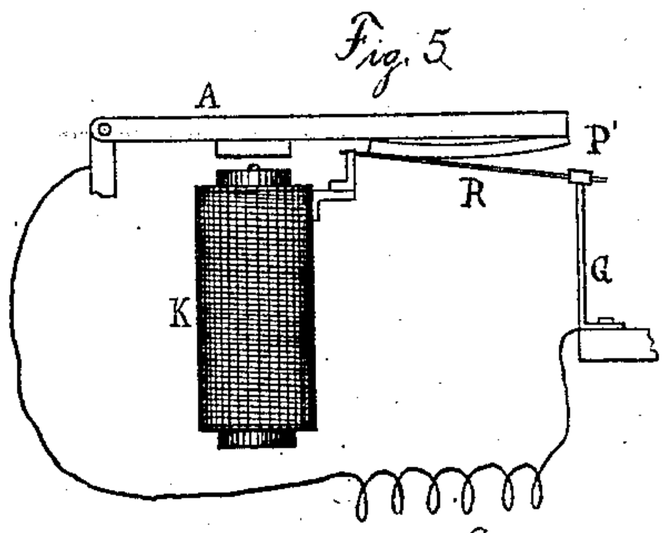
(No Model.) 2 Sheets—Sheet 2.

E. THOMSON.

ELECTRIC LAMP.

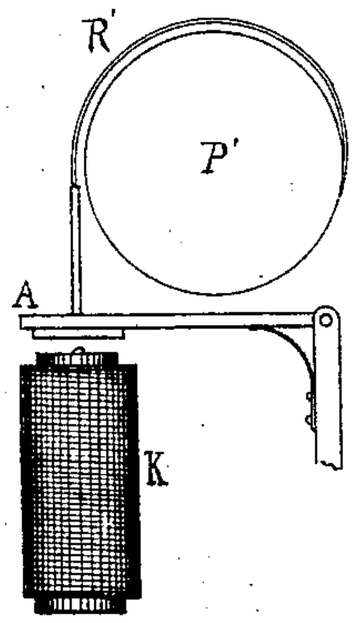
No. 283,437. Patented Aug. 21, 1883.

Fig. 5



C

Fig. 6



Witnesses.
W. B. Thomson.
E. W. Rice.

Inventor.
Elihu Thomson.

UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF NEW BRITAIN, CONNECTICUT, ASSIGNOR TO THE THOMSON-HOUSTON ELECTRIC COMPANY, OF SAME PLACE.

ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 283,437, dated August 21, 1883.

Application filed March 2, 1881. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, residing at New Britain, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Electric Lamps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to improved means of regulating the distance of two carbon pencils apart, when used for producing an arc, and in adapting said distance or arc length to various changes in the circuit in which the arc is operated, and in promoting steadiness of light and constancy of operation.

My invention further consists in a novel combination of devices for effecting a feed, consisting of a derived-circuit magnet, an electro-magnet controlling, in any suitable manner, the feed mechanism of the lamp, and an adjustable resistance controlled or varied by the derived-circuit magnet, in any suitable manner, so as to vary the amount of current flowing in the feed-regulating magnet, in the manner to be hereinafter described.

Figure 1 is a front view of the mechanism of a lamp embodying my improvements; Fig. 2, a side view of the same, only those parts shown which are described in connection with Fig. 2; Fig. 3, a detailed view of a self-locking clutch or toe engaging with a disk, W; Fig. 4, an end view of the shunt-magnet and the variable-contact device to be operated thereby, as hereinafter described; Fig. 4′, a top view of the same. Figs. 5 and 6 show modes of constructing a variable contact or cut-out for the lifting-magnet, operated by the shunt-magnet K.

In Fig. 1, R is a carbon rod, supporting the upper electrode or carbon pencil, E, and racked or otherwise connected, so that in moving downward a rotary motion is given to the disk W, mounted upon a shaft upheld by suitable supports. Centering upon this shaft is a frame, F, serving as a support and guide for a self-locking clutch mechanism, T, which engages upon the edge of the disk W, as shown. The magnet-core M and coil C are so arranged as to impart a motion to the frame F and toe or clutch T, so as to lift the carbon rod when the current is flowing. A spring, S′, may cause a return of said frame F and toe T when the current ceases to pass through the coil C. A shunt-magnet, K, in a derived circuit, 5, around the arc, attracts its armature A against the action of a spring, S, and in so attracting its armature closes a set of contacts, *p q*, which constitute a variable cut-out or short circuit around the lifting-magnet coil C, as shown. The current enters the lamp, passing through the coil C, thence to the upper carbon, E, to the lower carbon, E′, and out through the frame supporting the lower carbon and suitable connections, which are insulated from the body of the lamp, part being diverted through the shunt-magnet K, for the control of the cut-out *p q*. These general circuits are shown in Fig. 1. Upon the shaft of the wheel W, I sometimes place a thread of considerable pitch, V, Fig. 2, and in said thread a projection from one extremity of a lever, J, engages, while the other extremity of said lever is attached to the piston of a dash-pot, D. The dash-pot D thus operates to prevent too rapid rotation of the screw V and wheel W, since any change in the position of said screw or wheel will necessitate a change in the relation of the piston in its cylinder D.

Fig. 3 shows the preferred construction of the clutching device T. It consists of a hinged toe striking the wheel W, slightly above a line joining the centers of the wheel and pivot of said toe T, as shown. The toe T is borne upon the frame F, as aforesaid, and is held in place against the wheel W by a light spring, Z, or its own weight may be sufficient for this purpose. A projection or pillar, H, fixed to the frame of the lamp, is placed so that upon the descent of the toe T and frame F it lifts said toe and releases the wheel W, and the carbon rod moving therewith.

Fig. 4 shows the manner of securing a variable contact, or a contact whose power to divert current from the magnet-coil C is greater as the power of the shunt-magnet is greater. The magnet K, placed in a shunt around the arc, as aforesaid, in attracting its armature A, brings each of a series of contacts, *p*, borne by said armature into successive connection with a similar fixed series. The pieces of

the fixed series are joined electrically by a series of fine wire loops, R, or resistances, and are otherwise insulated from one another. Each of the contacts upon the armature is attached thereto by a light spring, so as not to interfere with the free movement of the parts as the contacts are successively made. When the armature A is attracted to its magnet K, the contacts are closed successively, so as to interpose less and less of the resisting-loops R in the circuit of the contacts, until finally a complete cut-out or contact of no resistance is formed by the closing of the last pair of contact-points.

It will now be convenient to describe the action of the lamp as thus constituted.

When the current flows through the coil C, Fig. 1, the core M is attracted and lifts the frame F, closing the clutch or toe T upon the disk W, which is thereby rotated so as to lift the rod R, and so establish the arc between the electrodes E E'. The separation thus made is retained until by the consumption of the electrodes, the resistance of the arc being increased, a greater portion of the current is diverted through the shunt-magnet K, which now attracts its armature A, closing some of the contact-points at *p q*, thereby diverting a portion of the current from the magnet-coil C. A weakening of the attraction of the coil C upon its armature-core M results in a partial release of the frame F, and consequent approach of the electrode E to E' takes place. By continued consumption of the electrodes and further contacting at *p q*, the magnet-coil C is so far cut out that the toe T, coming in contact with the pillar H, Fig. 3, is opened, and the wheel or disk W is free to move and rod R free to descend. The too sudden descent is checked by the screw V, lever J, and dash-pot D, acting in conjunction, as before described.

It is preferable that during action of the lamp a partial cut-out or partial contacting at *p q* shall at all times exist, and that the effect of said cut-out contacts upon the power of the magnet-coil C shall be due to its variations of resistance only.

Fig. 5 shows a modification of the variable cut-out shown in Fig. 4. C is the lifting-magnet coil; K, the shunt-magnet. The lever A, bearing the shunt-armature, is provided with an arc of metal resting upon a strained wire, R, of high resistance, attached to a support, G, as shown at P'. By the gradual attraction of the armature A the point of contact upon R is shifted so that it is made practically of shorter and shorter length, and the short circuit around C more complete.

Fig. 6 shows a modification in which the wire R', of high resistance, is moved by the armature A of the shunt-magnet K so as to contact upon a metal surface, P', at successive points, and thus provide a variable-resistance contact.

Other adjustable resistance devices controlled by the derived-circuit electro-magnet may be used in place of the one described, for the purpose of producing the varying shunt to the regulating electro-magnet, without departing from the spirit of my invention. One such device is shown in a prior application filed by me December 17, 1880, and consists of a slit spring or comb whose teeth are arranged to make contact successively with a carbon or other resistance-surface, the amount of resistance depending upon the number of teeth that are simultaneously in contact with said surface.

What I claim as my invention is—

1. The combination, with the brake or friction disk W, geared to the carbon-carrier, of the spring or equivalently actuated pivoted friction toe or clutch normally bearing against the outer periphery of the disk, a fixed stop arranged in the path of the friction toe or clutch and mounted on a fixed portion of the frame, and a support for said pivoted clutch connected with the regulating-magnet.

2. The combination, substantially as described, of a controlling electro-magnet in a derived circuit, an electro-magnet in the main circuit for operating the regulating devices, a high-resistance wire forming a portion of a derived circuit around the latter electro-magnet, and contact surfaces and points governed by the controlling electro-magnet, whereby more or less of the length of said high-resistance wire may be interposed in the derived circuit around the main circuit or regulating electro-magnet, substantially as described.

3. In an electric lamp, a controlling-train, a screw, V, and lever J, in combination with a dash-pot, D, as described.

4. The combination, in an electric lamp, of a feed-controlling coil or electro-magnet, a variable or adjustable resistance in a branch circuit around the same for varying the said magnet's power, and a derived-circuit magnet or coil, in a derived circuit around the arc, controlling said resistance.

5. The combination, in an electric lamp, of a feed-regulating magnet, a variable resistance controlling the flow of current in the coils of such magnet, so as by its variations to vary the power thereof, and suitable means independent of said magnet for automatically operating said resistance in accordance with changes in the length of arc, whereby the feed of the carbon may be governed.

6. The combination, in an electric lamp, of a main or principal magnet, a variable resistance in a branch around coils of said magnet, for controlling the flow of current in said coils, and thereby varying the power of the magnet, and means for varying said resistance in accordance with changes in the length of arc.

In testimony whereof I affix my signature in presence of two witnesses.

ELIHU THOMSON.

Witnesses:
G. W. HART,
E. W. RICE.