(No Model.) 4 Sheets—Sheet 1.

E. C. RUSSELL.

ELECTRIC ARC LAMP.

No. 432,284. Patented July 15, 1890.

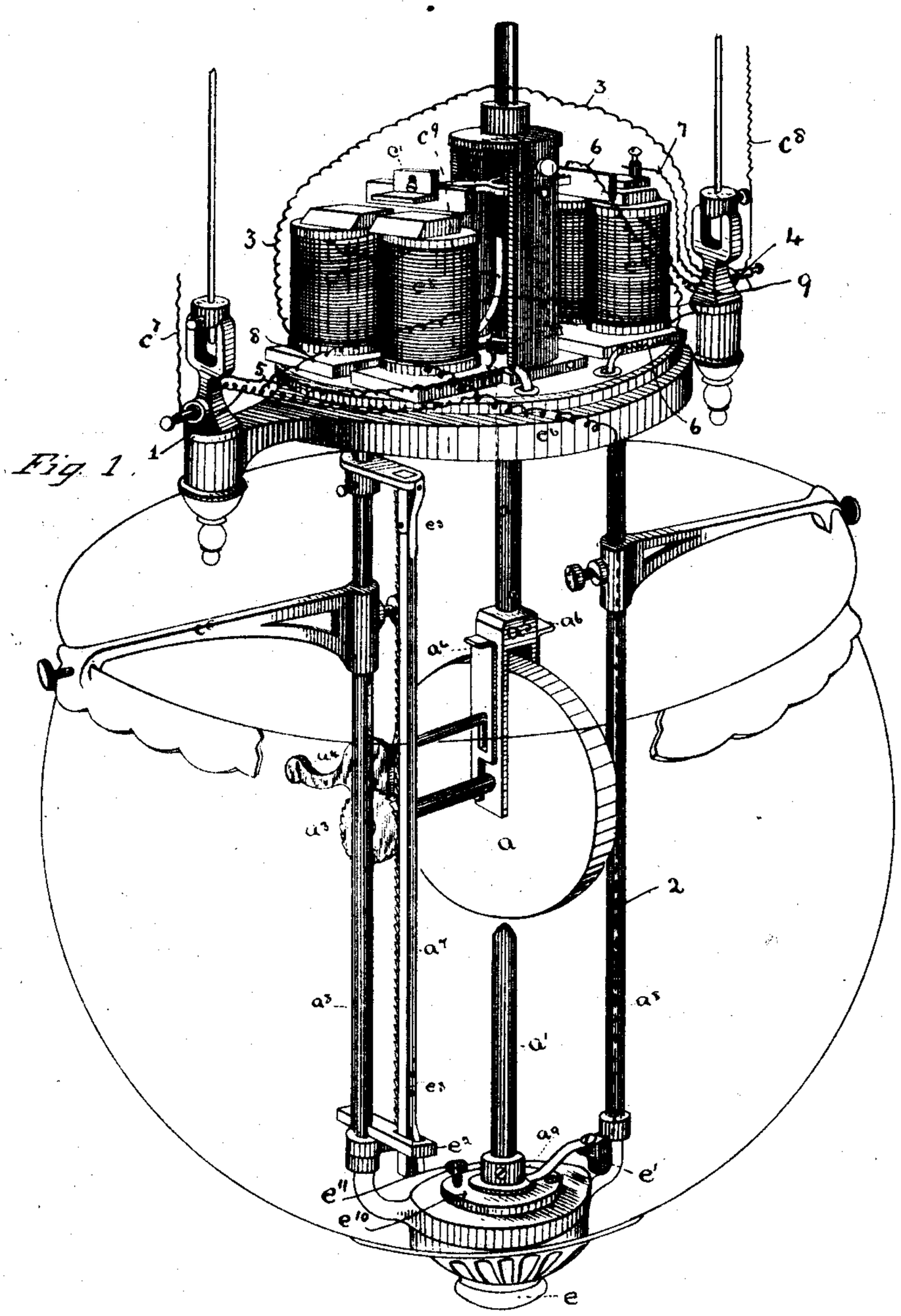

Fig. 1.

Witnesses.
Josiah W. Hovey
Lottie Planta.

Inventor.
Edwin C. Russell
by Edwin Planta
Attorney.

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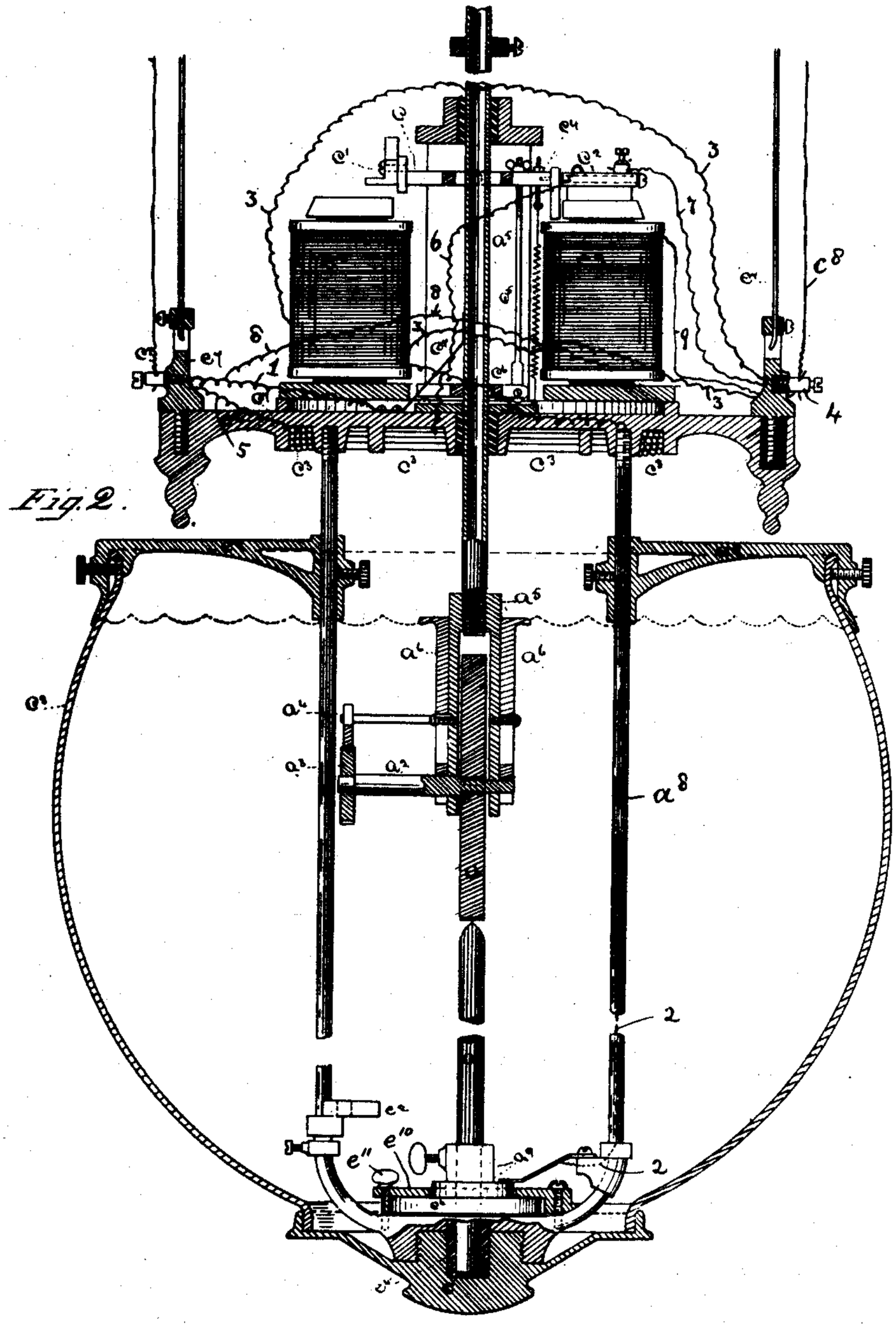

Fig. 2.

Witnesses.
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(No Model.) 4 Sheets—Sheet 3.

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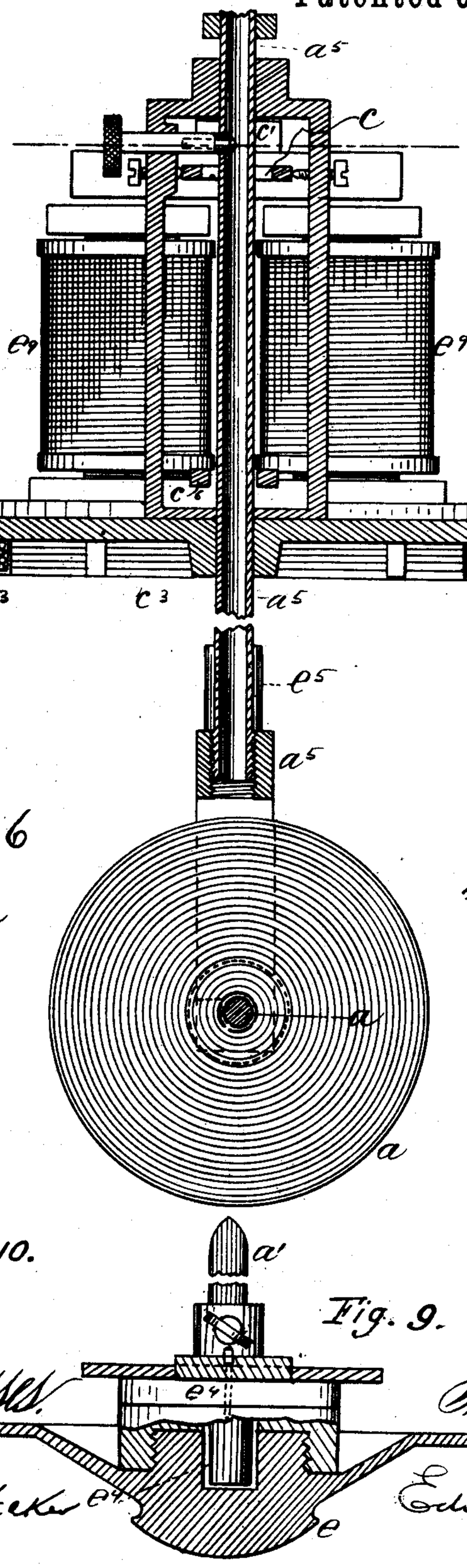

Fig. 3.

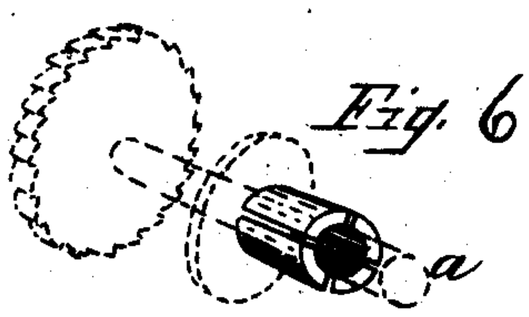

Fig. 6

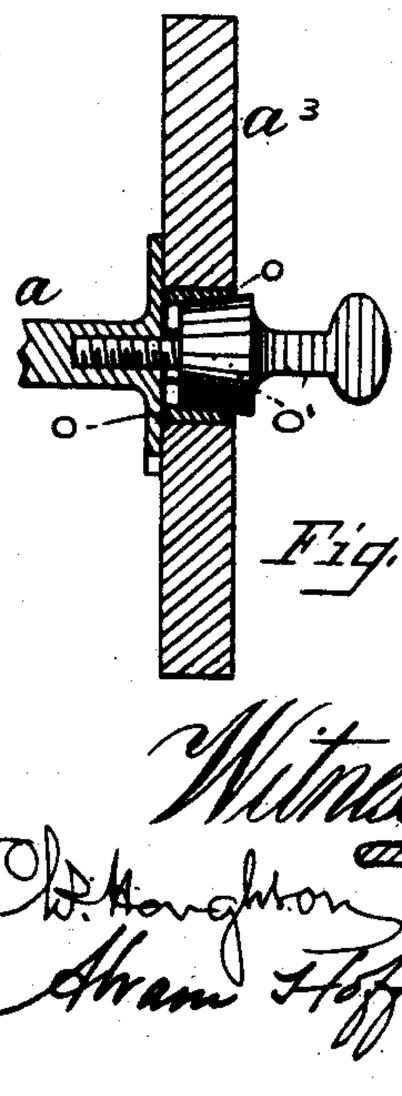

Fig. 10.

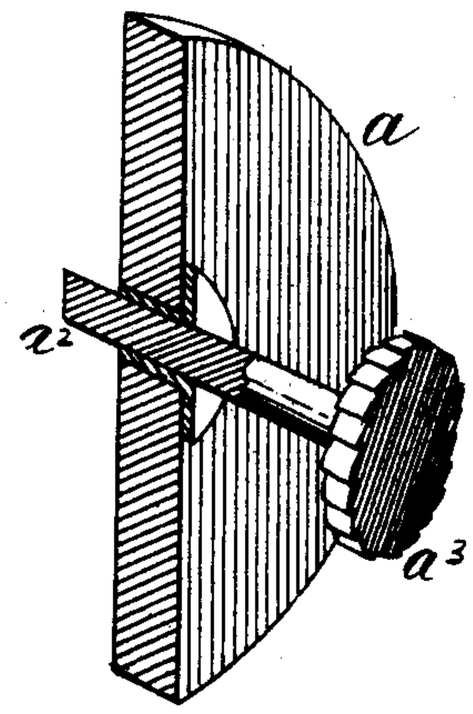

Fig. 7.

Fig. 9.

Witnesses.
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Edwin C. Russell

(No Model.) 4 Sheets—Sheet 4.

E. C. RUSSELL.

ELECTRIC ARC LAMP.

No. 432,284. Patented July 15, 1890.

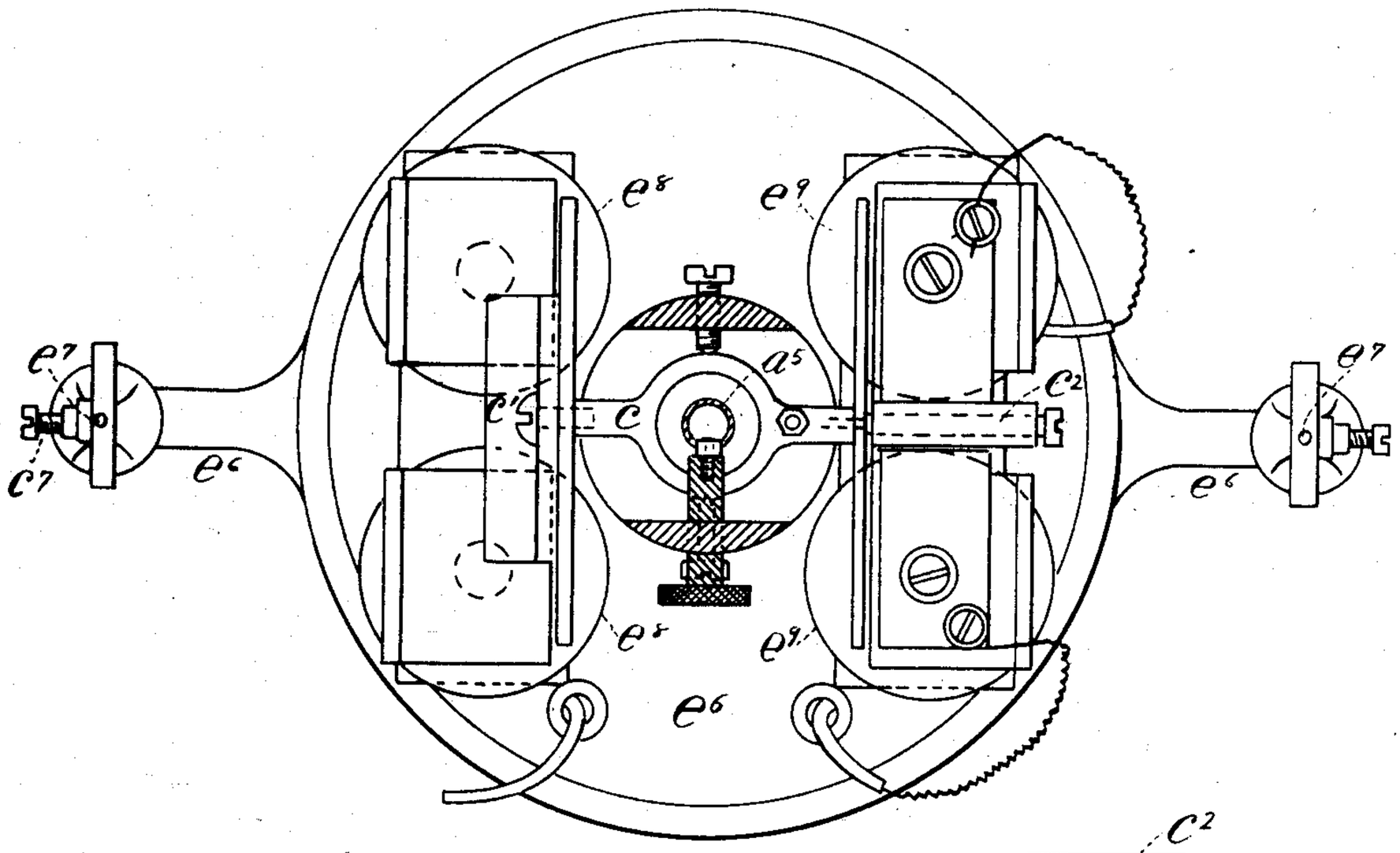

Fig. 4.

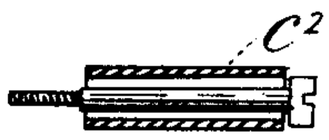

Fig. 8.

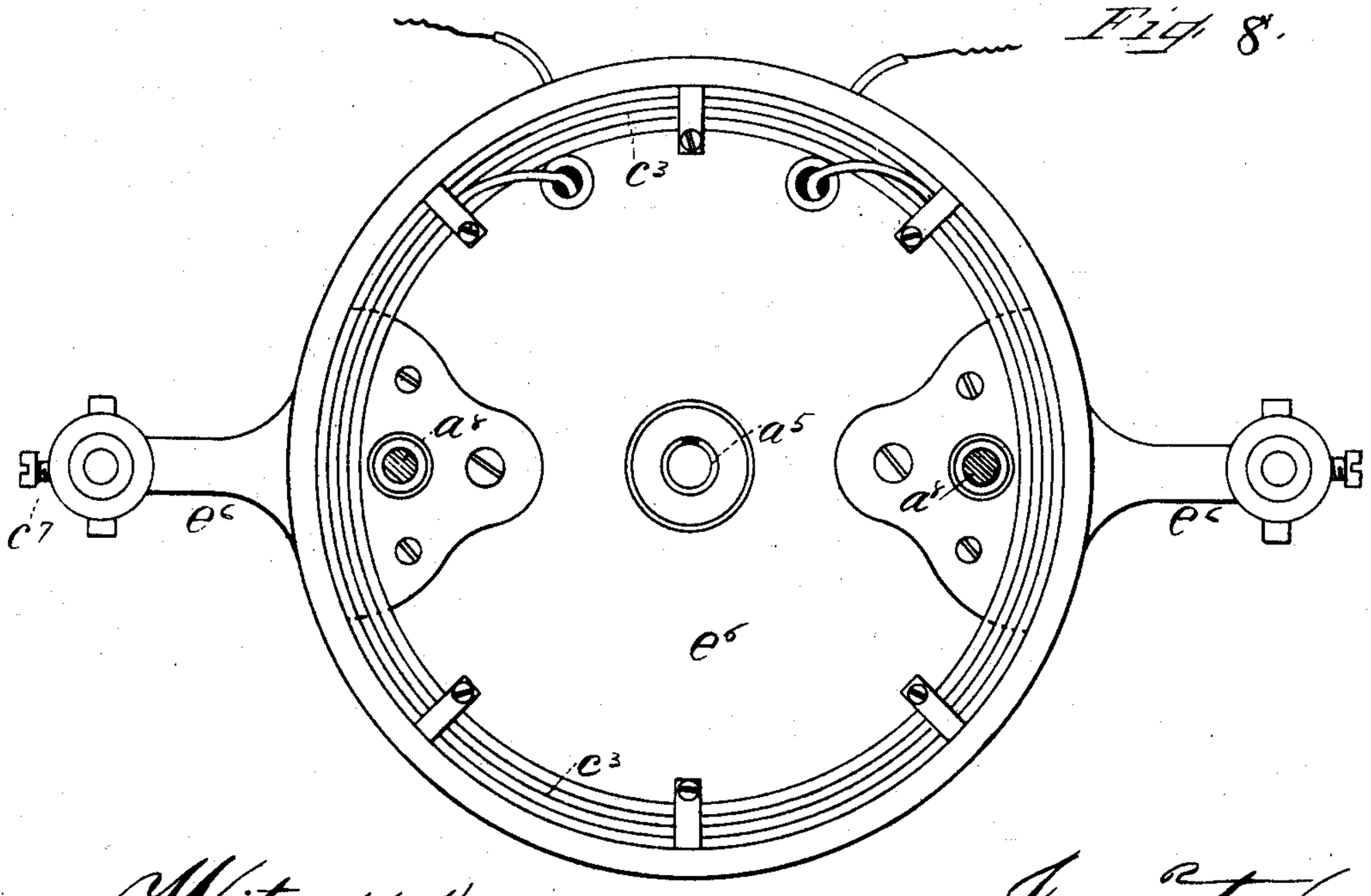

Fig. 5

Witnesses:
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Abram Hoffecker

Inventor:
Edwin C. Russell

UNITED STATES PATENT OFFICE.

EDWIN CHARLES RUSSELL, OF BOSTON, MASSACHUSETTS.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 432,284, dated July 15, 1890.

Application filed March 5, 1890. Serial No. 342,746. (No model.)

To all whom it may concern:

Be it known that I, EDWIN CHARLES RUSSELL, of Boston, in the county of Suffolk and Commonwealth of Massachusetts, have invented an Improved Electric Lamp, of which the following is a specification.

My invention relates to what is known as the "arc lamp," the object of it being to provide an arc lamp that will burn about twice as long without retrimming as the ordinary arc lamps now in general use at a cost of construction and operating not greater than the cost of the ordinary arc lamp; and it consists in the combination of a vertically-moving and intermittently-rotating carbon electrode in disk form with a pencil-shaped carbon electrode fixed and immovable standing vertically in the bottom of the lamp-frame, and the devices herein described for moving and controlling the disk-formed electrode, as hereinafter fully described.

In the drawings annexed, Figure 1 represents a perspective view of an electric-arc lamp embodying my invention. Fig. 2 is a vertical section of the same. Fig. 3 shows a vertical sectional view of the lamp and some of its several parts. Fig. 4 shows a top plan of that part of the lamp upon which the electro-magnets are placed and a top plan of the magnets, the supporting-stand, and the carbon-holder, the armature-lever and the bearing upon which it vibrates, and the cut-out. Fig. 5 is a plan of the bottom of the base of the lamp, showing the coil of wire which is in the circuit connecting the positive and negative poles of the lamp. Fig. 6 shows a detail in perspective of the construction of the spring, which secures the disk carbon in its place on the carbon-journal. Fig. 7 shows a vertical transverse section of the disk carbon, the carbon-holder, the journal which supports and rotates the disk carbon, and the ratchet-wheel, which rotates it. Fig. 8 shows the cut-out as it is in Fig. 2. Fig. 9 shows a sectional view of the carbon and devices for securing it upon the journal. Fig. 10 shows a vertical section of the disk carbon and the spring device shown in Fig. 6.

a marks the disk carbon, which is the positive, and is suspended in a carbon-holder extending from the top of the lamp downward to the center of the disk, there supporting a journal upon which the disk of carbon is affixed and with which it rotates.

a' marks the lower or pencil carbon, (the negative.) This is similar to carbon pencils in use in the ordinary arc lamp, and is fixed at the bottom of the frame in a socket a^9, that can be adjusted so as to bring the carbon pencil in a line with the center of the disk a. It is then secured by a clamp a^{10}, held down by a screw a^{11} or other suitable means. After the pencil carbon is adjusted in position it remains stationary.

a^2 marks the journal upon which the disk carbon is affixed and by which it is rotated intermittently, as hereinafter set forth.

a^3 marks a ratchet-wheel upon the journal a^2, by which the journal and the disk carbon on it are rotated. When the lamp burns, the carbons are consumed and the arc between the two is enlarged and the resistance increased, thereby actuating the armature-lever and releasing the clutch which holds the carbon-rod, letting it descend by gravity until the arc is diminished to its proper width, and rotating the disk carbon on it just far enough to present the unconsumed edge of it to the end of the pencil and near enough to make the proper arc.

a^4 marks a brake, the function of which is to prevent a reverse or backward motion of the ratchet-wheel a^3. This brake is affixed to a shaft, which is in turn secured to one of the sides of the forked rod which supports the disk carbon.

a^5 marks a hollow shaft, cylindrical in form, called the "carbon-rod." It is furcated at its lower end, the forks straddling the disk carbon and engaging the journal a^2, which passes through both sides of the fork and through the disk carbon. This carbon-rod has a longitudinal groove in one side of it, in which a stud works to prevent it from turning around, and it extends upward through the center of the base of the lamp between the electro-magnets and within the stand which supports the armature.

a^6 marks two sliding pieces, one on each side of the forks of the carbon-rod. When pushed down, they secure the journal a^2 and the disk carbon in their proper relative posi-

tions. When they are raised up, the journal a^2 and the disk carbon may be released, so that both may be removed from the lamp.

a^7 marks a vertical rack-bar, the inner side of which is toothed to match the teeth on the ratchet-wheel a^3. It is affixed to the frame of the lamp, and by engaging the teeth of the ratchet-wheel a^3 rotates the ratchet-wheel a^3, the journal a^2, and the disk carbon, when they descend with the carbon-rod. Springs at both the upper and lower ends of the bar allow it a little motion, so that it may not engage and rotate the ratchet-wheel when the disk carbon and ratchet-wheel are moved upward.

a^8 a^8 mark the two rods affixed to the under side of the base, upon which the electro-magnets are placed, and from which they extend downward, and being joined together by suitable means at the bottom form a hanger-support for the lower or pencil carbon a'. These rods are hollow, and through one of them an insulated electric conducting-wire passes to the connection between it and the lower end of the pencil carbon.

a^9 marks a collar in the loop at the bottom of the hangers a^8 a^8, which is affixed to the bottom part of the hanger by a screw-thread on it, which runs into a corresponding thread in the bottom piece of the hanger. Into this collar the lower or pencil carbon enters and is kept in place and supported by it.

e marks a circular block, which is affixed to the bottom of the loop, which supports the pencil carbon and forms a support for the glass globe which surrounds the carbon. This block is affixed to the loop at the bottom of the hangers by a screw which runs into a corresponding thread in the bottom or loop of the hangers.

e' marks an electric connection between the conducting-wire in the hanger-rod and the pencil carbon a'. It is affixed to a block which is an insulation.

e^2 marks a support for the bar a^7, connected with the hanger-rod a^8.

e^3 e^3 mark springs on the outside of the bar a^7, which allow the bar a yielding movement when the disk carbon and its appurtenances are raised up in the lamp.

e^4 marks insulation around and under the lower end of the pencil carbon a'.

e^5 marks a circular collar affixed to the rods a^8 a^8, which embraces the circumference of the top edge of the glass globe and keeps it in place.

e^6 marks a supporting-platform on which the electro-magnets are placed and through which the rod which supports the disk carbon passes from the disk carbon upward above the magnets. There is also on this platform a stand which supports the armature-lever.

e^7 marks suspension-wires by which the platform and all the parts composing the lamp are suspended from any suitable fixture above.

e^8 marks two lifting-magnets on the platform e^6.

e^9 marks two shunt electro-magnets on the platform e^6, connected by wire 8 to the positive wire and by wire 9 to the negative wire.

c marks the armature-lever, which is supported and pivoted on the inside of the stand, so that both ends of it are free to move vertically as the electric current may affect it.

c' marks an adjusting device by which the motion of the armature may be regulated.

c^2 marks what is known as a "cut-out," the function of which is to make an electric connection between the cores of the electro-magnets e^9 e^9.

c^3 marks a resistance-coil of German-silver wire, one end 5 of which is connected to the positive conducting-wire, thence extending downward below the platform e^6, where it is wound several turns around blocks affixed to the under side of the platform for that purpose, and thence by its end 6 to a conductor on the top of but insulated from one of the shunt-magnets. A wire 7 connects a similar conductor on the other shunt-magnet to the negative conducting-wire, so that when the armature-lever c is drawn down so as to make connection between the two conductors on the shunt-magnets the current passes directly to the negative wire.

c^4 marks a spiral spring which brings the armature-lever c and the cut-out c^2 down and keeps the cut-out in contact with the cores of the shunt electro-magnets e^9 until the superior force of the electric current overcomes the spring and brings the opposite end of the armature-lever down to the top of the cores of the magnets e^8, and raises the cut-out away from the cores of the shunt electro-magnets e^9, whereby the electric current is conducted down the carbon-rod a^5 to the disk carbon a and to the pencil carbon a', making light in the arc.

c^5 marks a rod which is affixed at its upper end to the armature-lever and at its lower end by a joint to a tilting clutch, through which the carbon-rod passes by an opening larger than the carbon-rod.

c^6 marks the tilting clutch referred to. When the end of it connected with the rod c^5 is raised, it engages two sides of the carbon-rod and holds it and the disk carbon in position. This takes place when the end of the armature-lever c is brought down by the electric current so as to make contact with the tops of the cores of the electro-magnets e^8 e^8.

c^7 marks the positive wire and the binding-post into which the electric current enters, and thence continues by a wire 1 to a conducting-brush c^9, affixed to the upper side of the platform e^6, and from it reaching upward in a slanting direction to and in contact with the carbon-rod a^5. The electric current thence follows down the carbon-rod a^5 to the disk carbon a, thence to the point of the pencil carbon a' and through it and over a contact-piece e' to a conducting-wire 2 in the right-hand rod a^8 of the supporting-hanger, through which it extends upward to the insulated wire around the electro-magnets e^8, thence by wire

3 to the binding-post 4 and negative wire c^8. The electric current is divided when it reaches the shunt electro-magnets, and a small part of it is shunted from the main circuit, thereby reducing the current through the carbon.

c^8 marks the glass globe which surrounds the carbons and protects the burning light.

In the use of this lamp the rotation of the disk carbon is intermittent, and it is moved forward, when the arc has by combustion of the carbon become too large, just far enough to make the open space between the edge of the circumference of the disk and the point of the pencil carbon what is required to make what is termed an "arc." In Figs. 6 and 9, *o* marks a cylindrical-formed spring cut into four parts, as shown in Fig. 6, which is placed on the journal between it and the disk carbon. *o'* marks a cylindrical wedge on a screw-pin, by which it may be forced into the spring *o*, making the carbon disk fast on the journal a^2, so that when the combustion of the carbons makes the space too great for a proper working-arc the resistance of the passage of the electric current becomes such that the armature-lever vibrates enough to release the hold of the clutch upon the carbon-rod and it descends by gravity, carrying the disk carbon, its journal, and the ratchet-wheel a^3, and partially rotating the ratchet-wheel a^3 by its engaging the teeth on the bar a^7, the journal, and the disk carbon with it, bringing the circumference of the disk near enough to the point of the pencil carbon to make an arc and produce a light. When this occurs, the armature-lever vibrates in the direction opposite to its last movement, causing the clutch to engage the carbon-rod again and prevent it from descending farther, and holding it and the disk carbon securely at the point where it and the pencil carbon form a light-producing arc. The pencil being stationary, the disk descends a little lower down after each complete rotation than it was during the previous rotation, and so on until the disk is as nearly consumed as it may be.

In the construction of this lamp, where insulation is required to keep the passing electric current from escaping, it must be applied.

I claim as new and of my invention—

1. In an arc lamp, the combination of the bifurcated carbon-rod, the disk carbon journaled in the bifurcated end of the rod, the pencil carbon, the gear-wheel on the shaft of the disk carbon, and the stationary rack engaged by said gear-wheel.

2. In an arc lamp, the combination of the carbon-rod, the disk carbon mounted therein, the plates for securing the journals of the disk carbon in place, and mechanism for rotating the disk carbon as it descends.

3. In an arc lamp, the combination of the carbon-rod having the bifurcated end, the disk carbon mounted in said end, the plates for holding the journals of the disk carbon in place, mechanism for imparting a rotary movement to the disk carbon as it descends, and a pencil carbon.

4. In an arc lamp, the combination, with the carbon-rod and disk carbon mounted therein, of the sliding plates for holding the journals of said carbon in place.

5. In an arc lamp, the combination of the electro-magnets, the armature-lever, the carbon-rod, the clutch for holding said rod, the disk carbon mounted in said rod, the sliding plates for holding the disk carbon in place, the gear-wheel on the shaft of the disk carbon, the stationary rack engaged by said carbon, and a pencil carbon.

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Witnesses:
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ABRAM HOFFECKER.