(No Model.)

E. THOMSON.

ELECTRIC ARC LAMP.

No. 297,198. Patented Apr. 22, 1884.

Fig. 1,

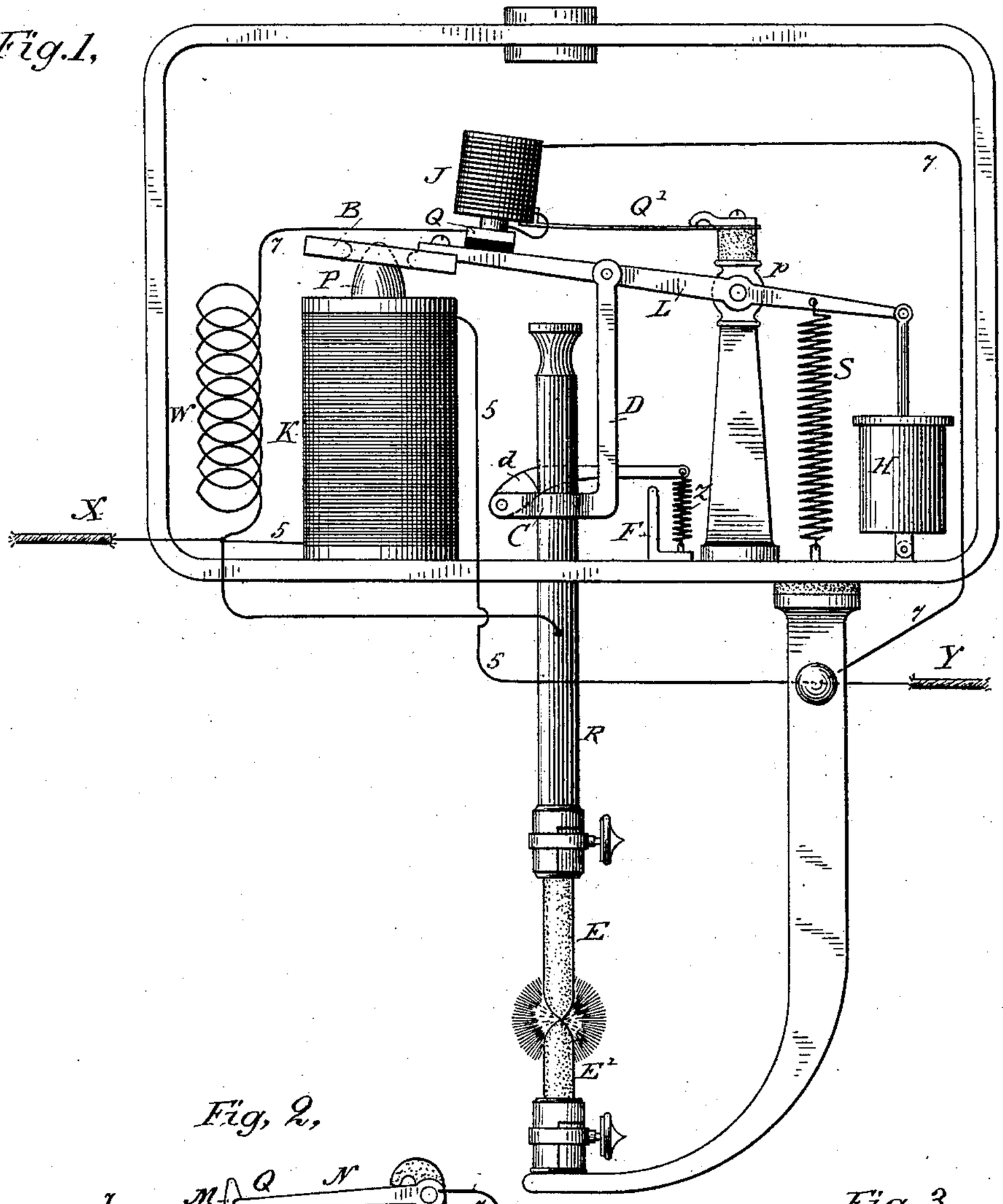


Fig. 2,

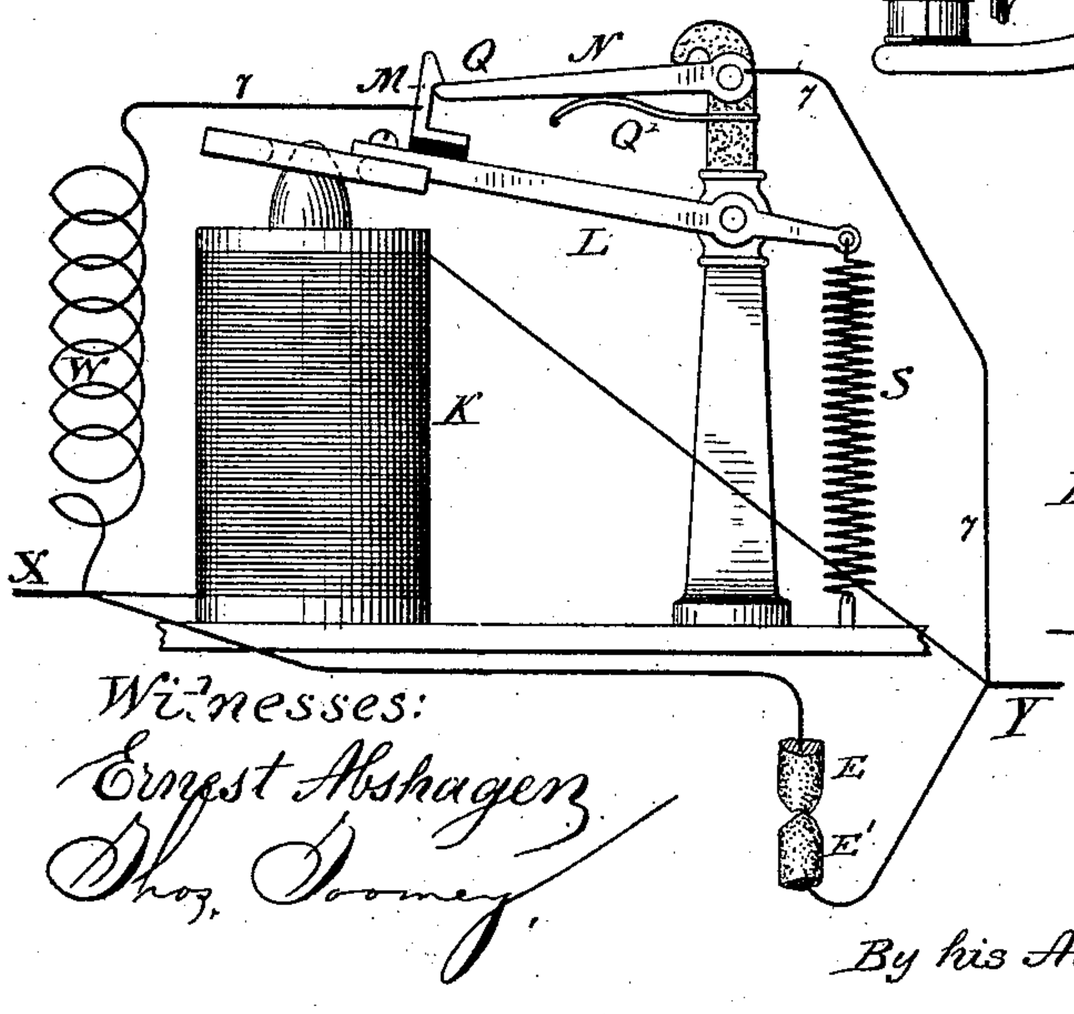
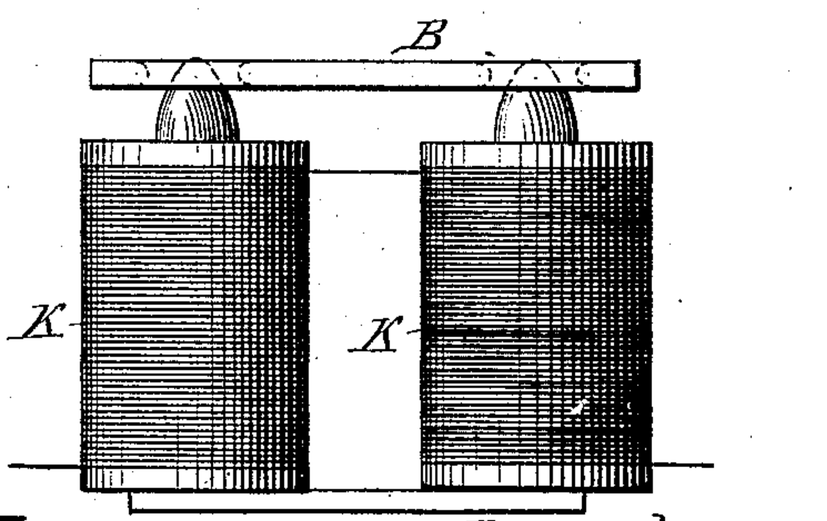


Fig. 3,



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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. 297,198, dated April 22, 1884.

Application filed January 5, 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 present invention relates to electric-arc lamps of the class in which the carbon-adjusting operations are carried on under the control only of current flowing in a high resistance around the carbons and acting in opposition to a retracting-spring or equivalent retractor.

My invention relates more particularly to the particular kind of such lamp described in another application for patent filed by me, in which I have shown how the lamp may be started into action by the employment of an extra resistance in a branch around the high-resistance circuit, or in a branch around the carbons, which resistance acts to force current into the high-resistance derived circuit when the current begins to flow, while said current, by means of suitable devices in said derived circuit, is made to act upon the lamp mechanism and carry it into proper position for releasing the carbon. When this is effected the extra-resistance branch is automatically broken, and the retractor of the regulating mechanism, then asserting itself, lifts the carbons to form the arc, and the carbon-adjusting operation then goes on in the regular way.

My present invention relates more especially to the means for automatically closing the extra branch containing the starting-resistance preparatory to a renewed operation of the lamp, and for automatically breaking said branch when the lamp mechanism has been brought into proper operating position, and assists primarily in combining the switch with the regulator-lever of the lamp or other portion of the regulating mechanism in such way that the branch will be closed directly by the movement of said mechanism to an extreme retracted position.

My invention consists, also, in the combination, with the switch, of a magnet adapted to hold the contacts closed and to move with said switch and the lamp mechanism, so as to preserve the circuit containing the starting-resistance until the lamp mechanism or regulating-lever has been moved forward to the proper position by the action of the current forced into the derived circuit by means of said resistance.

My invention consists, also, in using, as a magnet for the above purpose, an electro-magnet whose coils are in the extra branch around the carbons, so that the closing of the carbon-circuit will de-energize said magnet and permit the switch to open the extra branch.

I have shown my present invention applied to a simple form of feed-regulating mechanism, in which a feed-regulating lever is under the joint control of a high-resistance derived-circuit magnet and a suitable retracting-spring or weight acting on said lever in opposition to the magnet, and I have made the magnet itself the device which, when energized by the current forced into the derived circuit by the extra resistance, will act upon the regulating mechanism so as to put the same into operating position; but in these particulars my invention may be varied and the combinations herein described for controlling the switch may be applied to other constructions and arrangements operating upon the general principles herein described, and specified in the claims.

In the accompanying drawings, Figure 1 is an elevation of a lamp embodying my invention. Fig. 2 shows another device that may be employed for operating the switch directly from the feed-regulating lever or other portion of the lamp mechanism moving therewith. Fig. 3 shows a form of magnet that may be employed.

Referring to Fig. 1, R indicates the ordinary carbon-holder for the upper or positive carbon of an electric-arc lamp, and E E′, respectively, the positive and negative carbons.

L indicates a feed-regulating lever, pivoted at *p*, and acted upon by the opposing influences of a retractor, S, and of current flowing in a high-resistance derived circuit around the carbons. The influence of such current is brought to bear in the present case, in the ordinary way, by means of a high-resistance magnet, K, whose coils are in the ordinary

high-resistance shunt around the carbons indicated by the numeral 5, which magnet acts upon a core or armature connected to L.

P is the pole of the magnet, and B a perforated armature attached to L, and embracing the conoidal or paraboloidal pole P. This form is adopted in order that the magnet may exert the same pull upon the lever L in all positions of the armature for the same strength of current.

The magnet K is preferably a horseshoe-magnet, as indicated in Fig. 3. It is, however, to be understood that my invention is not limited to any particular form or construction of the magnet system.

Lever L is the feed regulating or controlling lever of the lamp, and serves to adjust the position of the carbons by acting directly or indirectly upon any suitable devices that will, when moved in one direction, raise the upper carbon, and when moved in the other direction to a certain extent will permit the carbon to feed or approach the opposite carbon. As typical of such devices, I have herein shown a clamp or clutch connected with lever L by a link, D, so as to be raised or lowered by said lever or held stationary, according to the relative strength of the current in the high-resistance-regulating circuit 5 and the strength of the retractor for the lever. Any other device or devices may be used in place of the clutch, provided they be of proper construction to cause a release of the carbon when moved in one direction, and to lift the carbon when moved in the opposite direction. The clutch here shown is of the form heretofore invented by me, and consisting, briefly speaking, of a clamp body or guide, C, through which the carbon-carrier may move, a dog or toe, *d*, pivoted on said body and held normally in engagement with the carbon or carrier by means of a spring, Z, applied to an arm extending from the toe, so as to prevent the carbon from moving downward through the clutch, and a stop, F, with which the arm engages to release the toe and permit the carbon to feed downward whenever the clamp is lowered to a sufficient extent by the regulating-lever or other device, L.

W indicates the artificial or starting resistance of my invention, which is placed in a branch, 7, around the carbons at starting of the lamp, and whose office is to force an abnormal current into the derived-circuit branch 5, so that the magnet K or other device in said branch may act upon the lever L or other portion of the feed-regulating mechanism, and in such way as to lower the clutch or clamp into the position where it will produce a feed of the carbons. The resistance W is preferably greater than the normal arc, and its circuit is closed at the start through contacts Q of a switch, Q′, consisting of a spring or a spring-actuated arm mounted on an insulated support, but capable at its end of moving down with lever L. One of the contacts is carried by Q′, and the other by the lever L, and the parts are so arranged that when the lever is retracted to its extreme position the contacts Q will be closed. A magnet, J, is mounted in Q′, and by attaching itself to an armature on L, when the contacts are brought together, preserves the contact by compelling the switch to move down with the lever until released by any suitable means. In the present method the magnet J is an electro-magnet whose coils are in the circuit 7, containing resistance W, and, as will be obvious, it will release its hold of its armature when current is shunted from it by the establishment of the circuit through the carbons. The contacts Q are shown as formed by the core of J and its armature, although this obviously is not necessary, and said contacts might be formed at some other part. It is also obvious that the magnet and the armature might be transposed. The stress of the spring-switch Q′ tends to hold it raised out of the way of the contact carried by lever L during movements of the latter in the range required in governing the feed of the carbons. When the lamp ceases to act and current ceases to flow, the retractor S carries the lever L back to a position where the contacts Q will be closed, ready for a renewed operation. The action is briefly as follows: When the lamp is out of action, the parts are in the position shown, and circuit 7 is established through contacts Q. The carbons are separated or in light contact, owing to the fact that the clutch or clamp is held up by the retractor S. When current is turned on, the resistance W forces current into K, and the magnet draws down lever L, the latter carrying with it the switch, whose contacts Q are kept together by the magnet J. This movement continues until the feed mechanism is carried down to a point where the upper carbon will be released, and will thereupon come into contact with the lower carbon, thus shunting the current from the magnet J, which thereupon loosens its hold on its armature, and permits the spring-switch to open contacts Q, and at the same time to recede out of the range of the lever L during the succeeding operations. The flow of current in the derived circuit having been by these actions lessened, and the circuits being now the ordinary or normal ones, the retractor S now asserts itself and raises the upper carbon, thus forming the arc. The lamp now operates and continues to operate under the control of magnet K, the latter acting to produce a feed whenever the current in K becomes sufficiently strong to pull down the clutch against the stop, and thus release the rod R.

In Fig. 2 I have shown a mechanical device that may operate in conjunction with the lever L or other part moving therewith, so as to produce the proper changes in the circuits. This device is shown in an application for patent filed by E. W. Rice and myself as joint inventors January 3, 1884, No. 116,300. In this instance contacts Q are closed by means of an insulated catch, M, on the lever L, which catch engages with lever N, when L is re-

tracted to its extreme position, owing to the withdrawal of current from the line. The circuit 7 is thus established, and when current is turned on produces, as before, an abnormal flow of current in K and a lowering of the clamp. In the forward movement of L in this operation, the catch M remains engaged with N, thus keeping the contacts Q closed, until by the movement of the end of N inward on the arc of a circle, the engaging parts are released, whereupon the circuit 7 is opened, and the switch N is thrown back by its retractor out of range of the catch M, and the contact carried thereby in the normal or usual movement of L in controlling the position of the carbons. The disengagement of the parts and the opening of the contacts are suitably timed to take place when lever L and the feed mechanism have been lowered to such a point that the carbons may come together. A suitable stop controls the backward movement of the switch-lever N and retains it in such position that when the lever L is withdrawn to its extreme position by the action of its retractor S, the catch M may again automatically engage with N, and at the same time close the starting-circuit 7, ready for the next operation.

Many other modifications may be made in the form and disposition of the parts without departing from the invention.

The employment of an artificial resistance in a branch around the arc for the purpose of forcing current into the feed-magnet coil at the start forms the subject of an application for patent filed by me January 5, 1884, No. 116,512.

What I claim as my invention is—

1. The combination, in an electric lamp, of a high-resistance derived-circuit magnet and retractor therefor, feed-regulating mechanism controlled thereby, a resistance in a branch around the carbons, and a circuit-controller actuated by the regulating-lever, as and for the purpose described.

2. In an electric lamp, the combination of a high-resistance derived-circuit magnet, a feed-regulating lever controlled thereby, a resistance in a second branch around the carbons, a circuit-controller that closes said branch when the lever is in an extreme retracted position, and means for keeping said branch closed while the lever is moving from such position to its proper position for permitting a release of the carbons.

3. The combination, in an electric lamp, of a high-resistance derived-circuit magnet, a feed-regulating mechanism controlled thereby, a resistance branch around the carbons closed by the regulating-lever when retracted to an extreme position, and a magnet in said branch for keeping the branch closed until contact of the carbons is effected.

4. The combination, in an electric lamp, of a high-resistance feed-regulating magnet in a derived circuit around the carbons, a resistance in a second branch around the carbons, a spring-retracted circuit-closer for said branch that closes the branch when the feed mechanism is retracted to an abnormal extent, and a magnet in the branch and mounted on said circuit-closer for compelling the circuit-closer to move with the lever and keep the branch closed during forward movement of the lever.

5. The combination, in an electric-arc lamp having a derived circuit of high resistance carrying the regulating-current, of an extra branch containing a resistance, means in the regulating derived circuit for bringing the lamp mechanism into operative position under the action of current forced into said circuit by the presence of the resistance in the extra branch, a circuit-controller for said branch arranged in the path of the regulator-lever or other portion of the lamp mechanism moving therewith, and a magnet adapted to move with the circuit-closing points for preserving the extra branch during forward movement of the lever from the extreme retracted position.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 1st day of January, A. D. 1884.

ELIHU THOMSON.

Witnesses:
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