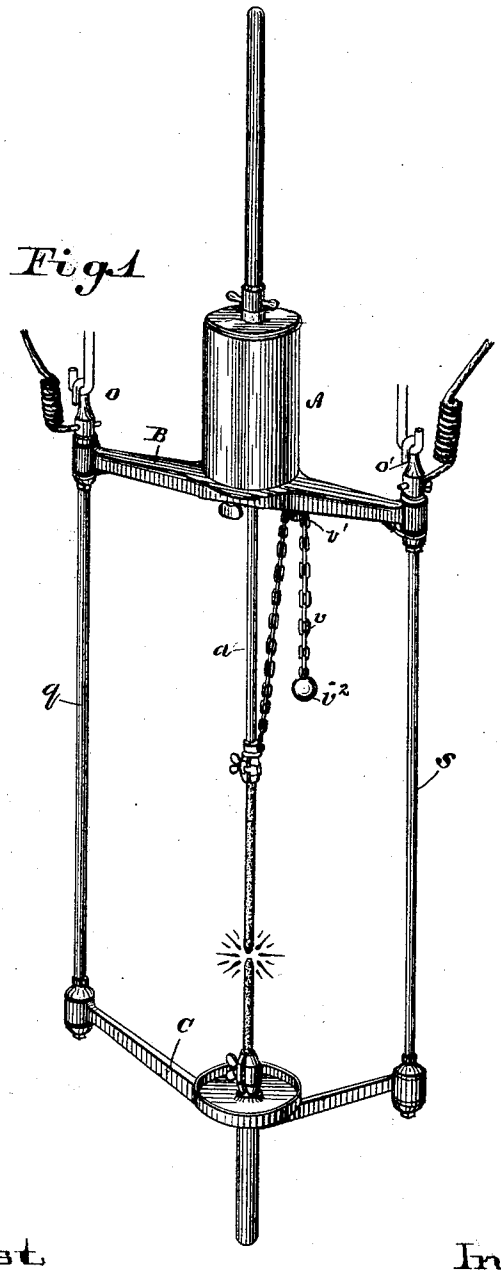
(No Model.) 3 Sheets—Sheet 1.

C. E. SCRIBNER.

ARC LAMP.

No. 415,571. Patented Nov. 19, 1889.

Fig 1



Attest

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(No Model.) 3 Sheets—Sheet 2.

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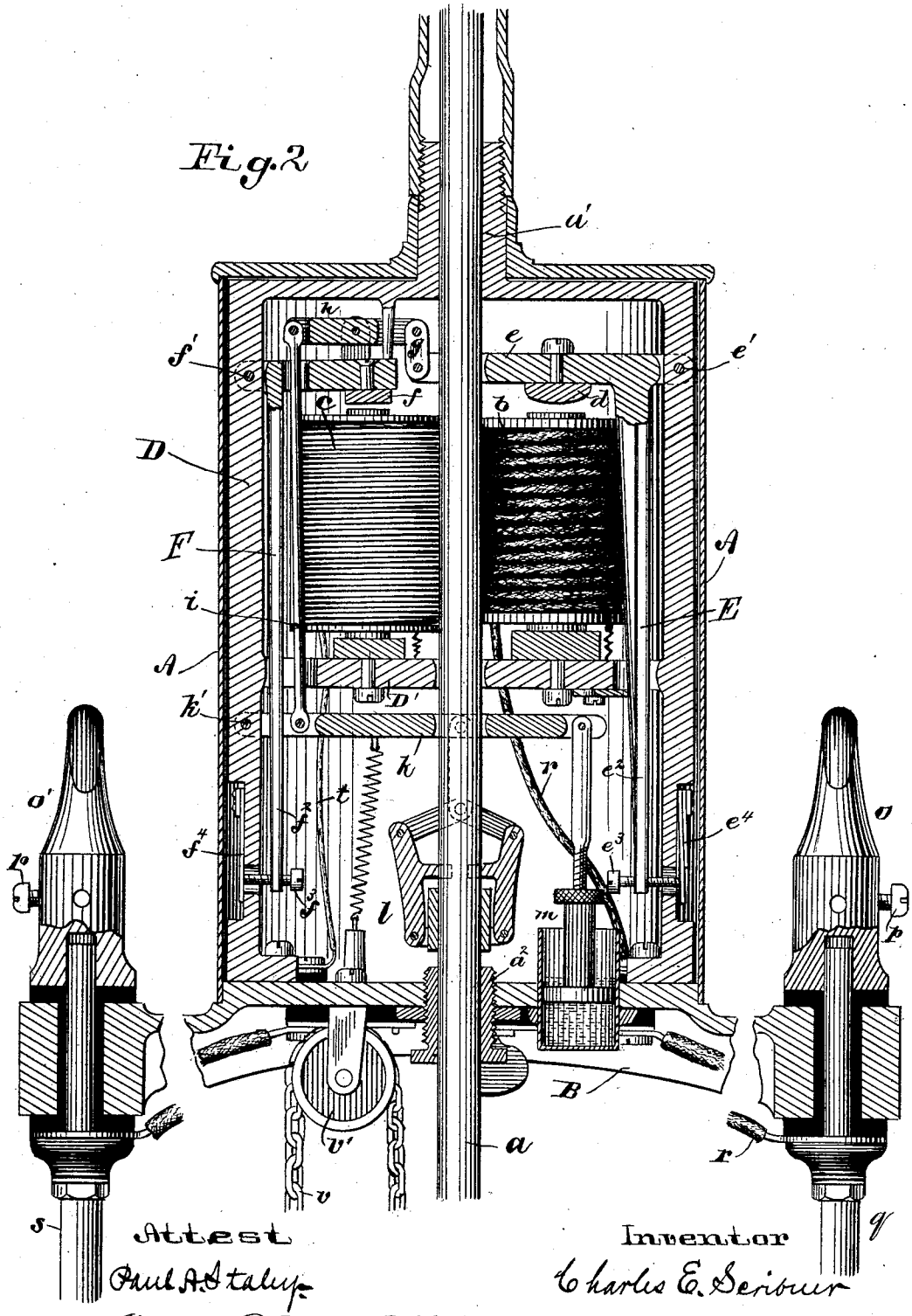
Fig. 2



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(No Model.) 3 Sheets—Sheet 3.

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ARC LAMP.

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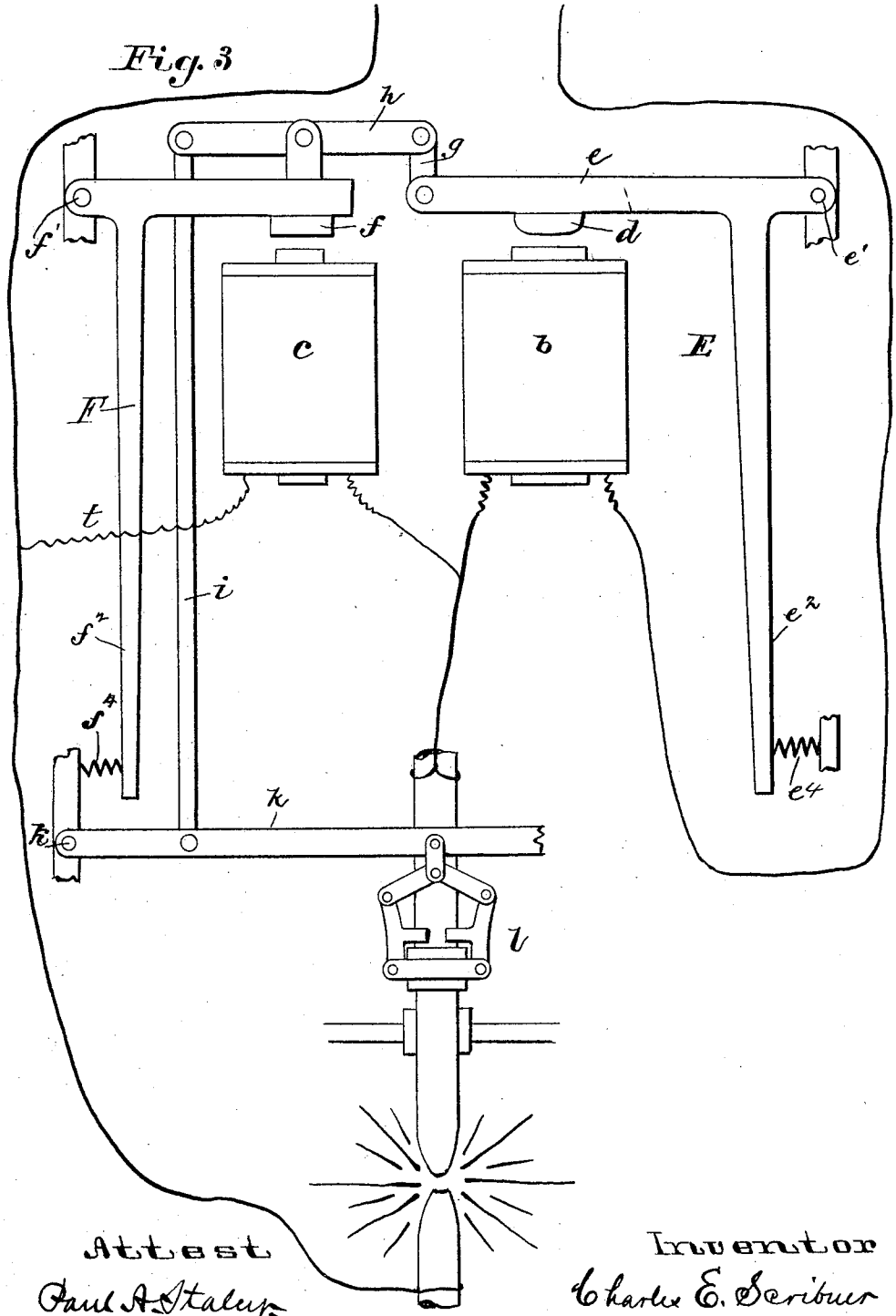
Fig. 3



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Millard A. Powers

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Charles E. Scribner
By his Attorney
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UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN ELECTRIC COMPANY, OF SAME PLACE.

ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 415,571, dated November 19, 1889.

Application filed December 31, 1883. Serial No. 116,102. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SCRIBNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Electric Lamps, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My inventon relates to that class of electric-arc lamps in which an electro-magnet in the main circuit is used to establish the arc and compensate for any variation in the strength of the main current, the feeding of the carbon as it burns away being accomplished by an electro-magnet placed in a shunt around the arc.

In my application, Serial No. 80,752, filed January 2, 1883, I have described a lamp in which the position of the lifting-armature relative to the poles of the lifting-magnet remains unchanged by any action of the shunt-magnet, a change in the relative positions of said lifting-armature being only effected by a change in the strength of the main current. In this case, however, the lifting-magnet is made movable and moves with its armature by the action of the shunt-magnet.

In my lamp herein described I form, as it were, two balances—one, which I term the "lifting-balance," being established between the lifting-magnet and its armature, the other, which I term the "feeding-balance," being established between the shunt-magnet and its armature. A variation of either balance directly affects the arc without disturbing the other balance. A variation of the lifting-balance is effected by a variation in the strength of the main current. A variation in the feeding-balance is effected by a variation in the resistance of the arc. I am thus enabled to obtain a compensation for a variation in the strength of the current without regard to the position of the feeding-armature.

The invention herein described consists in a lamp having a stationary lifting-magnet in the main circuit, a feeding-magnet in a shunt of the arc, and means whereby said feeding-magnet may lower the carbon independent of any movement of the lifting-armature.

My invention further consists in the arrangement and combinations of parts, as hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a perspective view showing the general form of a lamp in which I have embodied my invention. Fig. 2 is a vertical sectional view of the upper part of the same, showing the regulating and feeding mechanism. Fig. 3 is a view of the circuits and a portion of the mechanical devices shown in a diagrammatic manner.

Like parts are indicated by similar letters of reference throughout the several views.

The general form of the lamp shown is the same as many of those now in common use. The feeding and compensating mechanism is located at the top of the lamp in the usual way and is preferably inclosed within a casing A, which is supported on the metallic cross-piece B of the lamp-frame. To this cross-piece, inside the casing A, is secured a small upright metallic frame D, in which the greater portion of the feeding and regulating mechanism is located.

The carbons are supported in the usual way—the lower one on the metallic cross-piece C of the lamp-frame and the upper one on a metallic carbon rod *a*. Suitable carbon-holders may be provided for each carbon. The carbon rod *a* extends up through the metallic frame D, and is adapted to slide in bearings a' and a^2, placed, respectively, at the top and bottom of said frame D. The frame D is divided into two parts by a shelf D′. The magnets are located in the upper part of the frame D and are secured to this shelf D′. The lifting-magnet *b* is wound with coarse wire and is of very low resistance. The feeding or shunt magnet *c* is wound with fine wire and is of high resistance. The armature *d* of the lifting-magnet is secured to the short arm *e* of a bell-crank lever E, which is hinged at e' to the frame D. The other or long arm e^2 of the bell-crank lever E is extended through the shelf D′ and is provided at its lower end with an adjusting-screw e^3, which rests against a spring e^4, said spring being secured to the

frame D. The armature f of the feeding-magnet is secured to the short arm of a bell-crank lever F, which is hinged at f' to the frame D, the long arm f^2 of said lever being extended through the shelf D and provided with an adjusting-screw f^3, which rests against a spring f^4, secured to the frame D. The short arm of the bell-crank lever E is connected at its outer end by a link g to one end of a short oscillating lever h. This oscillating lever h is supported at or near its center in bearings on the short arm of the bell-crank F. The other end of the oscillating lever h is connected by a connecting-rod i to the lifting-lever k, which is pivoted at k' to the frame D, below the shelf D'. This lifting-lever k carries the clutch l, which is of a well-known form, adapted when drawn up to grasp the carbon rod a, and when lowered until it strikes the top of bearing a^2 adapted to release the carbon rod. The outer or free end of the lifting-lever k may also be connected to the customary dash-pot m to prevent any sudden movement of said lifting-lever. The electrical connections with the lamp are made at the hooks $o\ o'$ by the binding-screws $p\ p'$, and the circuit of the lamp may be traced as follows: from hook o to post q; thence by wire r to the lifting-magnet b, and thence to metallic frame D; from the metallic frame D to the carbon rod a and the upper carbon; thence through the arc and the lower carbon to the metallic cross-piece C of the lamp-frame, and from said cross-piece by post s to the hook o'. The feeding-magnet c is connected on one side by a wire t to the post s and on the other side to the metallic frame D. Said magnet is thus in a shunt of the arc, since one of the carbons is in direct connection with the frame D and the other with the post s.

The operation of the lamp is as follows: The current being started through the main circuit, the lifting-magnet b becomes charged and its armature d is drawn toward its poles. As the armature is drawn down, the lifting-lever k, through the medium of the oscillating lever h and connecting-rod i, is drawn up, carrying with it the clutch l and carbon rod a. The upper carbon is thus raised and the arc is established. The movement of the lifting-armature d is opposed by the spring e^4 acting against the long arm of the bell-crank E. When the tension of the spring e^4 becomes sufficient to counteract the power of the lifting-magnet in excess of the amount required to sustain the carbon rod and its carbons, a balance will be established between the said spring and the lifting-magnet. This is the lifting-balance. By means of the adjusting-screw e^3 the pressure of the spring e^4 may be varied. The position of the lifting-armature to sustain the balance may thus be varied, which will in turn vary the length of the arc. The feeding-magnet c, being in the shunt of the arc, will receive current when the arc is established, owing to the resistance of the arc in the main circuit. The amount of current which thus passes through the shunt-magnet will be directly dependent on the resistance of the arc. The resistance of the arc being varied by a variation in the length thereof, it follows that the feeding-magnet will be more or less strongly charged as the arc is shorter or longer. As the feeding-magnet becomes charged its armature f is attracted, and the shorter arm of the bell-crank F, to which said armature is attached, is drawn down, thus lowering the oscillating lever h, which is journaled or fulcrumed thereon. The movement of the armature f is opposed by the spring f^4 acting against the end of the extended arm f^2 of the bell-crank F. The pressure of the spring against said arm may be varied by the adjusting-screw f^3. As the oscillating lever h is lowered, as above described, the lifting-lever k will also be lowered, carrying with it the carbon rod a. The carbons will thus be brought closer together and the resistance of the arc diminished. This will in turn decrease the current in the feeding-magnet c and a feeding balance will be established. The position of the feeding-armature to sustain this balance may be varied by varying the pressure of the spring f^4. We have now two balances established—one sustained by the strength of the main current and the other sustained by the resistance of the arc. A variation of either balance acts directly on the arc independently of the other. For instance, as the arc is lengthened by the burning away of the carbons more current passes through the feeding-magnet, and its armature f is attracted toward said magnet, thus lowering the upper carbon by drawing down the oscillating lever h. When the carbon rod a is thus lowered until the clutch l strikes the top of the sleeve or bearing a^2, the rod a is released by the clutch and the carbon feeds. The instant the arc is shortened by the feeding of the carbon the current in the shunt-magnet is decreased and its armature is withdrawn from its poles by the spring f^4 and the balance is established as before. The tension of the spring f^4 is sufficient to sustain the weight on the short arm of the bell-crank F due to the lifting of the carbon rod by the lifting-magnet. It will be seen that by the above-described arrangement the action of the shunt-magnet is entirely independent of the action of the lifting-magnet, and vice versa. In accomplishing the feed the shunt-magnet does not weaken the lifting-magnet nor tend to draw the armature of said magnet away from its poles. The lifting-magnet is thus always in a condition to compensate for a variation in the strength of the main current without regard to the position of the armature of the shunt-magnet. As the oscillating lever h is lowered by the action of the shunt-magnet there will be a tendency of the lifting-armature to approach the poles of its magnet; but, owing to the constant pressure of the spring e^4 and to the fact that the

strength of the magnet is uniform, this movement is so slight that it does not affect the regulation of the lamp. The connecting-rod *i* is connected to the lifting-lever *k* at a point close to where said lever is pivoted, so that a slight movement of either armature produces a considerable movement of the clutch. By employing the bell-cranks E and F and placing the springs e^4 f^4 at the ends of the extended arms of said bell-cranks I get an increased leverage and am thus enabled to easily balance the magnets. By means of the adjusting-screws e^3 f^3, the lamp may be adjusted to any desired arc, so that the best possible results may be obtained. The sleeve or bearing a^2 is adjustable through the cross-piece B, and may be adjusted to vary the point at which the clutch releases the carbon in feeding to suit different conditions.

I have shown attached to the carbon rod *a* one end of a small chain *v*, which passes over a pulley *v'* on the cross-piece B, and is provided at the other end with a small weight v^2. This device is intended for a counter-balance for the carbon; but as I intend to make it the subject of another application I have not fully described it in this.

It is evident that my invention may be modified in various ways. I do not, therefore, limit myself to the construction shown.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, with the magnets *b* and *c*, placed, respectively, in the main circuit and in a shunt of the arc, the bell-crank levers E and F, to which the armatures of the respective magnets are attached, and the springs acting against said bell-crank levers, of an oscillating lever *h*, fulcrumed or journaled on the bell-crank F, said oscillating lever being connected at one end to bell-crank lever E and at the other to mechanism adapted to raise or lower the upper carbon of the lamp, substantially as described and shown.

2. The combination of the magnets *b* and *c*, the bell-cranks E and F, the oscillating lever *h*, lifting-lever *k*, clutch *l*, and carbon rod *a*, and means for connecting said oscillating lever at one end to bell-crank E and at the other end to the lifting-lever *k*, substantially as shown and described.

3. In an electric-arc lamp, the combination, with an electro-magnet in the main circuit of the lamp and its armature and armature-lever, of an electro-magnet in the shunt of the arc and its armature and armature-lever and a lever pivoted upon the armature-lever of said shunt electro-magnet and moving therewith, the said pivoted lever being linked to the clutch mechanism to operate the rod, said pivoted lever also being linked to the armature-lever of the magnet in the main circuit, whereby the rod is moved responsively to changes in the strength of either of said electro-magnets.

4. In an electric-arc lamp, the combination, with the electro-magnet *b* in the main circuit and the electro-magnet *c* in the shunt of the arc, of the armatures and the extended armature-levers of said magnets, said armature-levers being pivoted to the frame of the lamp at points *e'* and *f'*, respectively, the springs bearing against the extended ends of said levers, the tension of the springs and the length of the extended portions of the levers being adjusted to substantially balance the attraction of the poles of the magnets, respectively, as their armatures approach and recede therefrom, and the oscillating lever *h*, linked to both of said armature-levers and connected with the lever *k*, which carries the clutch, whereby the action of one magnet is exerted upon the clutch to regulate the arc independent of the action of the other magnet.

In witness whereof I hereunto subscribe my name this 19th day of December, A. D. 1883.

CHARLES E. SCRIBNER.

Witnesses:
PAUL A. STALEY,
GEORGE P. BARTON.