No. 684,785. Patented Oct. 22, 1901.

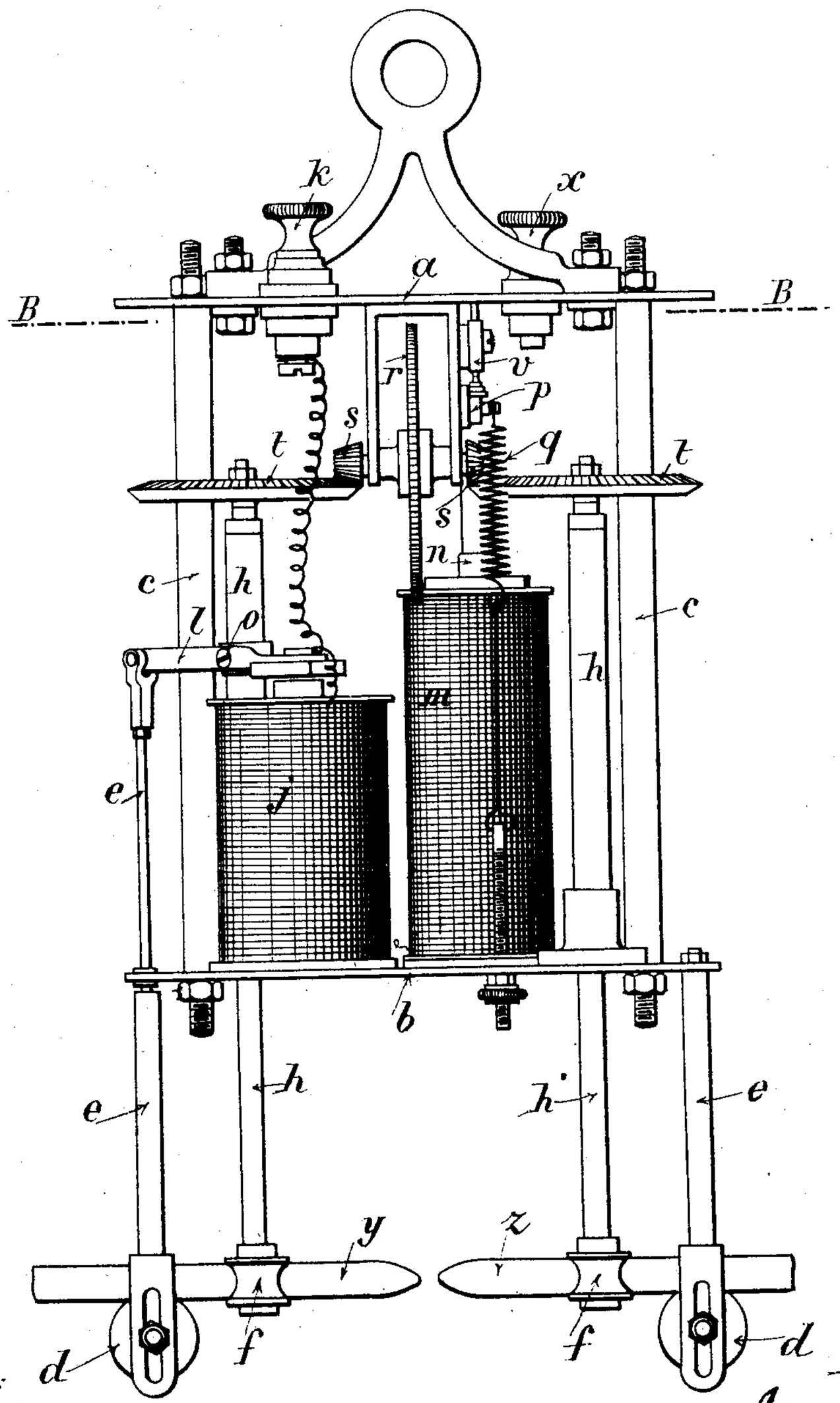
J. BOUILLET.

ELECTRIC ARC LAMP.

(Application filed Dec. 20, 1899. Renewed Mar. 16, 1901.)

(No Model.) 5 Sheets—Sheet 1.

FIG. 1.



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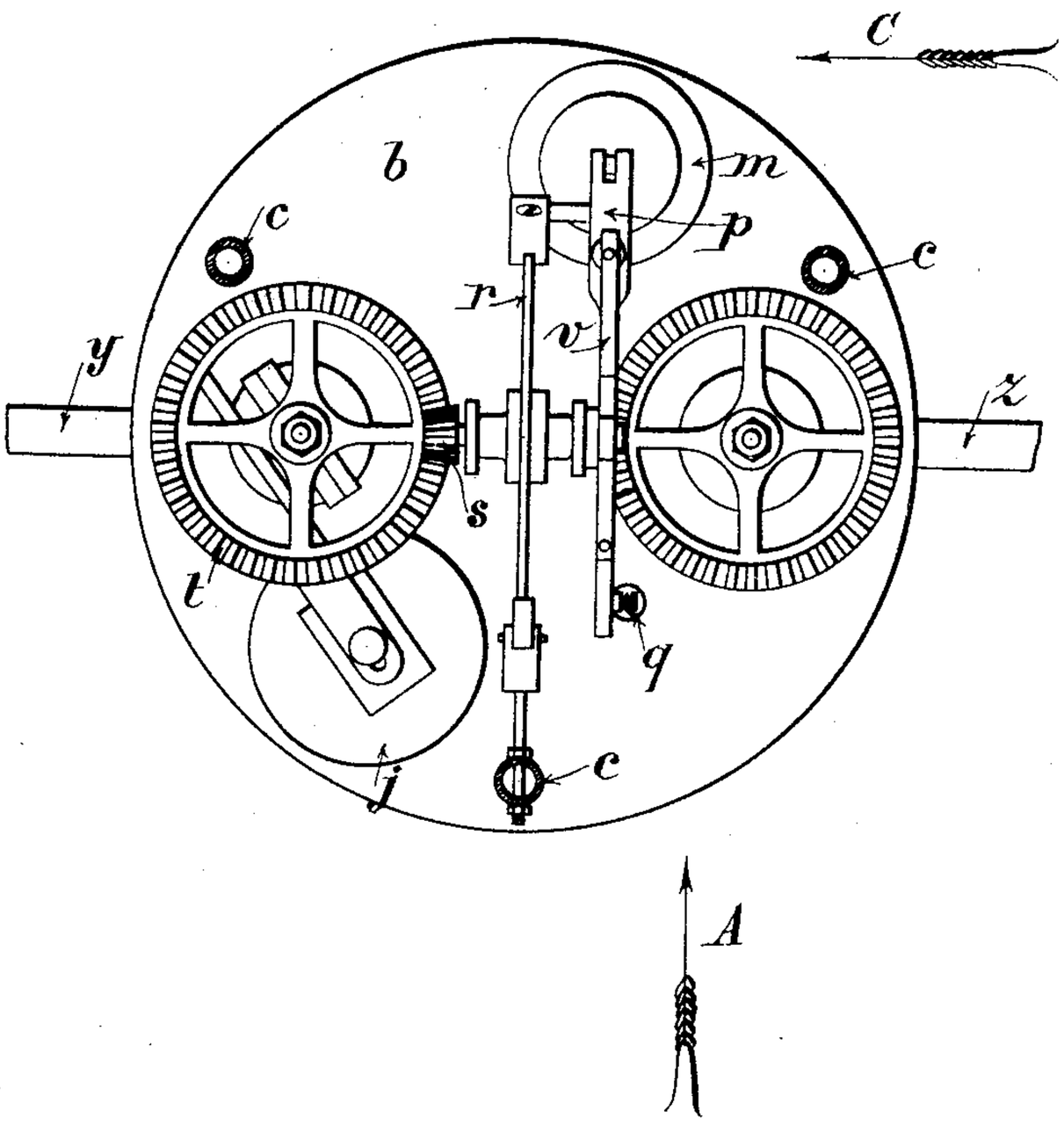
(No Model.) 5 Sheets—Sheet 2.

FIG. 2.



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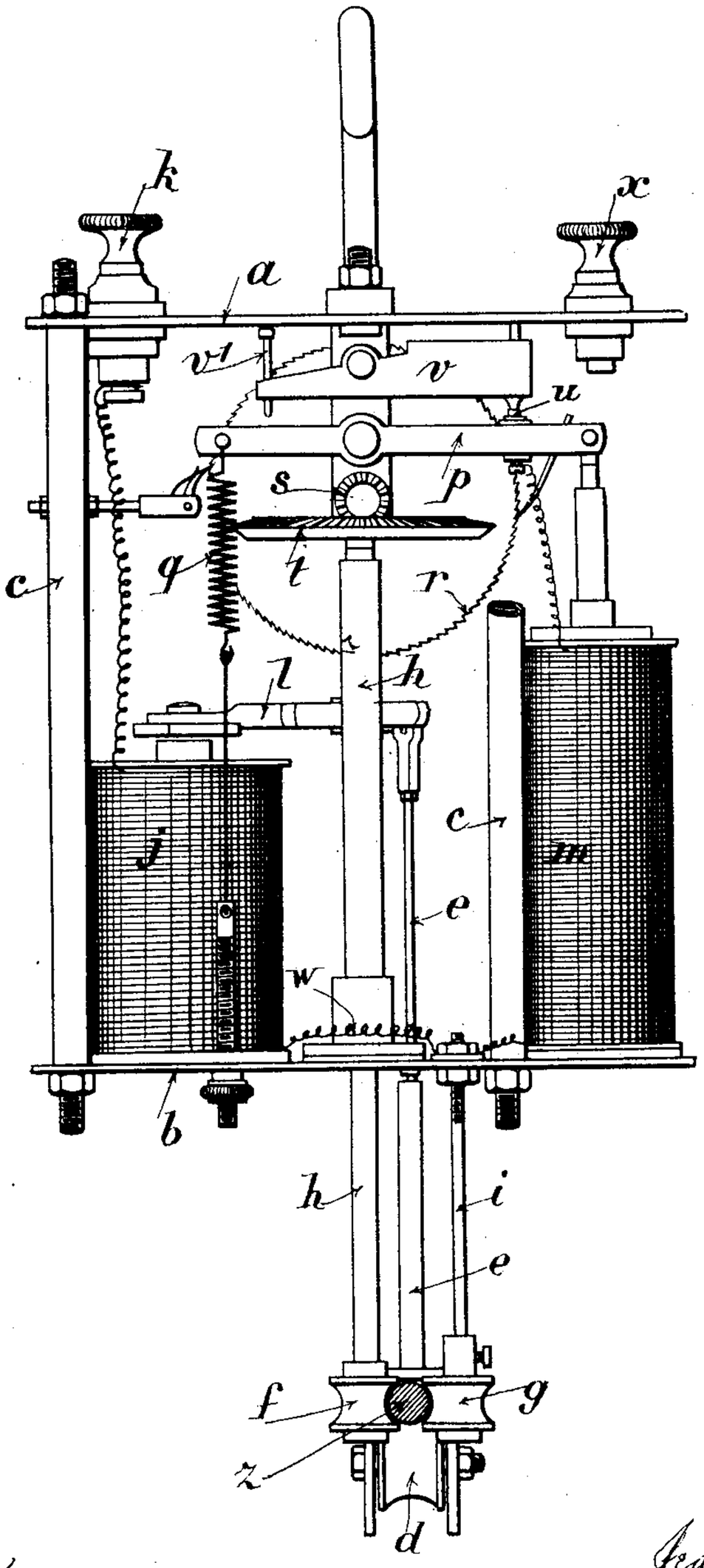
(No Model.) 5 Sheets—Sheet 3.

FIG. 3.



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No. 684,785. Patented Oct. 22, 1901.

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ELECTRIC ARC LAMP.

(Application filed Dec. 20, 1899. Renewed Mar. 16, 1901.)

(No Model.) 5 Sheets—Sheet 4.

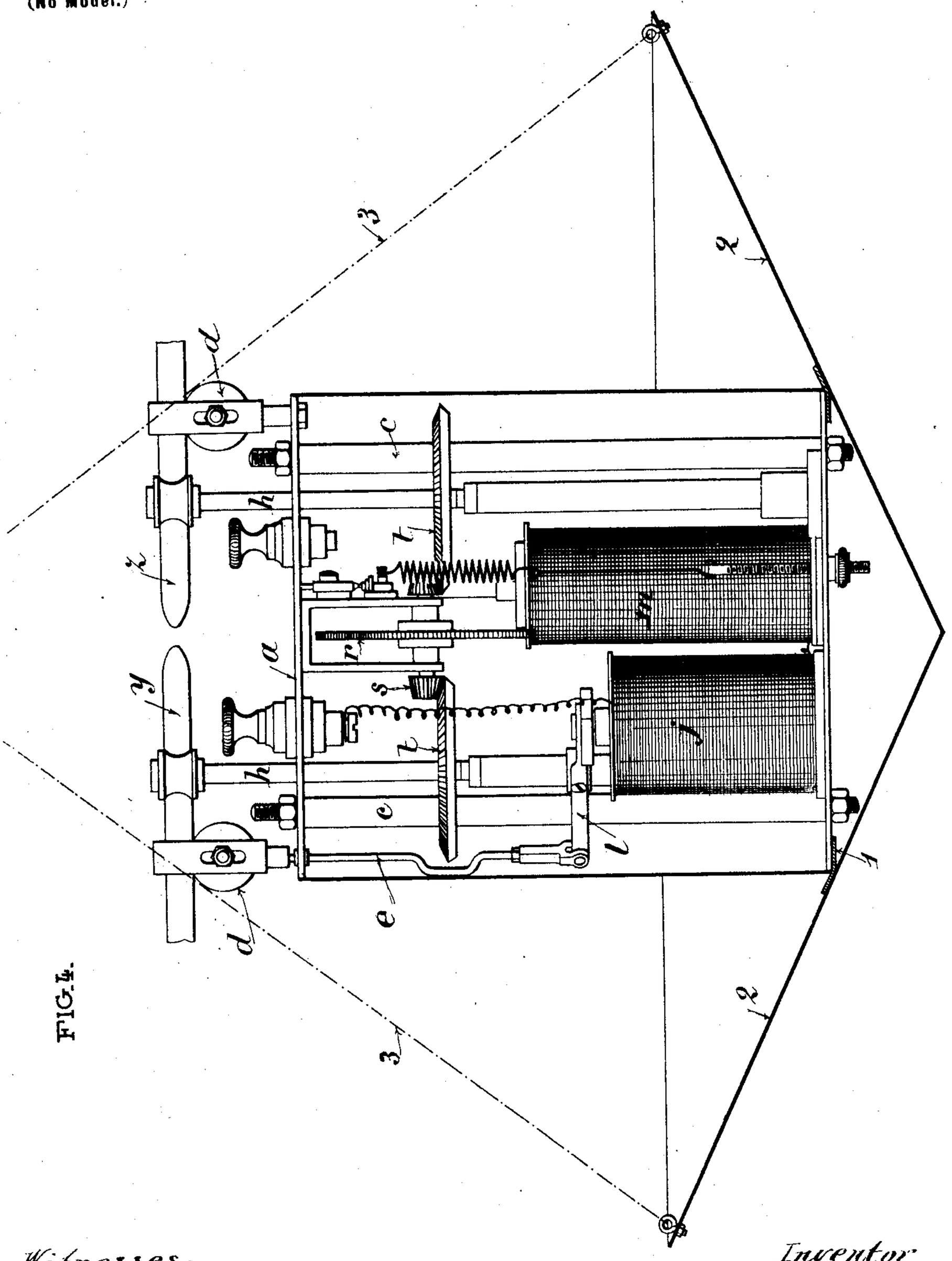

FIG. 4.

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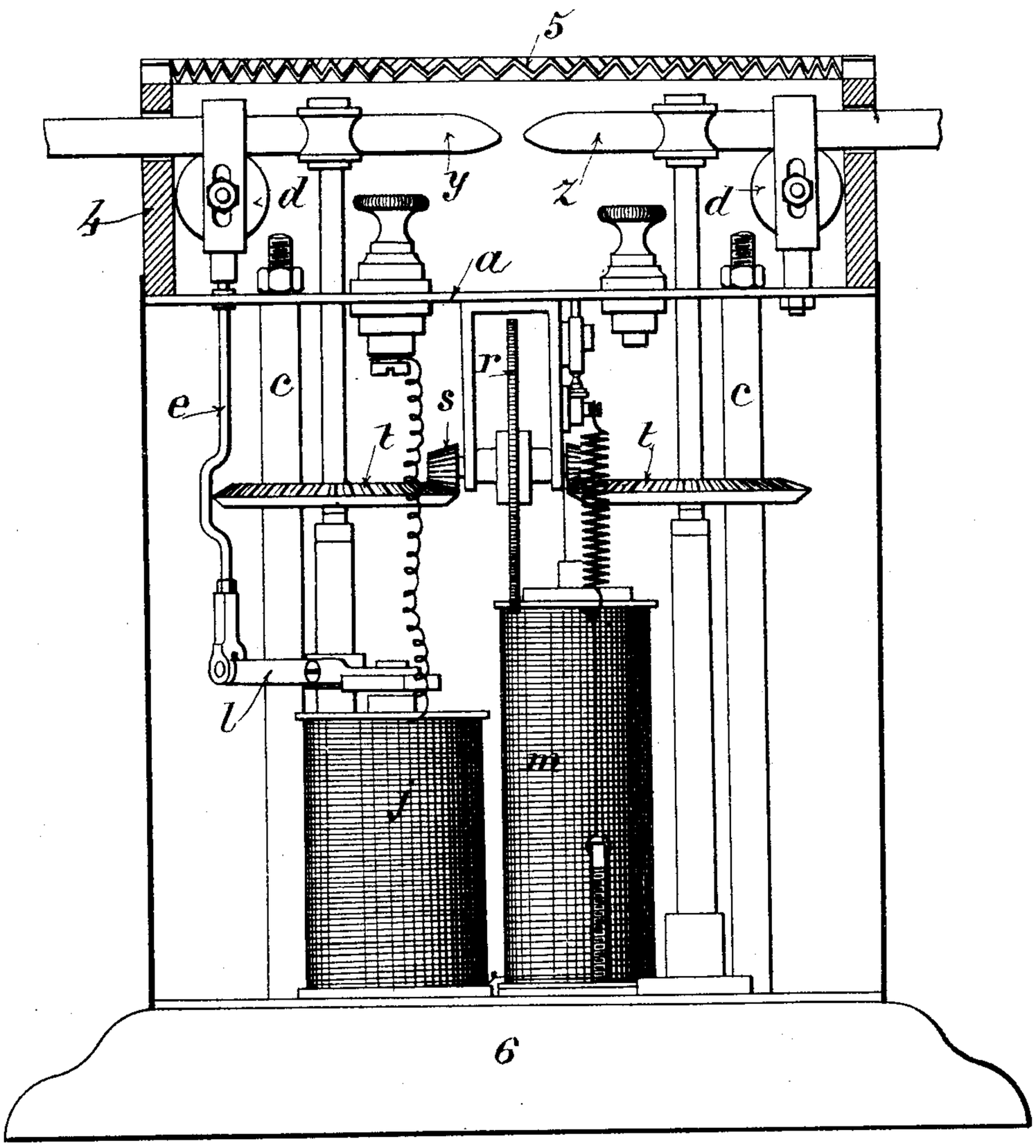
ELECTRIC ARC LAMP.

(Application filed Dec. 20, 1899. Renewed Mar. 16, 1901.)

(No Model.) 5 Sheets—Sheet 5.

FIG5.



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UNITED STATES PATENT OFFICE.

JEAN BOUILLET, OF LEVALLOIS-PERRET, FRANCE.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 684,785, dated October 22, 1901.

Application filed December 20, 1899. Renewed March 16, 1901. Serial No. 51,531. (No model.)

To all whom it may concern:

Be it known that I, JEAN BOUILLET, electrician, a citizen of the Republic of France, and a resident of Levallois-Perret, (Seine,) France, have invented certain new and useful Improvements in or Relating to Electric Lighting or Heating Apparatus, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof, in which similar characters of reference indicate corresponding parts.

This invention relates to an improved electric apparatus applicable as an ordinary arc-lamp, as a reflecting ceiling-lamp, or as a heating-stove in which there is no delicate and complicated mechanism liable to get out of order. I preferably arrange the carbons horizontally, which allows the same to be readily and easily inserted in place, assuring illumination without the possibility of the carbons jamming and a regular and faultless action.

In the accompanying drawings, Figures 1 to 3 represent fully a specimen of construction of my electric apparatus employed as an ordinary arc-lamp. Fig. 1 is an elevation view of the lamp, taken according to the direction of the arrow A, Fig. 2. Fig. 2 is a sectional plan view, the section being made through the line B B of Fig. 1. Fig. 3 is an elevation view of the lamp, taken according to the direction of the arrow C, Fig. 2. Fig. 4 shows the arrangement of my apparatus applied as a reflecting ceiling-lamp. Fig. 5 is a sectional elevation of the arrangement of this apparatus applied as a heating-stove.

The regulating mechanism remaining the same in the three applications, I will describe it with reference to Figs. 1 to 3.

The mechanism comprises, essentially, a frame formed by two horizontal plates *a* and *b*, connected by columns or rods *c*, which carry the various parts of the device, consisting of the carbon-carriers, the illuminating arrangement, and the regulating mechanism. Each carbon-carrier consists of a vertical roller *d*, mounted in a bracket fixed at the lower extremity of a vertical rod *e*, and two horizontal rollers *f g*, placed opposite one another and in advance or between the said vertical rollers *d*. The roller *f* is mounted on the lower extremity of a vertical rod *h*, which passes freely through the lower plate *b* of the frame and which can receive at its upper extremity a movement of rotation. The other horizontal roller *g* is mounted freely on an elastic rod *i*, carried by the lower plate *b*, and which tends to make the two horizontal rollers constantly approach one another. The carbons are carried by the vertical and horizontal rollers, which are grooved for this purpose and are perfectly supported and guided, and if the rods *h* are rotated at the same rate of speed and in reverse direction to one another it can be understood that these rollers simultaneously moving the two carbons the same will approach one another in a simple manner in proportion to their use. The rotation of the rods *h* is governed by the regulating mechanism, which will hereinafter be explained.

The illuminating arrangement comprises a bobbin *j*, connected to an insulated terminal screw *k*, and a horizontal lever *l*, pivoted at *o* to a fixed support of the frame. This lever carries at one of its ends an armature for the bobbin and at its other end is articulated to the rod *e*, carrying the corresponding roller *d*. This rod *e* is mounted freely in the lower plate *b* of the frame and can receive an up-and-down movement, while the other rod *e*, carrying the opposite vertical roller, is rigidly fixed to the said plate. By this arrangement when the current passes through the bobbin *j* the armature of the same is attracted and in consequence lifts the rod *e* and the corresponding vertical roller *d*, which has the result of slightly tilting one of the carbons in a vertical plane to its line of support and displacing the extremities of the carbons, so that the electric arc can be formed.

The regulating mechanism consists of a bobbin *m*, having a movable core *n*, articulated to one end of a horizontal pivoted pawl-lever *p*, at the other end of which is a spring *q*, which tends to maintain the core in the lifted position. A ratchet-wheel *r*, carried by a bracket mounted on the frame, has on each end of its axle a conical toothed wheel *s*, which transmits the movement of the ratchet-wheel to two beveled wheels *t*, arranged at the upper extremities of the rods *h*, carrying the horizontal rollers *f*. The bobbin is fed with the current by a wire from the illuminating-bobbin. This current after hav-

ing traversed the bobbin *m* passes to a piece *u*, mounted on the pivoted pawl-lever *p* and insulated therefrom, and from there by the intermediary of a balanced contact *v* to a terminal *x*, fixed on the upper plate of the apparatus.

The apparatus works as follows: At the moment of illuminating—that is to say, at the moment where the interrupter which governs the lamp is opened—the current, entering by the insulated terminal *h*, traverses the illuminating-bobbin *j*, the insulated carbon-carrier *h*, the carbon *y*, and the carbon *z*, which were in contact, and then passes to the second terminal *x* through the carbon-carriers which are not insulated. At the going out of the bobbin *j* a derivation of the current passes, as hereinbefore described, to the regulating-bobbin *m*, traverses said bobbin, and by the intermediary of a contact-piece returns to the second terminal *x*. The current which passes through the illuminating-bobbin attracts the armature of the horizontal lever *l* and causes the tilting of one of the carbons, as hereinbefore explained, with an insignificant effort, and consequently the separating of the ends of the two carbons if they are in contact, and renders thus the jamming quite impossible. The arc is then formed and there cannot be any uncertainty. As the distance between the carbons augments on account of their wear the electric resistance augments, and the intensity of the derivation-current which traverses the regulating-bobbin augments sufficiently to make said bobbin attract the core *n*, and this produces a rotation of the ratchet-wheel *r* by means of the pawl-lever *p*. This rotation is transmitted by the pinions *s l* to the rollers *f*, which will force the carbons to approach one another. In proportion as the core *n* is attracted the balanced lever *v* continues to rest by its own weight on the contact-piece *u* and the circuit remains closed until the adjustable projection *v'* of said lever arrives to the upper plate *a*. At this moment the contact-piece *u* abandons the lever *v* and the circuit is broken. The action of the bobbin *m* on the core *n* ceasing instantaneously, this core is lifted up by the medium of the spring *q*, connected to the lever *p*, and the system is in the same position as before, so that if the carbons are yet too far apart the same phenomena will recommence till said carbons are suitably approached one from the other. This regulating mechanism is perfectly sensible and requires a very small effort to be operated. The gearing transmission and the rigid rods assure also the indefinite working of the mechanism with a perfect precision and without being liable of getting out of order. The spring *q* is adjustable. By it is found the intensity of the current traversing the bobbin *m*. This current actuates the step-by-step mechanism by which the carbons are moved toward each other and must be sufficient to operate the mechanism.

In the illuminating arrangement, the effort to be overcome by the bobbin for the separation of the carbons being very small, said bobbin will need a much smaller quantity of wire than the illuminating-bobbins of the present lamps.

In the application of the invention as a reflecting ceiling-lamp or as a stove, Figs. 4 and 5, the carbons are placed on the upper plate of the apparatus. It is sufficient in this case to prolong the carbon-carrying rods upward. The carbon-carrying rods *h*, on which are fixed the conical wheels *t* and which receive at their upper extremity the horizontal rollers *f*, turn in sockets mounted on the lower plate *b* of the frame.

In the case of the ceiling-lamp, Fig. 4, the body of the mechanism rests, by means of its lower plate *b*, on the horizontal flange of an angle-iron 1, fixed on the interior face of an inverted reflector or shade 2, which is suspended from the ceiling by means of chains 3 or the like. By this means all the light of the arc is projected on the ceiling, which reflects it, lighting the room in a uniform manner, the lamp causing no shadow.

In the case of an electric stove, Fig. 5, a circular piece of refractory material 4 rests upon the upper plate *a* in any suitable manner and is provided with two holes for the passage of the carbons. On its upper border a metallic covering 5 is arranged, provided with indentations or corrugations, on which the utensils to be heated are placed. The lower part of the stove is provided with a hollow metallic base *b*, which serves as a stand. In this construction I can arrange the rheostat mechanism directly on this base. I can also arrange the resistance in the refractory circular part 4. It is sufficient to provide the latter with a carbon block, for example, in the interior of which is embedded an iron wire. By the passage of the current the refractory block is warmed and forms thus a heat-recuperator. Further, I can juxtapose a certain number of my apparatus and fix the whole in the same frame in order to form a heater of longitudinal shape.

In its various applications my electric apparatus can work with continuous current or alternate current by the mere changement of the regulating-bobbin. If the current be alternate, the carbons having the same diameter and the two series of rollers being alike, the two carbons will simultaneously advance at the same speed, and so the focus of light will be stationary. If the current be continuous and the positive carbon be thicker, the rollers which move it will act upon it with a greater circumferential contact than the rollers which move the negative carbon, so the advance of the carbons will be proportioned to the wear and a stationary focus of light will be maintained.

The placing of the carbons is extremely simple and the proper position of said carbons is assured without the necessity of a center-

ing device by means of the arrangement itself of the carbon-carriers.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In an arc-lamp having horizontal carbons, each carbon being supported by a vertical roller and guided between a pair of horizontal rollers, the combination of an arc-striking means consisting of a vertically-movable rod carrying one of the vertical rollers, and actuated by a magnet in the arc-circuit to tilt one of the carbons and establish the arc, with means for feeding the carbons consisting of rods rotating the horizontal rollers, geared together and actuated by a step-by-step mechanism controlled by a magnet in a shunt-circuit about the arc, all substantially as and for the purpose set forth.

2. In an arc-lamp, having horizontal carbons, each carbon being supported by a vertical roller, and guided between a pair of horizontal rollers, the combination of an arc-striking means, consisting of a vertical movable rod carrying one of the vertical rollers, and actuated by one of the magnets in the arc-circuit, to tilt one of the carbons and establish the arc, with means for feeding the arc-carbons, consisting of the bobbin *m*, through which passes the shunt-current about the bobbin *j*, the carbons, and the arc, and which attracts the armature *n*, when the carbons are too far apart, and the resistance is sufficiently increased, and by means of intermediate mechanism, causes the ratchet-wheel *r*, to partially rotate, transmitting its motion by the wheels *s*, and *t*, to the rod *h*, on the lower end of which are mounted the rollers which guide and support the carbons, and forcing the carbons to approach each other, step by step, as required, to maintain a stationary focus of light, all substantially as and for the purpose set forth.

3. In an arc-lamp, arranged as a reflecting ceiling-lamp, having horizontal carbons, each carbon being supported by a vertical roller and guided between a pair of horizontal rollers, the combination of an arc-striking means consisting of a vertical movable rod carrying one of the vertical rollers and actuated by a magnet in the arc-circuit, to tilt one of the carbons and establish the arc, and means for feeding the arc-carbons consisting of rods rotating the horizontal rollers, geared together and actuated by a step-by-step mechanism controlled by a magnet in a shunt-circuit about the arc, with an inverted reflector suspended from the ceiling, and the angle-iron 1, fixed on the interior face of said reflector and carrying the frame by which the mechanism of said lamp is supported, all substantially as and for the purpose set forth.

4. In an arc-lamp arranged for a stove, having horizontal carbons, each carbon being supported by a vertical roller, and guided between a pair of horizontal rollers, the combination of an arc-striking means consisting of a vertically-movable rod carrying one of the vertical rollers, and actuated by a magnet in the arc-circuit, to tilt one of the carbons and establish the arc, and means for feeding the arc-carbons consisting of rods actuating the horizontal rollers, geared together and actuated by a step-by-step mechanism controlled by a magnet in the shunt-circuit about the arc, with a hollow metallic base on which rests the mechanism and which supports the stove, a circular piece of refractory material pierced and arranged with two opposite holes for the passage of carbons, and a metallic covering upon the upper edge of said refractory piece, all substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 5th day of December, 1899.

JEAN BOUILLET.

Witnesses:
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ANTOINE LAVOIX.