(No Model.) 3 Sheets—Sheet 1.

# H. JAPY & O. HELMER.

## ELECTRIC ARC LAMP.

No. 485,347. Patented Nov. 1, 1892.

FIG. 1.

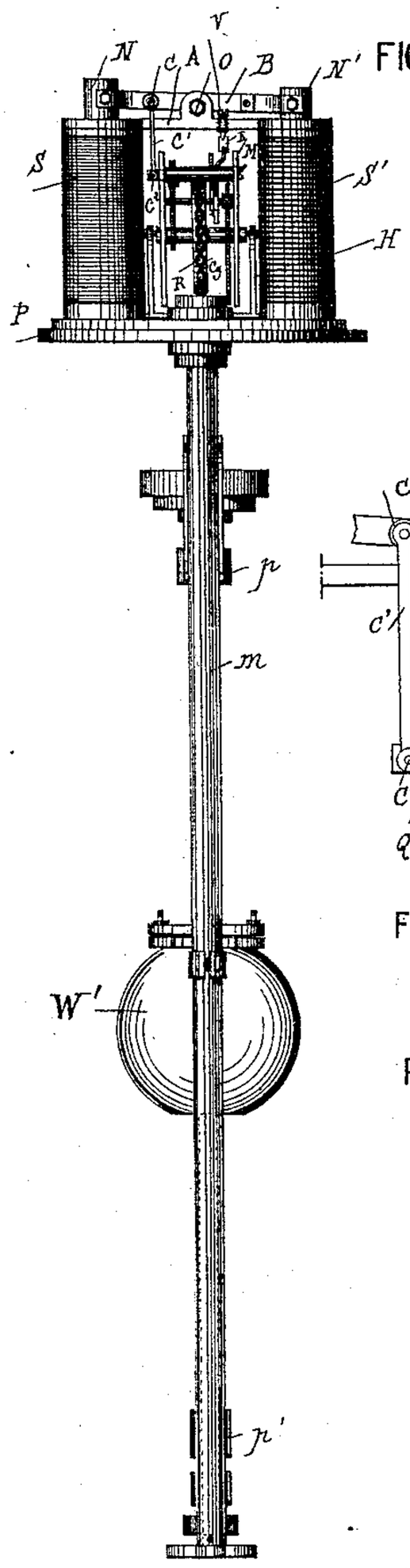



FIG. 1A.

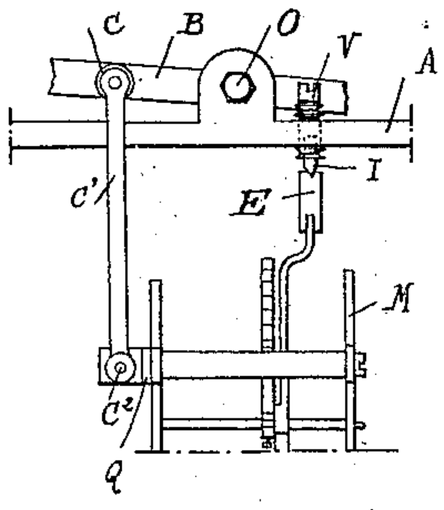



FIG. 1B.

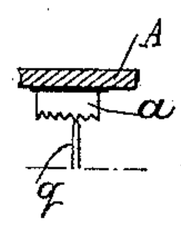



FIG. 1C.

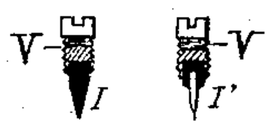



FIG 2a

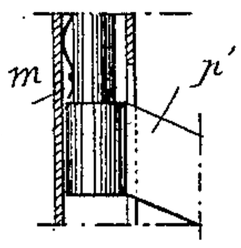
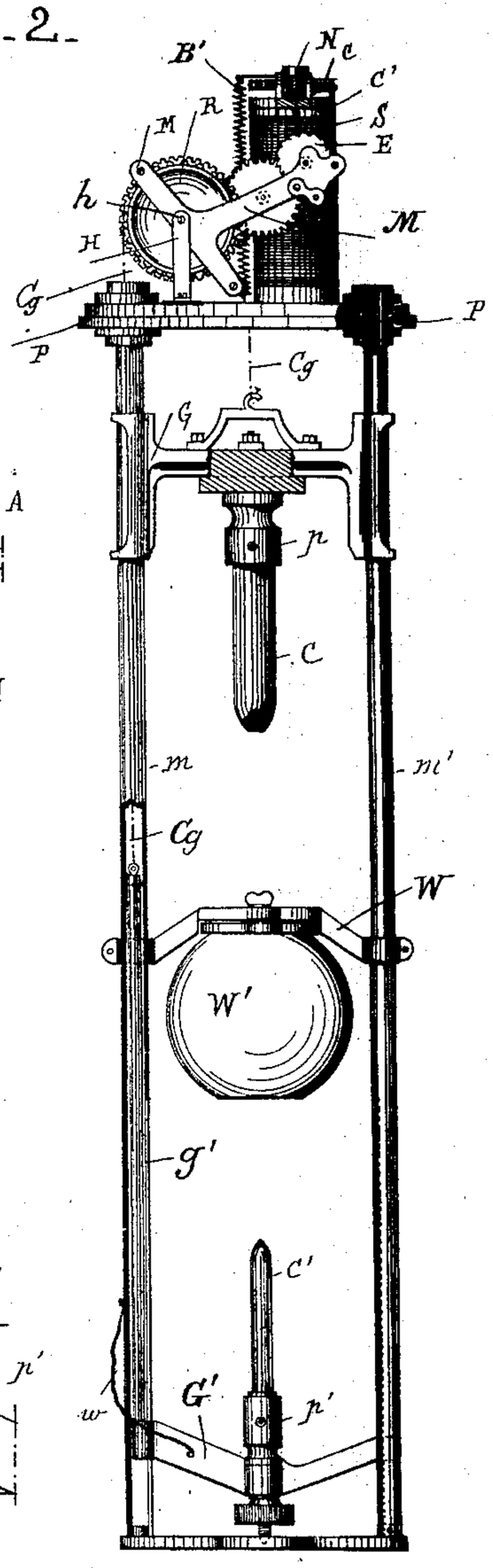



FIG. 2.




Witnesses.
Geo. T. Smallwood.
Rowe Lewis.

Inventors:
Henri Japy and
Oscar Helmer
by Pollok & Mauro
their attorneys

(No Model.) 3 Sheets—Sheet 2.

# H. JAPY & O. HELMER.

## ELECTRIC ARC LAMP.

No. 485,347. Patented Nov. 1, 1892.

FIG. 3

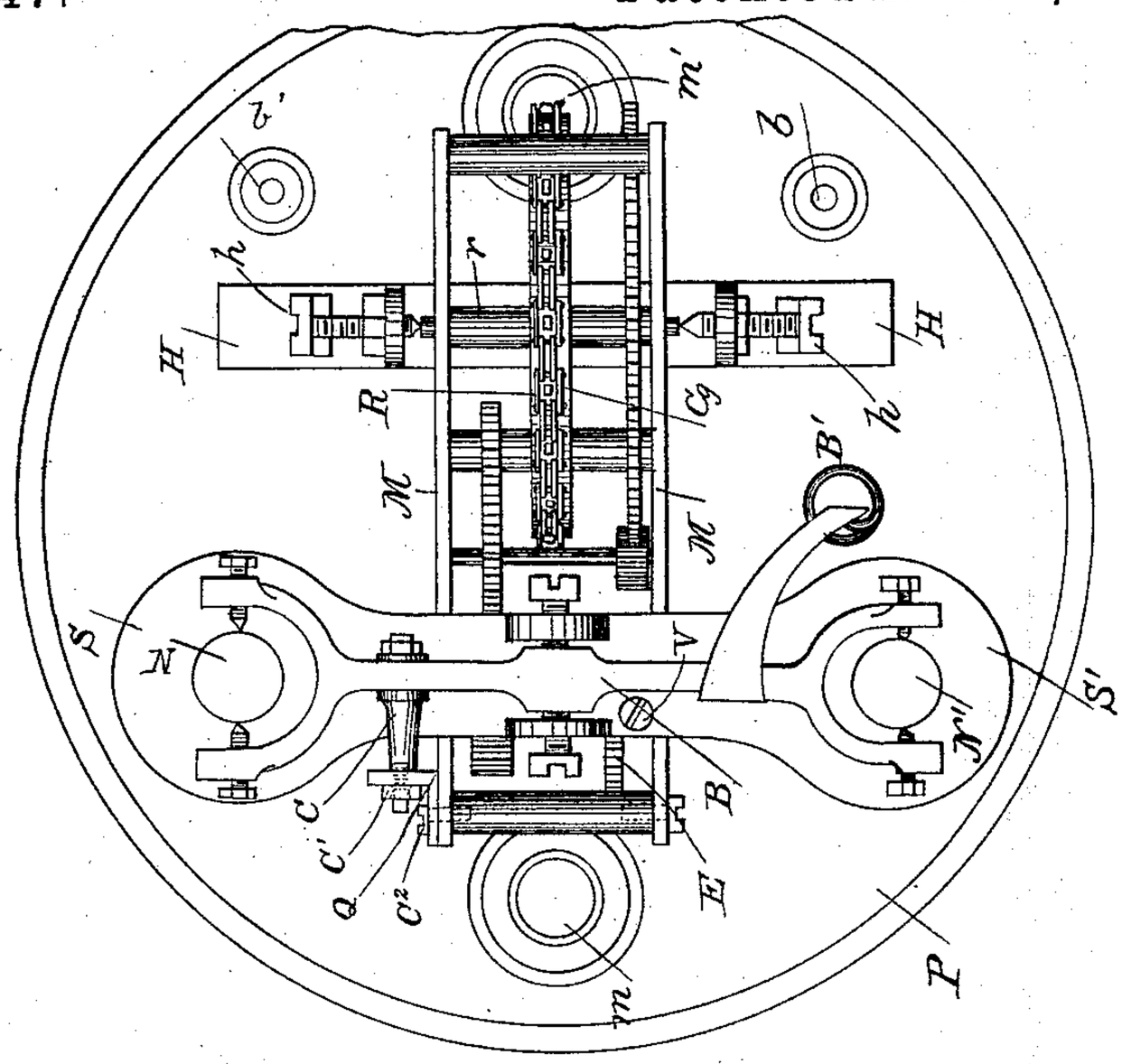
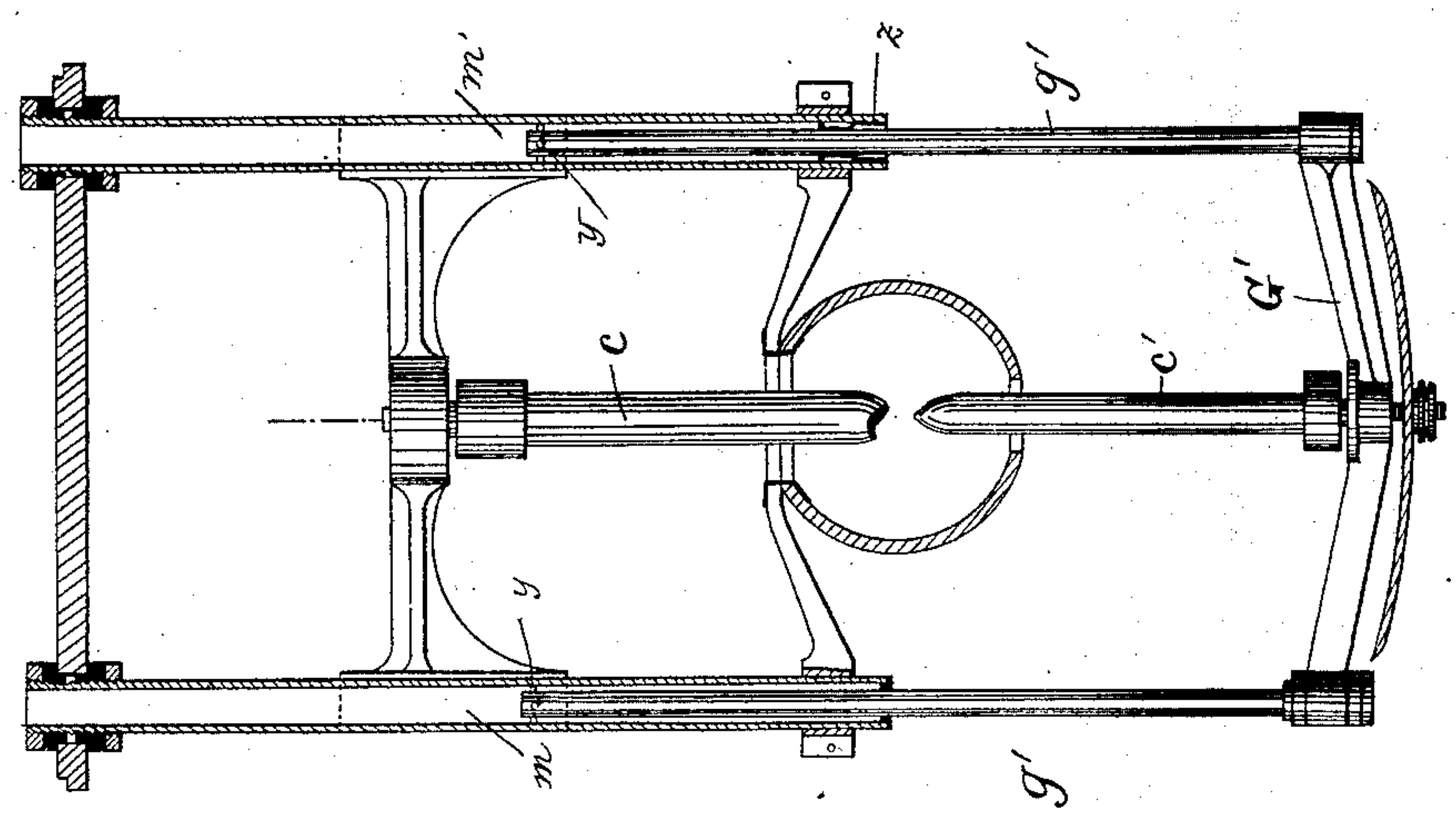



FIG. 4




Witnesses:
Geo. T. Smallwood.
Rowe Lewis.

Inventors:
Henri Japy and
Oscar Helmer
by Pollard & Mauro
their attorneys

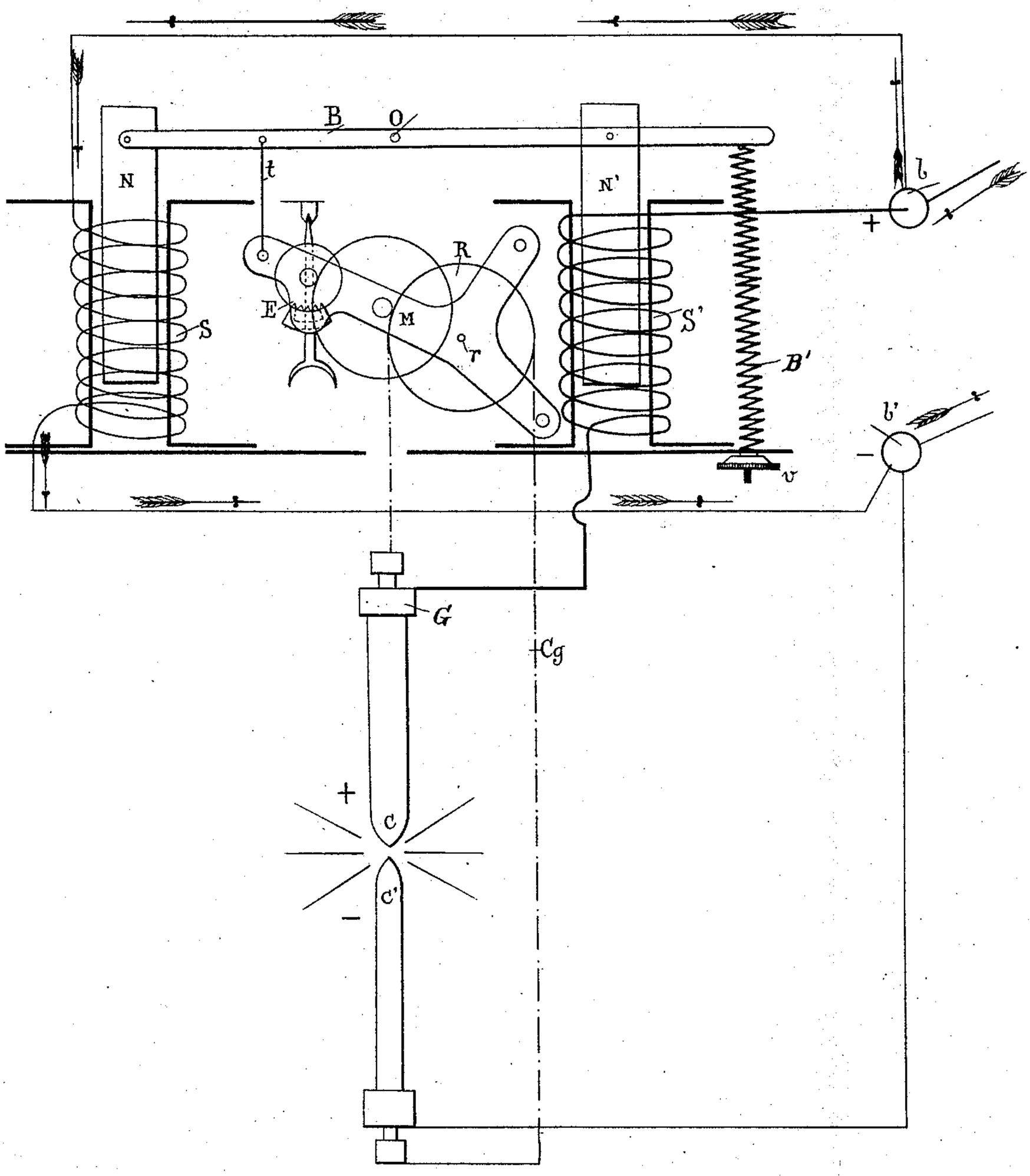
(No Model.) 3 Sheets—Sheet 3.

# H. JAPY & O. HELMER.

## ELECTRIC ARC LAMP.

No. 485,347. Patented Nov. 1, 1892.

FIG. 5.




Witnesses.

Geo. T. Smallwood.

Fred Lewis.

Inventors:

Henri Japy and

Oscar Helmer

by Pollok & Maura

their attorneys.

# UNITED STATES PATENT OFFICE.

HENRI JAPY, OF BEAUCOURT, AND OSCAR HELMER, OF PARIS, FRANCE.

## ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 485,347, dated November 1, 1892.

Application filed March 22, 1892. Serial No. 425,929. (No model.) Patented in Belgium June 12, 1891, No. 95,240; in France September 28, 1891, No. 216,393, and in England February 22, 1892, No. 3,443.

*To all whom it may concern:*

Be it known that we, HENRI JAPY, manufacturer, residing at Beaucourt, and OSCAR HELMER, electrician, residing at Paris, in the Republic of France, have invented a new Electric Lamp, of which the following is a specification.

The said invention has been patented in France by Patent No. 216,393, dated September 28, 1891; in Belgium by Patent No. 95,240, dated June 12, 1891, and in Great Britain by Patent No. 3,443, dated February 22, 1892.

The present invention relates to the construction of differential-arc lamps designed to operate in circuit with either a continuous or an alternating current generator.

According to our invention the feed of the carbons is effected at very short intervals by a novel arrangement of clockwork feed mechanism. The carbons are suspended at opposite ends of a chain or equivalent flexible suspensory, so that the carbons are caused to simultaneously approach and recede from each other and the focal point of the light is fixed. The movement of the clock-train, which is pivoted in line with the axis of the actuating motor-wheel, is effected differentially by the action of the current in two solenoids, one connected in the main circuit including the carbons and having a low-resistance coil, and the other connected in derivation and having a high-resistance coil. The carbon-carriers are guided by upright rods. These are made rigid by means of a brace which supports the globe, which may be of small dimensions, owing to the invariable position of the arc, and has the advantage of concentrating the light and protecting the supporting-rods from sparks or dust projected from the carbons.

Many of the elements of our improved regulating mechanism have been severally used or proposed for use heretofore; but our invention consists in novel combinatons of devices, whereby great simplicity and certainty of action are secured, a very small movement of the solenoid-cores suffices to produce an arc in starting the light, and whereby a positive and nicely-regulated movement is imparted to the carbons at short intervals, producing a steady light of practically-uniform intensity.

In the accompanying drawings, which form part of this specification, Figure 1 is a side view of the improved lamp. Fig. 2 is a front elevation partly in section. Fig. $1^A$ is an enlarged detail illustrating the operation of the clock-movement; Fig. $1^B$, a detail of a detent that may be used to disengage the clockwork in place of the screws shown in Fig. $1^C$. Fig. $2^A$ is an enlarged detail of the lower part of the hollow standard *m*. Fig. 3 is an enlarged plan view of the lamp. Fig. 4 is an elevation, partly in section, illustrating a modified arrangement of the lower carbon-carrier; and Fig. 5 is a diagram illustrating the electrical circuits and connections.

S S′ represent solenoids, the former wound with fine wire and the latter with coarse wire. Solenoid S is placed in a derived circuit and S′ in the main circuit, as shown in Fig. 5. These solenoids rest upon a base-plate P, from which they are insulated. To said plate are also attached the hollow rods *m m′*, which support and guide the carbon-carriers.

B is a balance-beam centrally pivoted at O in ears of plate A and carrying at its ends the soft-iron cores N N′ of the solenoids S S′.

M represents the parallel side frames of the clock-movement, said frame being pivoted by means of the screws *h*, Figs. 2 and 3, in the standards H, which rest upon but are insulated from plate P.

R represents a sprocket-wheel turning on the axis *r*, which is the axis of oscillation of the entire clock-movement. This wheel, hereinafter termed the "motor-wheel," actuates a chain C*g*, from the ends of which are suspended the upper carbon-carrier G and the lower carrier G′, the latter being provided with rods *g′*, which slide in the hollow standards *m m′*. About midway of these standards is the cross-brace W, fixed thereon, as shown, and serving to give rigidity to these standards and prevent their spreading. Brace W constitutes the support for the globe W′, which is attached thereto in any suitable way.

*p p′* are the sockets or holders for the carbons C C′.

The arrangement of the carbon-carriers

may be such as shown in Fig. 4, in which the rods $g'$, to which the lower carrier G′ is attached, are maintained concentrically in the tubular rods $m\,m'$ by small guide-pins $y$. One of the rods $g'$ is also guided at the lower end of tube $m'$ by means of a contact-spring $z$, through which electrical connection is made.

E represents the anchor-escapement or other equivalent escapement of the clock-train. As shown in Figs. 1, 1$^{A}$, and 3, its upper end has a serrated surface, which when in contact with the point of screw V is held stationary. The point of screw V may be of ivory or other insulating material, as at I, Fig. 1$^{C}$, or of insulated metal, as shown at I′. An equivalent arrangement is shown in Fig. 1$^{B}$, in which the end of the escapement-lever is engaged by a comb $a$, attached to (but insulated from) plate A.

To the beam B, on one side of the fulcrum, is jointed by a pin C a connecting-rod C′, the lower end of which is pivoted by pin C$^{2}$ to an angle-plate Q, screwed to the frame M of the clock-movement. (See Figs. 1$^{A}$ and 3.) By this connection the clock-movement is turned on the center $r$ when beam B oscillates.

B′ represents a spring tending to draw down the right-hand end, Figs. 2 and 5, and to hold the escapement E in engagement with its arresting device.

In Fig. 2 a flexible conductor $w$ is shown connecting the rod $m$ with the lower carbon-carrier G′.

To explain fully the operation, reference is now made to Fig. 5, which represents the system in diagram, the carbons being separated. The current entering by post $b$ traverses the solenoid S, having the fine-wire coil, and departs by post $b'$. At this moment the core N is drawn down, depressing that end of lever B. Since lever B is connected with the clock-movement by the means described, which are represented in the diagram simply by the rod $t$, the clock-movement is lowered and caused to turn slightly on its center $r$, thereby bringing the carbons into contact. As soon as this contact is established the main current traverses the coarse-wire solenoid S′, which now oscillates lever B in the opposite direction, returning it to its first position, and the arc is thus established. As the carbons are consumed and the resistance of the air-space between the ends of the carbons increases, the current in the derived circuit containing solenoid S increases also, gradually depressing lever B until the escapement G is disengaged and the clock-movement allowed to operate and turn the motor-wheel R. The carbons are thus caused to approach but only to a very small extent, since lever B returns immediately to its normal position under the influence of solenoid S′. This operation is repeated at short intervals.

The upper carbon-carrier G constitutes the motor-weight of the lamp.

As shown in Fig. 5, the tension of spring B′ may be regulated by an adjusting-nut $v$.

We have in the drawings herein referred to described what is deemed the best embodiment of the principle of our invention; but we wish it to be understood that departures and modifications may be made without departing from the spirit of the invention.

Having now fully described our invention, what we claim, and desire to secure by Letters Patent, is—

1. The combination, with the carbon-carriers and supports adapted to slide on vertical columns, of regulating devices comprising a low-resistance solenoid in the main circuit, a high-resistance solenoid in a derived circuit, a balance-beam to the ends of which are attached the cores of said solenoids, a series of gear-wheels, a pivoted frame in which the arbors of said wheels are supported, a link connecting said frame and balance-beam, a stationary detent engaging an escapement-lever pivoted on said frame, a motor-wheel whose axis is concentric with the pivot of said frame, and flexible suspensories actuated by said wheel and supporting the carbon-carriers, substantially as described.

2. The combination of the sliding carbon-carriers, a flexible drive-chain attached at each end to one of said carriers, a toothed motor-wheel over which said chain passes directly from said suspensories, a clock-movement geared to said wheel, a frame pivoted on the axis of said wheel and carrying said clock-movement, an escapement-lever adapted to engage a stationary serrated surface, and means, as indicated, for oscillating the frame to release and engage said escapement, substantially as described.

3. The combination of the sliding carbon-carriers, the drive-chain attached at each end to one of said carriers, the toothed motor-wheel over which said chain passes directly from said carriers, a clock-movement pivoted on the axis of said motor-wheel, a low-resistance solenoid in the main circuit, a high-resistance solenoid in a derived circuit, a balance-beam to the ends of which the cores of said solenoids are attached, a connection between said frame and balance-beam, and escapement mechanism, substantially as described.

4. The combination of the pivoted clock-movement provided with escapement mechanism, a toothed motor-wheel concentric with the pivot of said clock-movement, a chain passing over said motor-wheel direct to the carbon-carriers, one of which is attached to each end, a balance-beam connected to said pivoted movement, and two solenoids, one in the main circuit and one in a derived circuit, for oscillating said beam, substantially as described.

5. The combination of the tubular vertical columns, an upper carbon-holder sliding exteriorly on said columns, a lower carbon-holder having rods guided within said tubes, a toothed motor-wheel, a drive-chain passing over said wheel directly to said carbon-hold-

ers, to which its opposite ends are respectively attached, a clock-movement in a frame pivoted on the axis of said motor-wheel, and means, as specified, for oscillating said frame and releasing said clock-movement as the carbons are consumed, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HENRI JAPY.
OSCAR HELMER.

Witnesses:
ARISTIDE FAUGE,
EMILE DARRYL.