(No Model.) 2 Sheets—Sheet 1.

C. E. SCRIBNER.

ELECTRIC ARC LAMP.

No. 574,045. Patented Dec. 29, 1896.

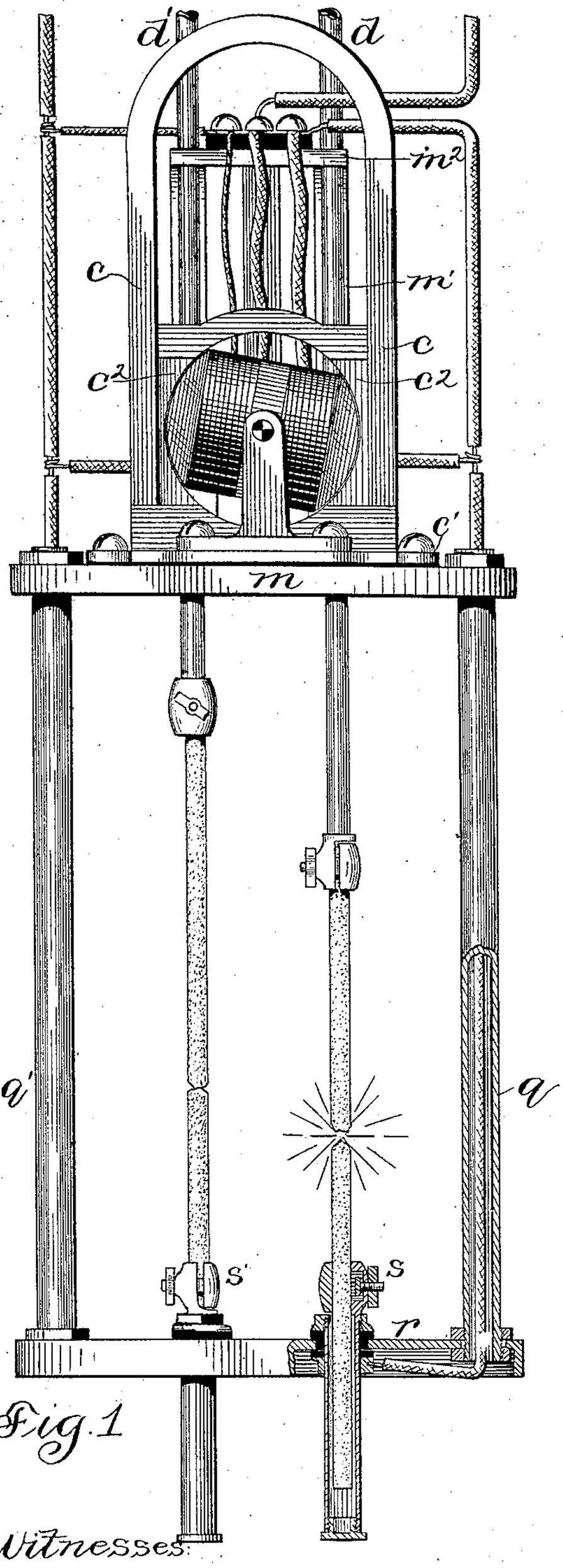

Fig. 1

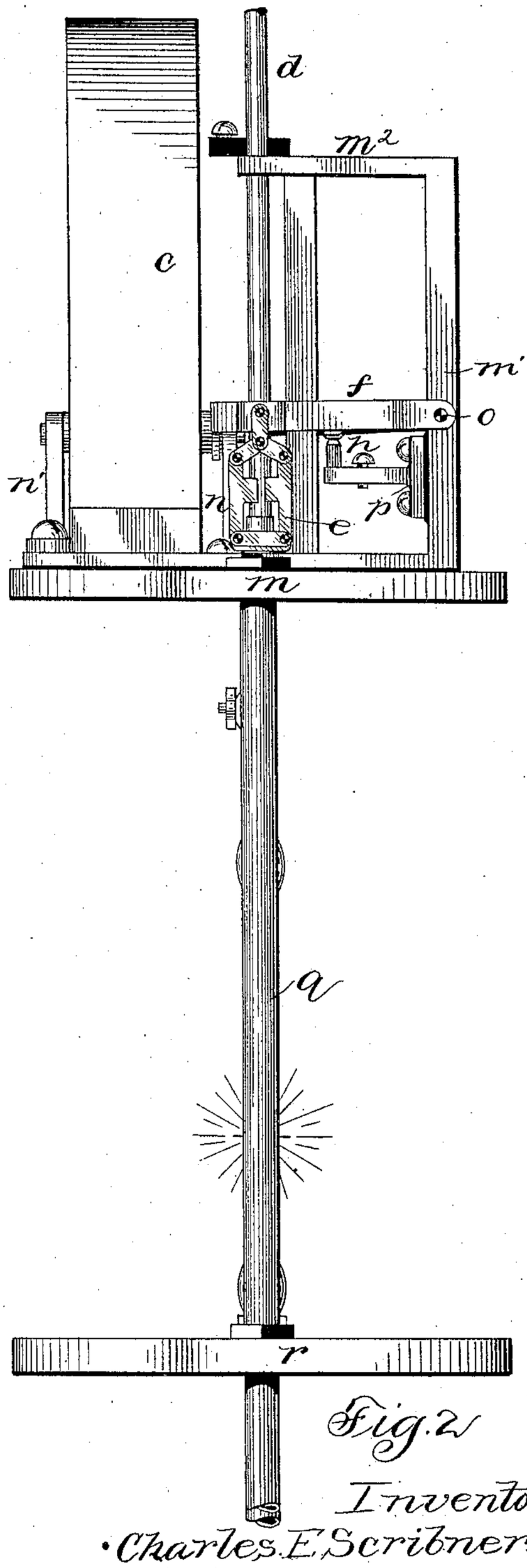

Fig. 2

Witnesses:
George L. Cragg.
George McMahon.

Inventor:
Charles E. Scribner
By Barton & Brown,
Attys.

(No Model.) 2 Sheets—Sheet 2.

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ELECTRIC ARC LAMP.

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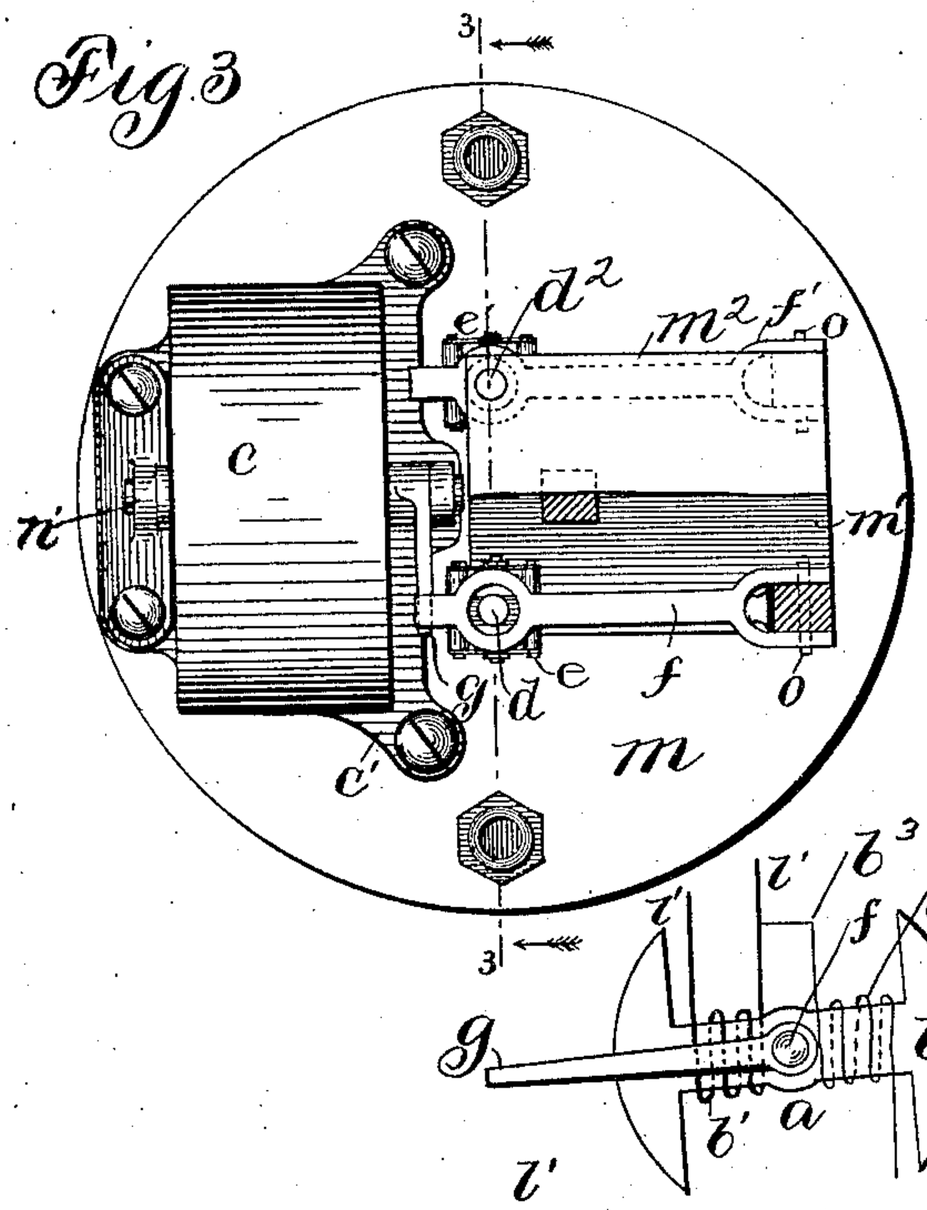
Fig. 3



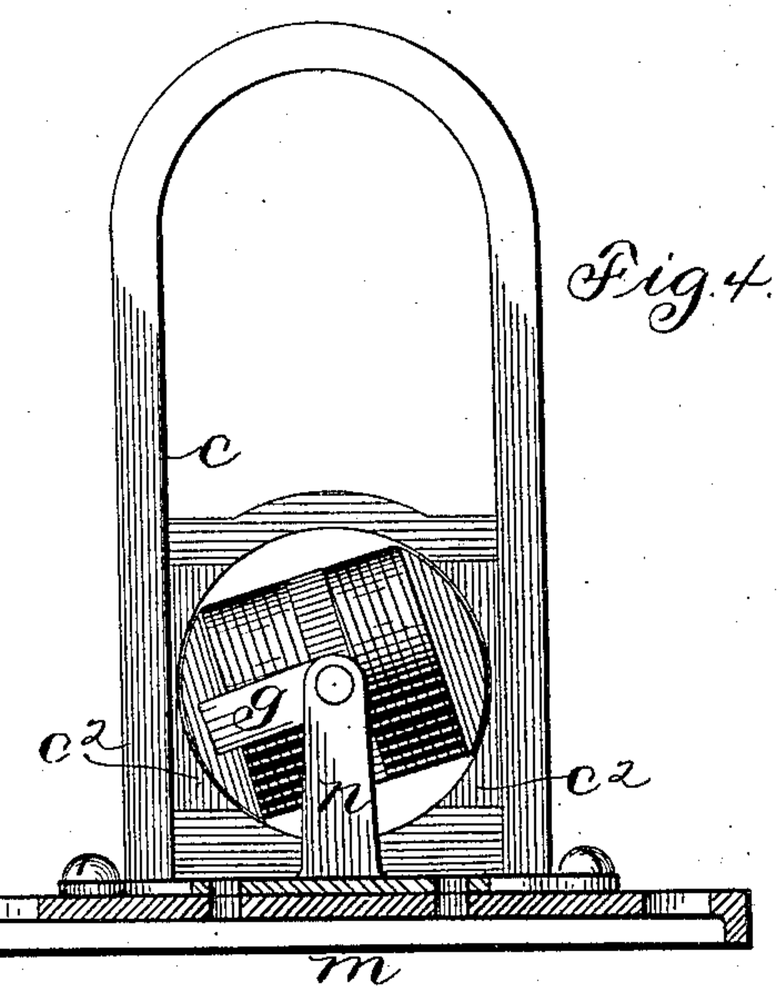


Fig. 4.

Fig. 5

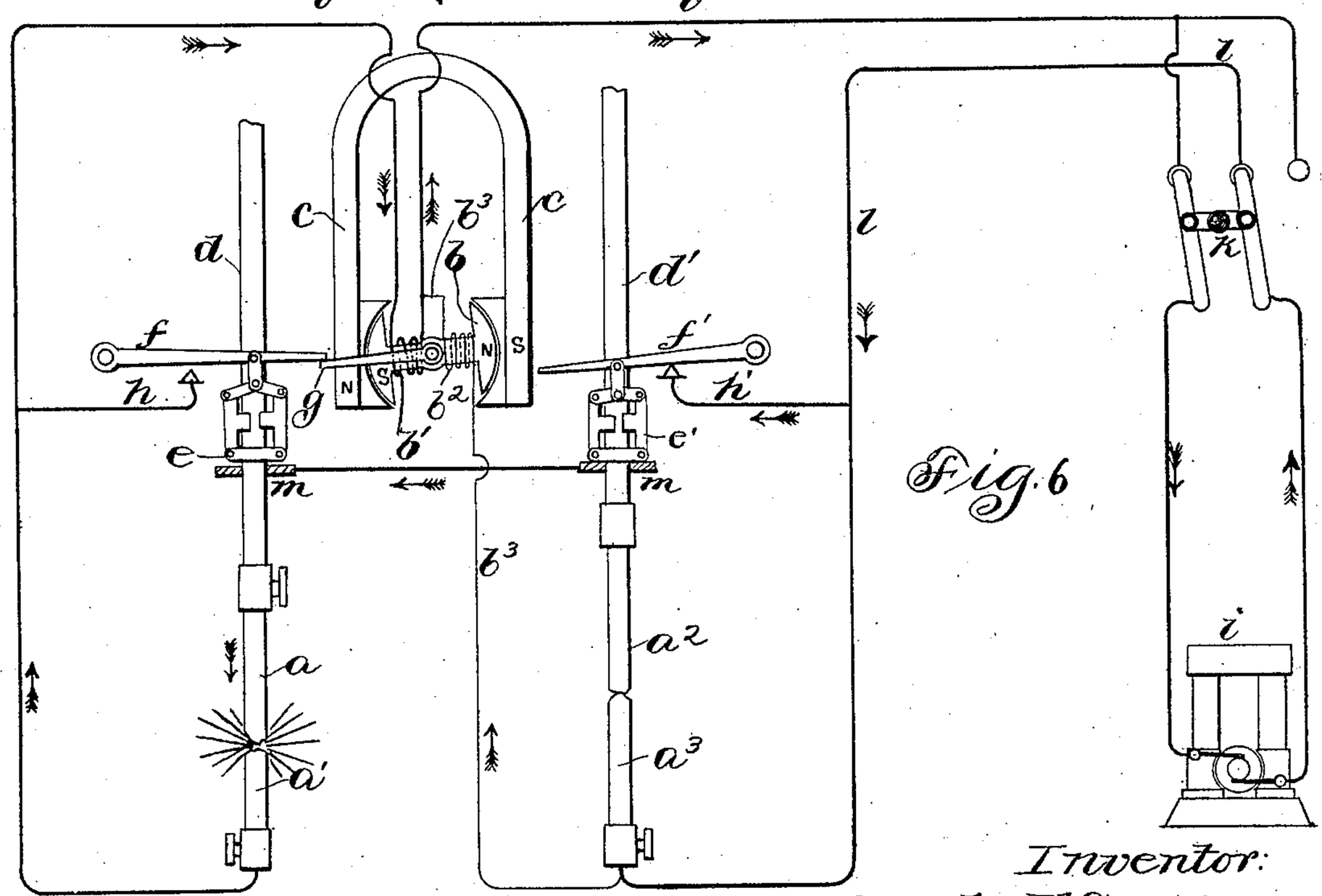


Fig. 6

Witnesses:
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Inventor:
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UNITED STATES PATENT OFFICE.

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

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 574,045, dated December 29, 1896.

Application filed May 9, 1893. Serial No. 473,584. (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-Arc Lamps, (Case No. 314,) 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 invention relates to electric-arc lamps; and its object is to provide apparatus whereby the arc may be exhibited between one or the other of the pairs of carbons of each of the lamps of a series, according to the direction of the current, the direction of the current being controlled by a manual switch at the power-house. Thus the arcs of all the lamps of a series may be shifted from one side to the other at the will of the attendant from time to time, as occasion may require. Heretofore two helices, one included in the main circuit and the other in a shunt-circuit, have been wound upon the same spool of a magnet, the main current and the subsidiary current passing through said helices, respectively, in opposite directions to act differentially.

The principal feature of my invention herein consists in the combination, with an oscillating electromagnet or shuttle-armature having two helices, one in the main circuit and the other in a shunt-circuit, of two pairs of carbons and switching apparatus for reversing the direction of the current in the helices, respectively, said oscillating magnet being placed in a permanent magnetic field, whereby, on the reversal of the current, the said magnet will be shifted, thereby acting to shift the arc from one pair of carbons to the other. By the term "oscillating electromagnet" I intend to include any device having differentially-wound coils placed in a magnetic field and so arranged that it will be rotated or shifted from either one of its two positions to the other whenever the current through the differentially-wound helices shall be reversed. Since the principal function of the fine-wire helix is to control the feed of the lamp, it is evident that the oscillating armature might perform its function of shifting the arc if the fine-wire magnet were otherwise disposed. The Siemens shuttle-armature is an oscillating electromagnet which acts in a somewhat analogous manner to that of my oscillating differentially-wound electromagnet. The Siemens device is, however, provided with only one helix.

I shall describe my oscillating electromagnet in connection with a double-carbon arc-lamp, the construction of the parts and the arrangement of the circuits being such that the coarse-wire helix may be considered as performing the function of the main or lifting magnet of an arc-lamp, while the fine-wire helix performs the function of the fine-wire or regulating magnet. My differential magnet being placed in a permanent magnetic field and pivoted is shifted when the current is reversed to switch out one pair of carbons and bring the other into circuit. While specially useful in an arc-lamp it is evident that my differential oscillating magnet, placed in a magnetic field and operated by shifting the direction of the currents through the helices, might be applied to other uses with only such obvious mechanical changes as would suggest themselves to those skilled in the art.

Figure 1 is a front elevation of an electric-arc lamp embodying my invention. Fig. 2 is a side elevation thereof. Fig. 3 is a plan showing the position of the permanent magnet, the coils, and clutch-levers. Fig. 4 is a view on line 3 3 of Fig. 3 of the differential oscillating magnet. Fig. 5 is a detailed view showing the differentially-wound helices upon the core of the pivoted electromagnet or shuttle-armature. Fig. 6 is a diagrammatic illustration of a lamp connected in circuit with the dynamo-machine and the switch for reversing the direction of the current.

Like parts are indicated by similar letters of reference throughout the different figures.

As shown in Fig 5, the core *b* is provided with the coarse-wire helix b' and the helix b^2, which in this instance should be of fine wire. In the actual machine the connections of the wire b' with the helix b' and of the wire b^3 with the helix b^2 will be made in a well-known way through the pivot or axis upon which the shuttle-armature is mounted, or the connec-

tions may be made by flexible cords or in any other well-known way. The arm g, carried by the shuttle, is adapted to come against the clutch-lever f or f', according to the position of the shuttle, to lift said levers from their respective contacts $h\,h'$. When arm g engages with lever f, as shown, said lever will be lifted from the cut-out contact h. When the position of the arm g is reversed, lever f will close upon its contact h. The same may be said of clutch-lever f' and its cut-out contact h'.

Referring now to Fig. 6, when the current from the dynamo i finds circuit from its positive pole to the line-wire l, thence to the contact-anvil h of the lamp, thence to the lever f', through the mechanism and the frame m of the lamp to the lever f, thence to the contact h, thence through the main helix b' of armature b, and out to the line l', returning to the negative pole of the dynamo.

By the flow of current through helix b' the armature b is energized in a particular direction with reference to the field in which it is situated and tends to place itself in a position in which the lines of force from the helix b' are of the same direction as those of the field of magnet c. In this position the arm g engages with the extremity of the lever f, lifting the lever, and thereby causing the clutch e to engage with the carbon-rod d, and in its further movement to separate the carbons $a\,a'$. An arc is thus formed between the carbons, whereby the resistance of the lamp-circuit is increased and more current is caused to traverse the high-resistance shunt-circuit extending from the conductor l through the wire b^3 to the helix b^2 on armature b and thence to the line l'. As the resistance of the arc between carbons $a\,a'$ increases and becomes abnormally great the current through this shunt-circuit is increased in amount until its differential action with respect to helix b' is sufficient to cause a slight rotation of the armature in the opposite direction, whereby the lever f and the carbon-rod d, connected with it through the medium of the clutch, are lowered and the length of the arc is suitably reduced. In this manner the distance between the carbons $a\,a'$ is regulated until they have been consumed to the desired extent. Then the switch k is thrown into its alternate position, reversing the direction of the current through the circuit. The mechanism of the lamp at once drops into its idle condition and the cut-out contacts $h\,f$ are closed together. The current now finds circuit through the line l' and the helix b', thence through the cut-out contacts $h\,f$ to the frame of the lamp, thence through the cut-outs $f''\,h'$ to the line l, thence returning to the dynamo. The polarity of the armature b is thus reversed and the armature rotates through nearly a half-revolution in the effort to place itself in its normal position with respect to the field of magnet c. The arm g then engages with the lever f', lifting it and the clutch e'. In the first movement of the lever f' it is separated from the cut-out contact h', whereby the current is directed through the carbons $a^2\,a^3$. An instant later the clutch e' grasps the carbon-rod d' and separates the carbon a^2 from the lower carbon a^3, thereby starting an arc between them. A current is again set up in the shunt-circuit, including the fine-wire helix b^2, and the regulation of the distance between the carbons $a^2\,a^3$ is effected as before.

It is obvious that my invention admits of various modifications which would be well understood by those skilled in the art, and I therefore do not limit myself to the specific construction and combination of parts herein illustrated and described.

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

1. The combination with two pairs of carbons in an electric circuit, of a differential oscillating magnet in the circuit, a source of permanent magnetic field wherein said magnet is located, and mechanism actuated by the said magnet adapted to bring into operation one pair or the other of the carbons according to the position which said magnet assumes with relation to the said magnetic field when current is sent through it, substantially as described.

2. The combination with two pairs of carbons in an electric circuit, of an oscillating magnet in the same circuit and a source of permanent magnetic field surrounding the said magnet, the magnet and source of magnetic field being capable of movement with relation to one another in response to changes of polarity of the magnet, and mechanism actuated by the movement of one of the elements adapted to bring about the operation of one pair or the other of the carbons according to the direction of said movement, substantially as described.

3. The combination with two pairs of carbons included in an electric circuit, of regulating mechanism adapted, when actuated, to effect the separation or approach of the members of each pair of carbons, an oscillating magnet in the said circuit or a branch thereof, a source of magnetic field of constant direction about the said magnet, and means connected with the magnet to be actuated thereby adapted to bring about the operation of one pair or the other of the carbons according to the movement of the said magnet with relation to the magnetic field wherein it is situated; whereby either pair of carbons may be brought into operation by suitably directing the current through the magnet, substantially as described.

4. The combination with two pairs of carbons in an electric circuit, of two carbon-rods, each carrying one member of a pair, clutches engaging with the different carbon-rods, lever mechanism controlling the clutches, an oscillating magnet in the said circuit, a source of magnetic field of constant direction, the said magnet being situated in the said field, and

an arm controlled by the magnet in its movement adapted to engage with the lever controlling one pair of carbons or the other, according to its position, to actuate the same, substantially as described.

5. The combination with two pairs of carbons, of carbon-rods each carrying one member of a pair, clutches engaging with the said carbon-rods, levers controlling the movement of the clutches, an oscillating magnet provided with two helices, one helix included in circuit with the carbons, and the other helix included in a shunt of the said carbons connected with the first helix, said helix being wound differentially, a source of magnetic field of constant direction, and an arm connected with the said helices to be actuated thereby as the magnet moves in response to changes in strength or direction of the current through the coils thereof, said arm being adapted to engage with and actuate one or the other of the said clutch-controlling levers; whereby the members of one pair of carbons or the other are separated and adjusted to form and control the arc according to the direction of the current through the lamp, substantially as described.

6. The combination with two pairs of carbons in series in an electric circuit, of an oscillating magnet in the said circuit, a source of magnetic field of constant direction surrounding the said magnet, contact-points and circuit connections adapted to short-circuit each pair of carbons when said contact-points are closed together, and mechanism controlled by the said magnet to separate one pair or the other of the contact-points according to the position of the helix, substantially as described.

7. The combination with an element adapted to produce a permanent magnetic field, of a coil comprising differentially-wound helices located in the field and revoluble therein, two sets of mechanism, each designed to be movable through different ranges, a device connected with the said coil adapted to be brought into engagement with either of said mechanisms according to the position of the coil in the field, means for reversing the current through one or both of the helices, and means for varying the currents in the two helices with relation to each other, substantially as described.

In witness whereof I hereunto subscribe my name this 5th day of May, A. D. 1893.

CHARLES E. SCRIBNER.

Witnesses:

GEORGE P. BARTON,

ELLA EDLER.