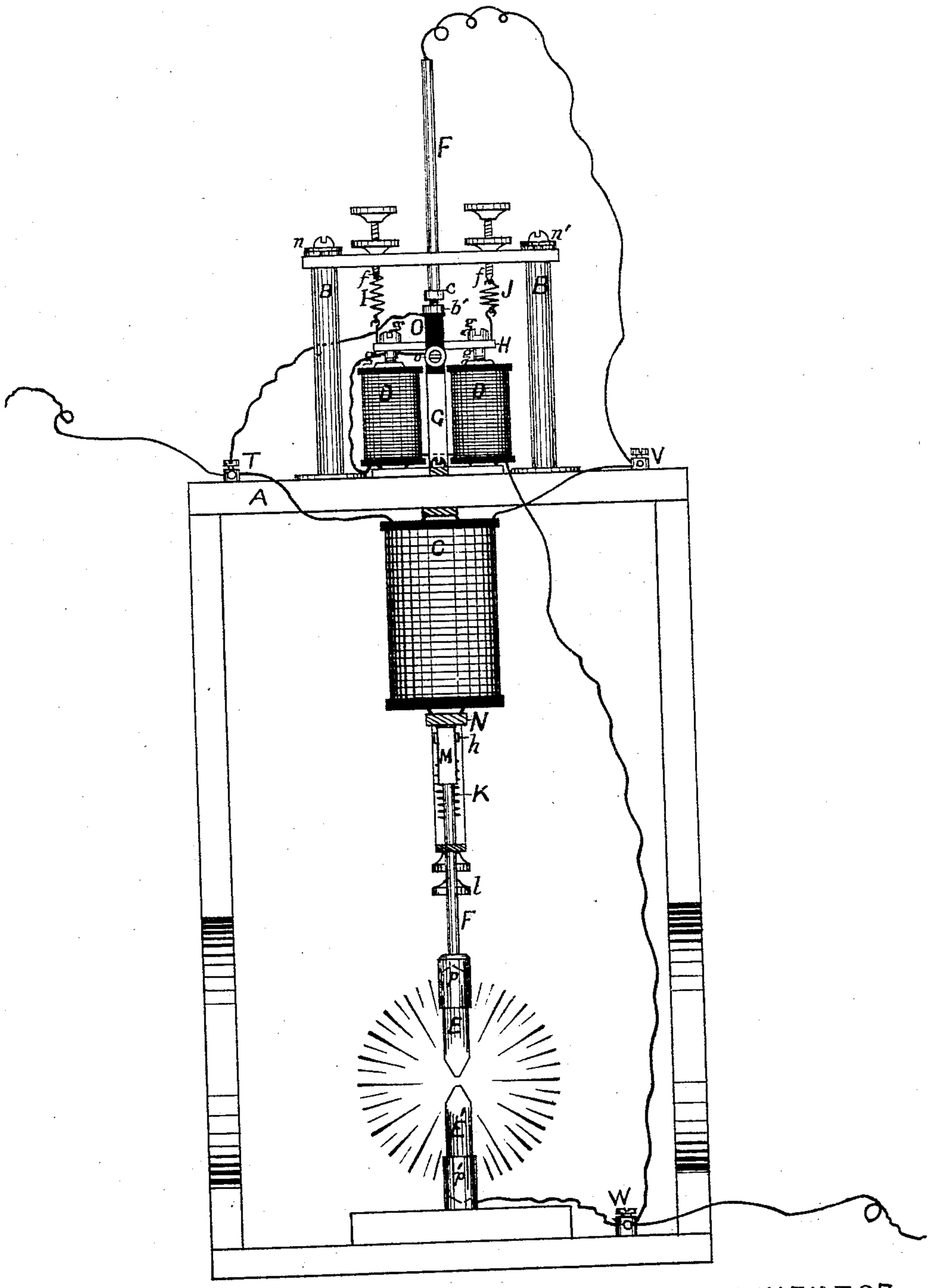
3 Sheets—Sheet 1

M. G. KELLOGG.

Electric Light Regulator.

No. 229,536. Patented July 6, 1880.



WITNESSES

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Calvin DeWolf

INVENTOR

Miles G. Kellogg

3 Sheets—Sheet 2.

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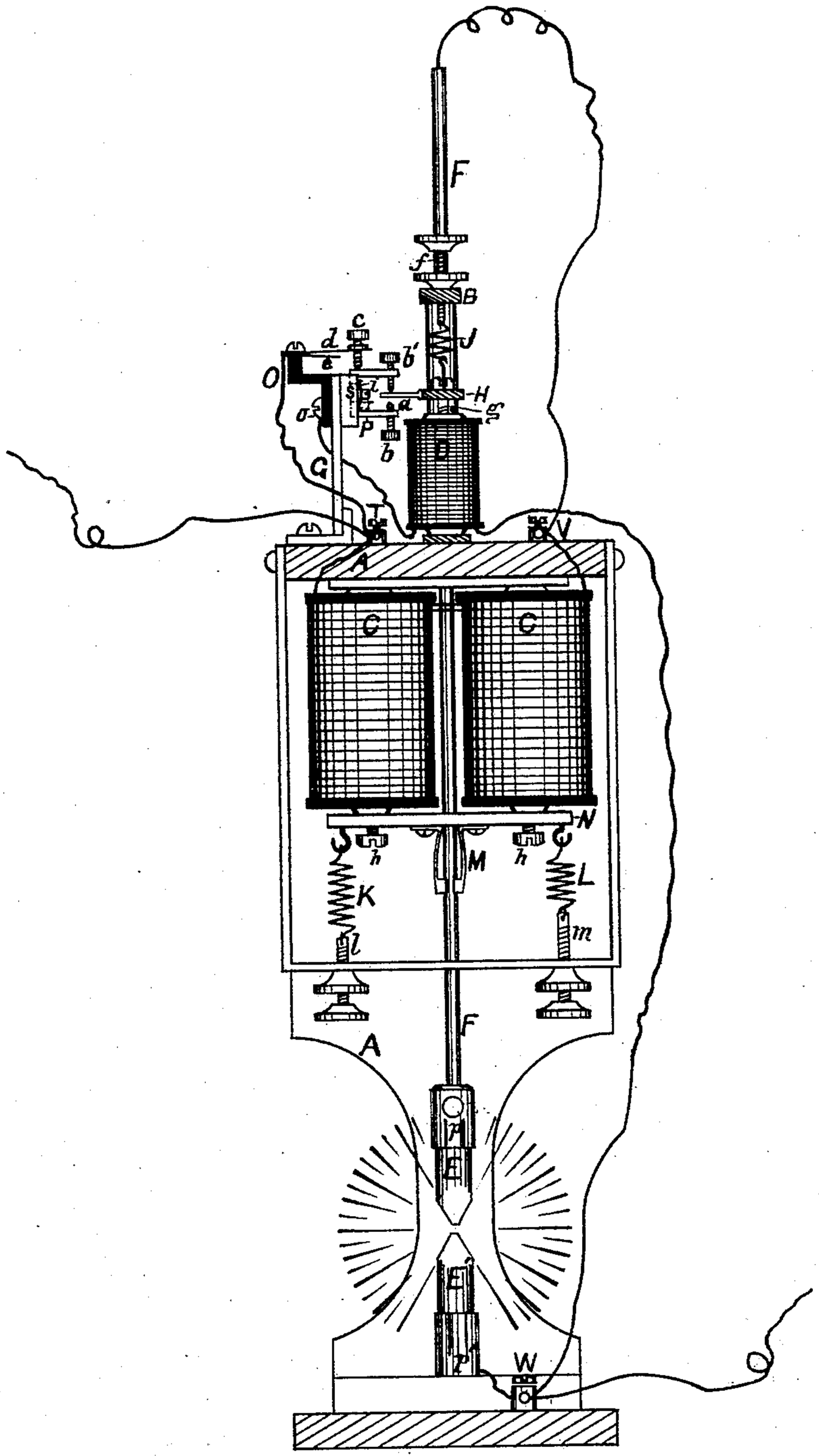

WITNESSES

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3 Sheets—Sheet 3.

M. G. KELLOGG.

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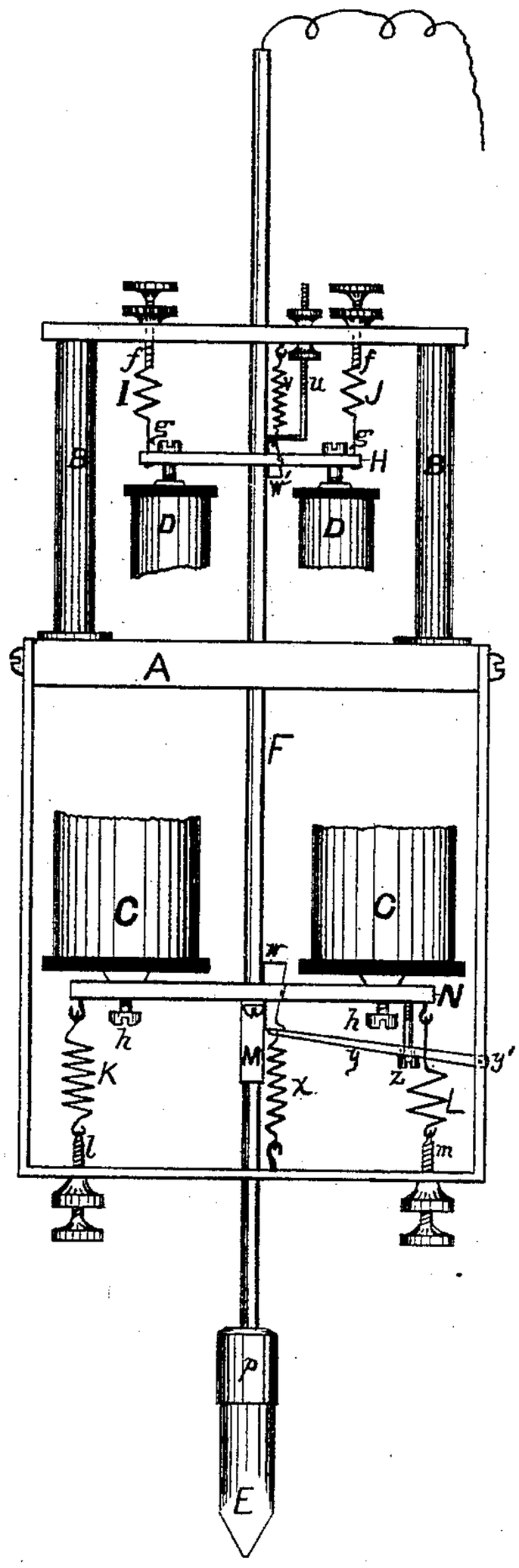

WITNESSES.

Wallace L. DeWolf.

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INVENTOR.

Milo G. Kellogg

UNITED STATES PATENT OFFICE.

MILO G. KELLOGG, OF HYDE PARK, ILLINOIS.

ELECTRIC-LIGHT REGULATOR.

SPECIFICATION forming part of Letters Patent No. 229,536, dated July 6, 1880.

Application filed November 20, 1879.

To all whom it may concern:

Be it known that I, MILO G. KELLOGG, of Hyde Park, Cook county, Illinois, have invented certain new and useful Improvements in Electric-Light Regulators; and I do hereby declare the following to be a full, clear, concise, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to electric-light regulators; and it consists of the devices and appliances, hereinafter set forth, whereby the carbon-points usually employed in electric lights are automatically kept in such position and relation to each other that a continuous steady light is maintained.

In the drawings, Plate I represents a front, and Plate II a side, view of my electric-light regulator. Plate III shows side views of both electro-magnets, and represents modified arrangements for clamping and releasing the rod to which one of the carbons is attached.

C C is an electro-magnet of small resistance, placed in the circuit of the carbon points E E′, and of an electric generator of suitable character connected by proper arrangement of wires.

The poles of the electro-magnets C C are faced with copper or other non-magnetic material, so that the iron armature N cannot come in actual contact with the poles of the magnet.

h h are two brass screws screwed into the poles of the electro-magnet C C through the iron armature N.

E E′ are pieces of carbon. *p p′* are metal carbon-holders, and F a metal rod, which carries the carbon-holder *p*.

W, V, and T are binding-posts. N is the iron armature of the electro-magnet C C. In this armature are two holes, somewhat larger than the body of the screws *h h*, and through which they pass. There is also a hole in the armature N, through which the rod F passes. This hole in the armature N fits so closely around the rod F that when the armature N assumes a position out of perpendicular to rod F it clamps the rod, and yet the hole is sufficiently large so that when the armature is at right angles to the rod the rod can be moved freely through the hole in the armature.

A pair of springs, M, are attached to the armature, and so adjusted that they press constantly against the rod F with sufficient force to easily sustain its weight when loaded with the carbon point. This force is entirely frictional. The rod is not rigidly clamped by the springs, and hence may be readily moved from time to time, as desired.

K L are two springs of unequal tension, acting on the armature N.

l m are adjusting-screws screwed into the frame, as shown, and are used in adjusting the tension of the springs K L.

D is an electro-magnet of high resistance, placed in the circuit of a shunt to the voltaic arc. Its poles are faced with copper or other non-magnetic material, so as to prevent the armature from coming in actual contact with the poles of the magnet.

g g (shown in Plate I) are two brass screws screwed into the poles of the electro-magnet D D through armature H.

H is the iron armature of the electro-magnet D. In this armature are two holes, somewhat larger than the body of the screws *g g*, and through which they pass. There is also a hole in the armature H, through which the rod F passes. The rod F fits so closely into this hole of the armature H that when the armature assumes a position out of perpendicular to rod F it clamps the rod, and yet the hole is sufficiently large so that when the armature H is at right angles to the rod F the rod can be moved freely through the hole of the armature.

I J, Plate I, are two springs of unequal tension, acting on the armature H. *f f* are two adjusting-screws screwed through the frame to vary the tension of the springs I J. *a* is a rigid bar extending from the armature H.

G is a metal standard. O is a piece of vulcanite or other non-conductor fastened to the standard G by screw *o*.

P is a metal piece fitted to a groove in G, so that it can be moved up and down.

i is a screw which passes through the spring *r* and a slot in P, and is screwed into the metal piece G.

r is a spring held in place by the head of the screw *i*, so as to press against P with sufficient force to hold P where placed, against the force of gravity.

b b' are stop-screws pointed with vulcanite or other non-conductor and screwed into P. *d* is a flat spring. *e* is a rigid stop for spring *d*. *c* is a platinum-pointed screw screwed into the spring *d*.

The electric circuits are as represented in the drawings. The main current passes from the electric generator along the wire through binding-post W, the voltaic arc, the rod F, and flexible wire, to binding-post V; thence by the wire through magnets C C to binding-post T, and thence along the wire to the generator. The current which shunts the voltaic arc goes from binding-post W, thence along the wires through magnets D D, and along the wire to screw *o*, through screw *o*, frame G, metal piece P, screw *c*, spring *d*, along wire to binding-post T.

When there is no current passing through the circuit of the lamp or regulator the armature H, drawn back by springs I J, rests against the heads of the screws *g g*, Plate I, and the bar *a*, striking the point of the screw *b'*, Plate II, carries the piece P, so that it strikes the point of the screw *c*, thus completing the circuit of the shunt. The armature N is also drawn away from the poles of the electro-magnet C C by the springs K L, until the points of the carbon E E' touch each other.

As soon as the current from the generator passes through the regulator the armature N is attracted toward the poles of the electro-magnet C C, and on account of the unequal tension of the springs K L, Plate II, the armature N, as it moves toward the poles of the electro-magnet, takes a position out of perpendicular to the rod F, and clamps and carries the rod F with it, thus separating the carbon points E E' and establishing the voltaic arc. When the armature N comes against the poles of the electro-magnet it takes a position at right angles to the rod F, and releases its clamp on the rod F, which is then held in position against the force of gravity acting on it by the clutch of the springs M. The clutch of the springs M on the rod F and the clamp established by the armature on account of the unequal tension of the springs K L must be firm enough to overcome the weight and inertia of the rod F, and the force with which the armature is drawn toward the poles of the magnet must be great enough to overcome the weight of the rod and the tension of the springs K L.

It is well known that when an electric current has two channels for its passage it will divide itself between them, the relative amount of the current in the two channels being inversely as their resistance.

Now as the carbon points in my regulator burn away the resistance of the arc gradually increases, and consequently the amount of current which passes through the electro-magnet D gradually increases. Hence the attraction between the poles of the electro-magnet D and its armature H gradually becomes stronger. When this attraction becomes strong enough to overcome the tension of the springs I J the armature H approaches the poles of the electro-magnet D. On account of the unequal tension of the springs I J the armature H, as it is attracted toward the poles of the electro-magnet D, assumes a position out of perpendicular to rod F, and, clamping the rod, carries it down with it, notwithstanding the friction of the clutch-springs M, and thus brings the points of carbon E E' nearer together. As the armature H is attracted down, as before described, the bar *a*, moving with it, strikes the point of the screw *b*, and causes the piece P to move so as to disconnect P from the point of the screw *c*. By this means the shunt-circuit in which is the electro-magnet D is broken, and the electro-magnet D loses its magnetism. The springs I J immediately bring the armature H to a position at right angles to the rod F, thus releasing the clamp on the rod, which, being still held by clutch-springs M, remains where placed by the downward movement of the armature.

The armature H is then brought back by the springs I J to its original position against the heads of the screws *g g*, leaving the rod where placed by the downward movement of the armature. By the same movement the bar *a* is carried back by the armature, and, striking the head of the screw *b'*, raises P, so that electrical contact is again formed between P and the point of the screw *c*. The rod F remaining where placed by the downward movement of the armature H, and the distance between the carbon points E E', and consequently the amount of current in the shunt-circuit, having been decreased, the armature H will for a time remain against the heads of the screws *g g*, Plate I. As the points of the carbons again burn away the current through the shunt will gradually become stronger, until it is sufficient to again attract the armature down, and thus push the rod farther down and bring the points of carbons nearer each other.

By a continuance of the action above described the points of carbon will always be kept within proper distance of each other as the carbons are consumed. The length of the arc can be adjusted by varying the tension of the springs I J.

The length of the motion of the armature H, and consequently the distance which the rod F can be forced down by each movement of the armature, may be regulated by adjusting the screws *b* and *b'*.

The screws *h h* must be long enough to allow the carbon points E E' to meet whenever, on account of interruption of the main current, the armature N is brought down by the tension of the springs K L. The machine must be so adjusted that while the current is

on there will always be a sufficient direct current to hold the armature N against the poles of the electro-magnet C.

I do not limit myself to the device above described for clamping the rod F by means of the unequal tension of the springs attached to the armature as the only one. Plate III represents another of my methods for clamping the rod F by means of wedges which fit in between the armatures and rod F.

v represents a spring attached to the frame and wedge *w'*, the wedge being inserted in the armature H. *u* is a stop for the wedge *w'*.

Now when the current in the shunt-circuit is sufficient to attract the armature H toward the poles of the electro-magnet the armature, moving downward, presses against the wedge *w'*, thus clamping the rod F and carrying the rod downward, notwithstanding the friction of the clutch-springs M. When the circuit of the shunt is broken and the armature begins to move back toward the heads of the screws *g g* the clamp on the rod F, created by the armature and wedges, is removed, and the rod remains where placed by the downward movement of the armature. The spring *v* carries the wedge *w'* back with the armature, and the stop *u*, coming in contact with the wedge *w'*, prevents the wedge from clamping the rod F while the armature H remains against the heads of the screws *g g*. After the rod is thus free the springs M hold the rod where placed against the force of gravity.

The device for clamping rod F by means of wedges and carrying it upward with the armature, so as to create the voltaic arc, is substantially the same as the method just described.

Let *w*, Plate III, represent the wedge; *x* the spring, to which it is attached, and *z* a screw, screwed into armature N, with lever *y* pivoted at *y'*. In lever *y* is a slot through which screw *z* passes.

When the current in the main circuit is sufficient to attract the armature N toward the poles of the electro-magnet C the armature N, moving upward, presses against the wedge *w*, thus clamping rod F and carrying it upward. The lever *y* is also carried upward by the armature by the head of screw *z*, and is so adjusted that just before the armature N comes against the poles of the magnet C the end of the lever *y* strikes the lower end of the wedge *w*, and as the armature comes against the poles of the magnet the wedge *w* is raised by the end of the lever *y*, and the clamp on rod F is thus released and the rod is then held where placed by springs M against the force of gravity acting on it.

The method heretofore described for clamping rod F and carrying it upward so as to create the voltaic arc may also be modified, and the carbon points may be separated by placing the electro-magnets C C below the arc and attaching the lower carbon-holder, *p'*, or rod to which it may be attached, holding carbon E' to the armature. In that case the armature would be situated above the electro-magnets, and when the current was not passing would be held by springs away from the poles of the electro-magnet, in the same manner as described above for electro-magnet C and armature N, and springs similar to M, to hold up rod F against force of gravity, can be attached to the frame-work. When the current passes from the generator the armature, attracted toward the poles of the magnet, will carry the carbon point E' downward, and thus create the voltaic arc, while the shunt-circuit will continue to push the rod F downward as the carbon is consumed, as before described.

By the construction of my regulator, as described above, the voltaic arc will be automatically established and maintained during the continuance of the current, and on the interruption of the current the parts will automatically place themselves so that the operation will be repeated when the current is again established. My regulator is therefore automatic in all its actions.

It is well known that in most forms of electric-light regulators it is impracticable to have more than one regulator at a time in the circuit of the generator. This is due to the fact that in most forms of lamps the feeding of the carbons is determined by the amount of current which passes from the generator, and this amount of current is regulated by the amount of resistance in the voltaic arc or arcs in the circuit. Therefore, in case several lamps are in the circuit, the one which is adjusted to feed with the least diminution of current will feed first and continue to feed until its points come together and the light goes out. Of the remaining lights, the one which feeds with the least diminution of current will soon go out, and this will continue until only one light will be left, and this last one will continue to feed as the carbons are consumed.

In my lamp, however, when the current begins the armature N is drawn up, carrying with it the rod F, thus separating the carbons and establishing the voltaic arc. As the armature is arrested by coming against the poles of the magnet it assumes a position at right angles to the rod, and thereafter, during the continuance of the current, remains passive, resting against the poles of its magnet. As the carbon points burn away they are at intervals of time brought nearer together, and their distance apart is regulated by the action of magnet D D in the shunt of the arc, as before described.

The feeding of each lamp not depending upon the strength of the current in the main circuit, but being entirely controlled by its own arc, it is possible to practically use very many of my lamps in one electric current.

In some forms of lamps the current in the shunt is used, in connection with the current in the main circuit, to regulate the carbon points, so as to maintain them in proper rela-

tion to each other, and in others the shunt-circuit operates a clutch to release the upper carbon to permit it to fall by gravity, to lessen the distance between the carbons.

As far as I know my lamp is the only one in which, during the continuance of the light, the proper position of the carbons is regulated by positive mechanism operated by the current in the shunt of the arc only. On account of this peculiarity of my lamp I believe that better and more uniform results are obtained with it than with any other form of regulator heretofore devised.

I claim—

1. In an electric-light regulator, the combination of an electro-magnet in the main or carbon circuit, which acts through suitable intermediate devices to separate the carbons and is incapable of further operation while the carbons continue to burn, and an electro-magnet in a shunt of the carbon-circuit arranged to propel positively one of the carbons, through suitable intermediate devices, for the purpose of lessening the distance between the carbons, substantially as described.

2. In an electric-light regulator, the combination of a rod carrying one of the carbons with a friction-clutch acting continuously on the rod with sufficient force to sustain its weight when loaded with the carbon, an electro-magnet the armature of which carries said clutch, said magnet being in the carbon-circuit, and an electro-magnet in a shunt-circuit arranged to act through suitable intermediate devices to force the rod longitudinally through its clutch in a direction opposite to the attractive force of the magnet the armature of which carries said clutch.

3. In an electric-light regulator, the combination of a rod carrying one of the carbons, a friction clamping device which holds the rod where placed against the force of gravity acting on it, an electro-magnet placed in the circuit of a shunt to the arc, its armature, a clamping device which clamps and carries the rod forward as the armature moves toward the poles of the electro-magnet and unclamps the rod as the armature moves away from the poles of the magnet, and a circuit-controller which opens the shunt-circuit when the armature approaches the poles of the magnet and closes the shunt-circuit when the armature comes back against its stops, substantially as set forth.

4. In an electric-light regulator, the combination of an electro-magnet in the circuit of the arc and the electric generator, its armature, which carries one of the carbons and establishes the arc when the current passes from the generator to the regulator, a rod carrying one of the carbons, a friction clamping device which holds the rod where placed against the force of gravity acting on it, an electro-magnet placed in the circuit of a shunt to the arc, its armature, a clamping device which clamps and carries the rod forward as the armature moves toward the poles of the magnet and unclamps the rod as the armature moves away from the poles of the magnet or rests against its stops, substantially as set forth.

5. In an electric-light regulator, the combination of an electro-magnet in the circuit of the arc and the electric generator, its armature which carries one of the carbons and establishes the arc when the current passes from the generator to the regulator, a rod carrying one of the carbons, a friction clamping device which holds the rod where placed against the force of gravity acting on it, an electro-magnet placed in the circuit of a shunt to the arc, its armature, a clamping device which clamps and carries the rod forward as the armature moves toward the poles of the magnet and unclamps the rod as the armature moves away from the poles of the magnet or rests against its stops, and a circuit-controller which opens the shunt-circuit when the armature approaches the poles of the magnet and closes the shunt-circuit when the armature comes back against its stops, substantially as set forth.

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