No. 696,807. Patented Apr. 1, 1902.

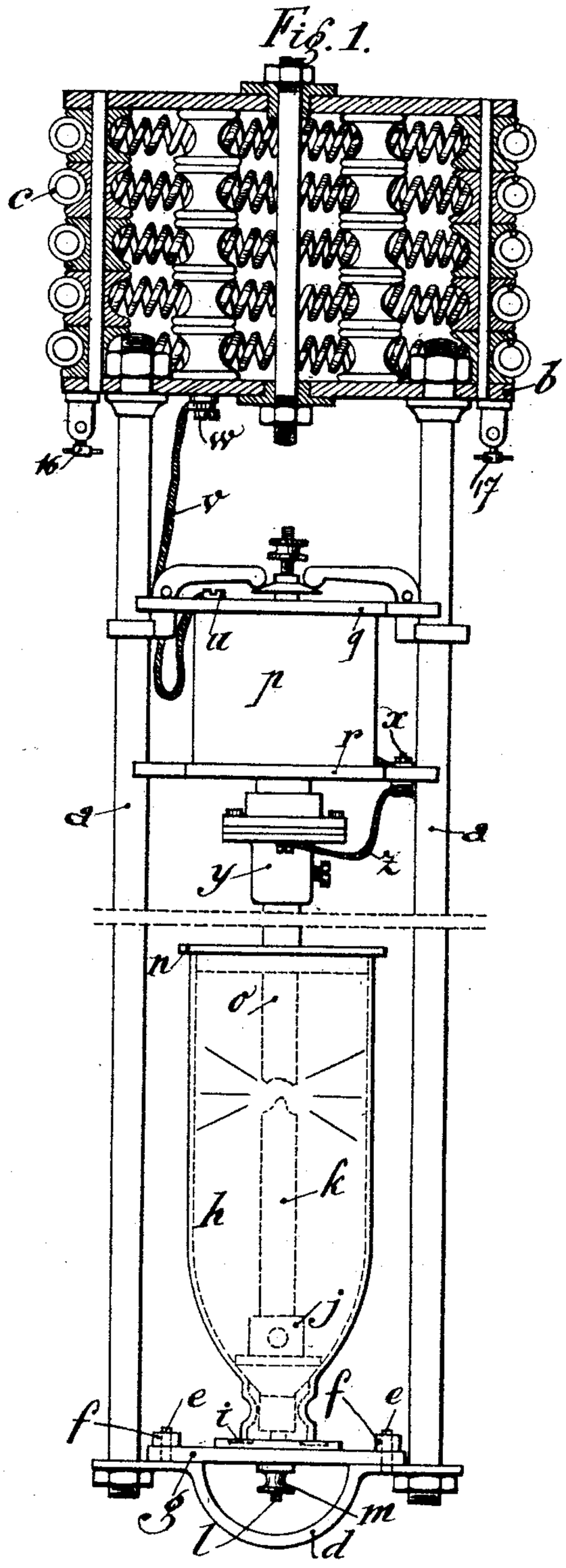
R. FROMENT.

ELECTRIC ARC LAMP.

(Application filed Sept. 7, 1901.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



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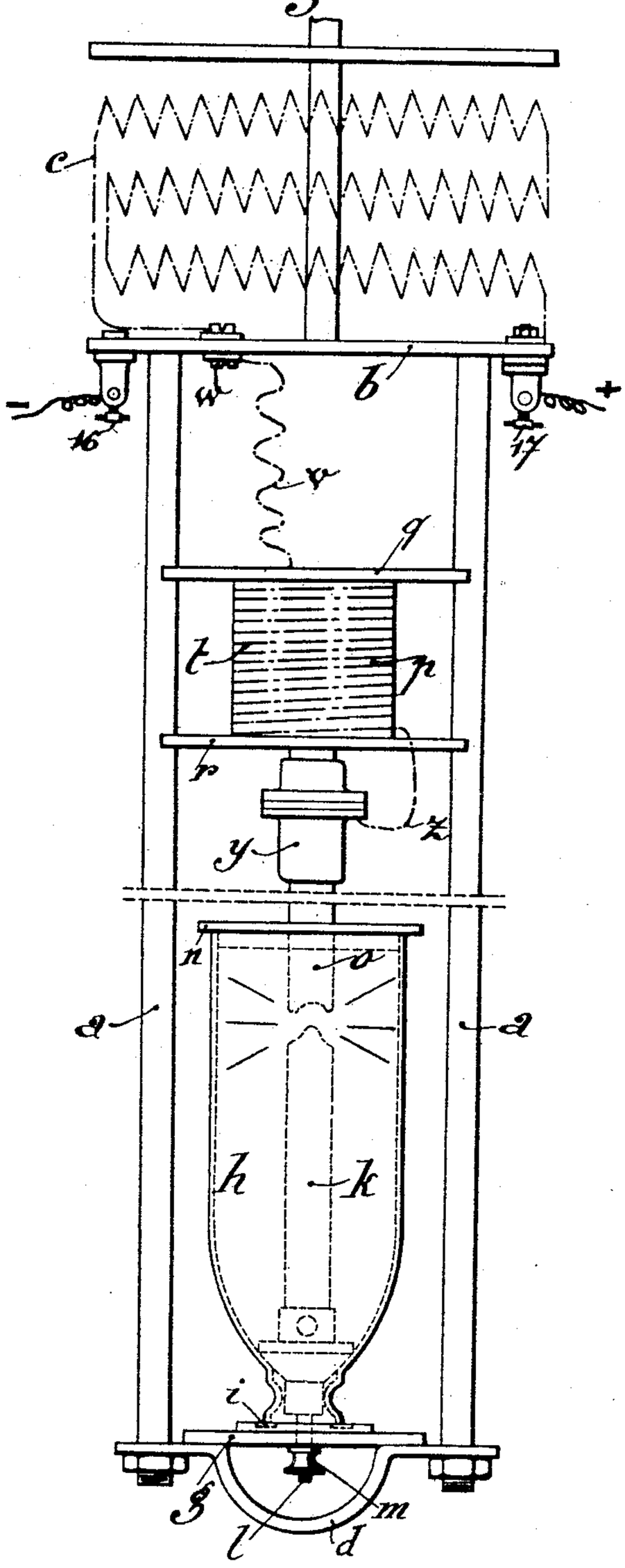
(No Model.) 4 Sheets—Sheet 2.

Fig. 2.



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(No Model.) 4 Sheets—Sheet 3.

Fig. 3.

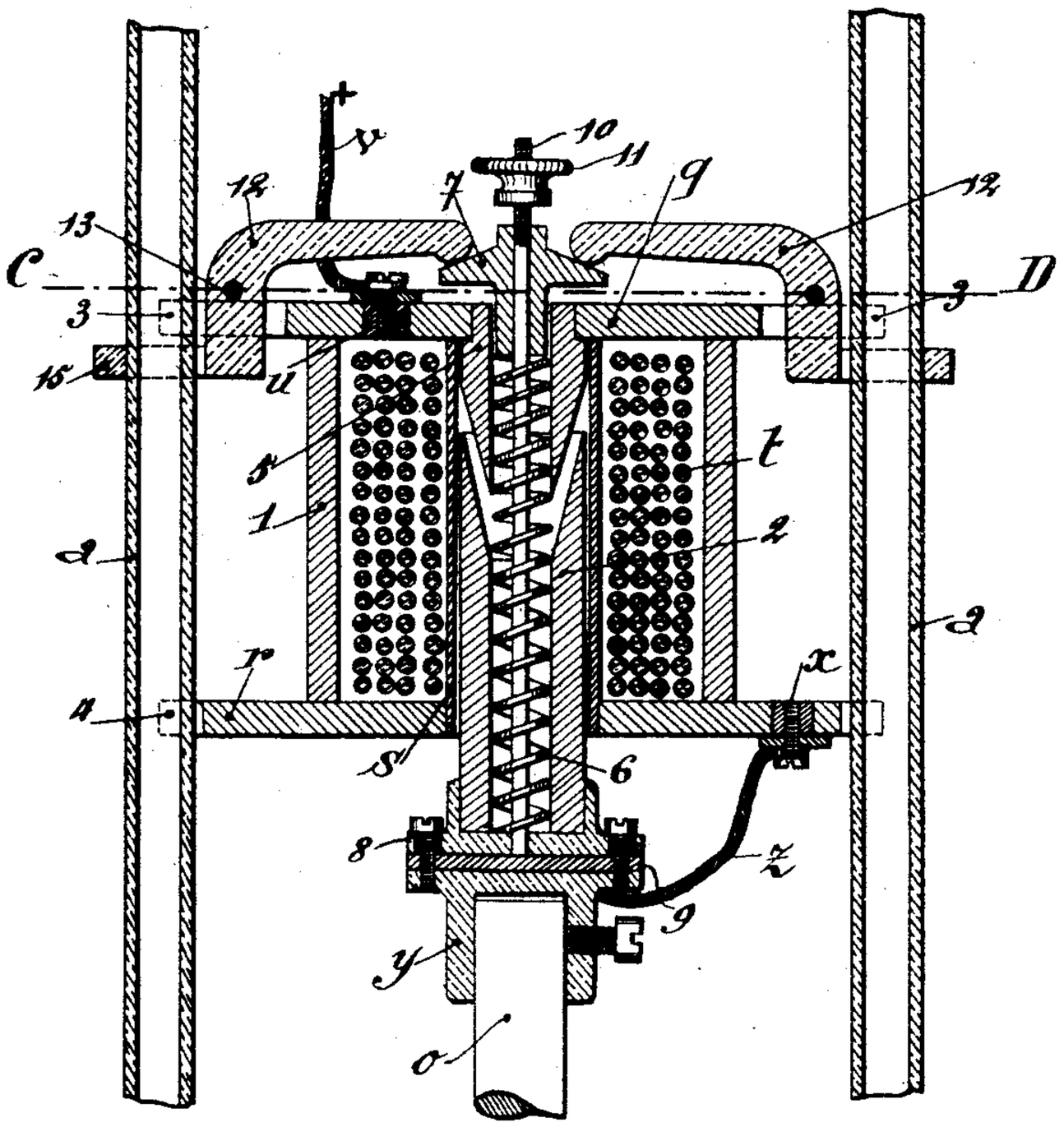

Fig. 4.

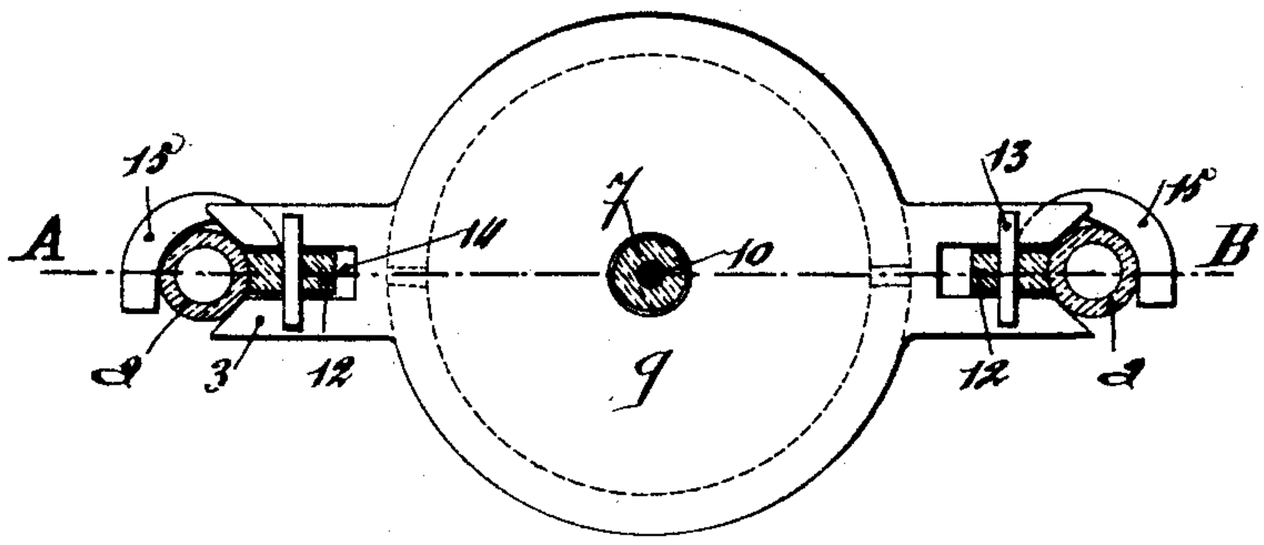

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Fig. 5.

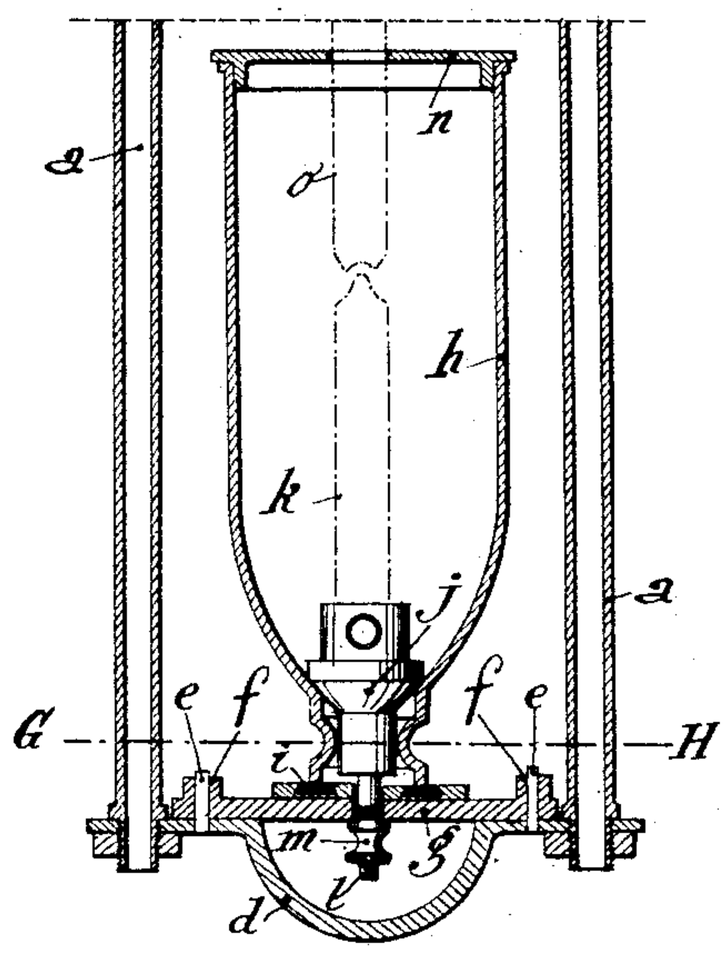
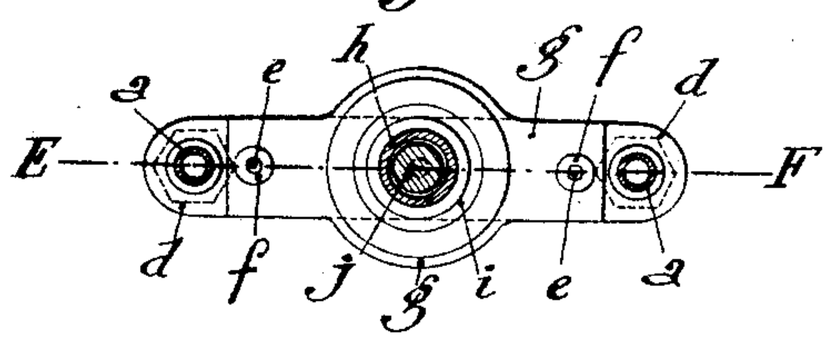


Fig. 6.



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UNITED STATES PATENT OFFICE.

RENÉ FROMENT, OF PARIS, FRANCE.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 696,807, dated April 1, 1902.

Application filed September 7, 1901. Serial No. 74,684. (No model.)

To all whom it may concern:

Be it known that I, RENÉ FROMENT, a citizen of the Republic of France, and a resident of Paris, France, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a full, clear, and exact specification.

This invention relates to electric-arc lamps; and in order that my invention may be readily understood and carried into effect I will describe the same fully with reference to the accompanying drawings, in which—

Figure 1 is an elevation of my improved lamp, the rheostat arranged above it being shown in axial section. Fig. 2 is a diagrammatic representation of the electric circuit. Fig. 3 is a vertical section, upon a larger scale, of the regulator on the line A B of Fig. 4. Fig. 4 is a horizontal section through the same on the line C D of Fig. 3. Fig. 5 is a vertical section upon line E F of Fig. 6. Fig. 6 is a horizontal section on line G H of Fig. 5.

According to my invention the guide-frame of the lamp is constituted by two metal rods or tubes *a a*, stayed at their upper portion by means of a plate *b*, upon which is fixed an adjustable rheostat *c*, and at their lower portion by a cross-piece *d*, suitably curved and provided with two pins *e e*, upon which are engaged corresponding sleeves *f f* on a plate *g*, supporting the closed vessel *h*. This latter is restricted at its lower portion, the extremity of which is pressed upon an asbestos washer *i* upon the plate *g* by means of a part *j*, serving as support for the lower carbon *k*, and which is provided with a screw-threaded rod *l*, upon which is screwed a nut *m*, which is preferably milled. Owing to this method of assemblage the vessel *h* is quite hermetically closed at its lower portion, while its upper portion is simply closed by means of a removable metal cover *n*, perforated with a central aperture in which the upper carbon *o* is freely guided.

The regulator comprises an electromagnet *p*, consisting of two iron washers *q r*, forming the cheeks, and which are united by a central sleeve *s*, preferably of copper, around which are wound a suitable number of convolutions of an electric wire *t*. One of the extremities of this wire terminates at the insulated terminal *u*, connected by a flexible wire *v* to the terminal *w* of the rheostat *c*. The other extremity of the wire is connected to the insulated terminal *x*, in connection with the support *y* of the upper carbon *o*, by means of a flexible wire *z*. The convolutions of the wire *t* are surrounded by an iron casing 1 in two parts, which serves to concentrate at the center of the electromagnet the magnetic flux developed and in addition offers a path permeable to the lines of force, thereby permitting of a regular displacement of the movable core 2 under a constant force.

The two washers *q r* are provided with lugs 3 4, terminating in portions formed with a V-shaped recess, in which the rods *a* of the guide-frame are engaged. The upper washer *q* is provided with a central conical iron core 5, in which is drilled an opening in which is arranged a certain length of spiral spring 6, adjustable as to tension and adapted to be compressed between a movable cap 7 and the base-plate 8. Within this latter is lodged the lower extremity of an iron core 2, displaceable within the sleeve *s*, in which is formed a cavity having the shape of a truncated cone of the same form as the lower portion of the upper core 5.

The base-plate 8 and the carbon-holder *y* are suitably connected, but are electrically insulated one from the other by means of an asbestos washer 9 and small ebonite sleeves. In addition to this the base-plate 8 is provided with a central rod 10, passing through the movable cap 7 and terminating in a screw-threaded portion upon which is screwed an adjustable nut 11, preferably milled, permitting of the suspension of the core 2 and of the carbon 9.

The movable cap 7, the upper portion of which is preferably conical, is in constant contact with two tappets or brakes 12, each of which is traversed by a pivot 13, resting freely upon the washer *q*, in the grooves 14 of which the tappets may be displaced in the radial direction of the regulator in order to allow for differences which may exist in the interval separating the rods *a a*. Upon these latter are adapted to slide the hook-shaped extremities 15 of the tappets 12, Figs. 3 and 4.

The lamp is completed by a suitable suspension device and by terminals 16 and 17, to which are attached the extremities of the wires closing the circuit.

The operation of the lamp thus coustruct-

ed is as follows: Assuming the lamp to be in the condition of repose, when the carbon *o* will rest upon the carbon *k*, as soon as the current is sent into the lamp through the terminal 17, the rheostat *c*, the electromagnet *p*, the carbons, the cross-piece *d*, the rods *a*, and the terminal 16, Figs. 1 and 2, the magnetic field developed in the electromagnet *p* attracts the core 2, and consequently causes the carbon *o* to rise at the same time that the spring 6 lifts the cap 7, which causes the tappets 12 to oscillate and wedge the hooks 16 upon the rods *a a*, which results in rendering the regulator as a whole motionless. The arc is then formed between the carbons, which wear gradually. The distance separating them increasing owing to this wear, the intensity of the current diminishes, as does also the attractive force of the cores 2 and 5. Thereupon the spring 6, bearing upon the cap 7, pushes forward the carbon *e* by degrees; but when its tension is sufficiently reduced the cap 7 descends, and the tappets 12 being no longer wedged upon the rods *a* the regulator as a whole, sliding upon these rods, descends until the intensity of the current has again become normal and the tappets are again wedged. It is therefore apparent that owing to the action of the lower core 2 perfect regulation of the intensity is obtained, since this latter is inversely proportional to the interval separating the carbons. It follows from this that if this interval increases the spring 6, becoming preponderating, causes the carbons to approach each other; but if, owing to a too-pronounced sliding of the regulator, the interval between the carbons is too small the attraction becomes the preponderating factor, the interval is increased, and the intensity again becomes normal. An absolutely-fixed light is thus obtained.

The advantages of my invention may be summed up as follows:

First. The mechanism is very simple and its operation absolutely certain. On the other hand, the arrangement of the axes of the tappets 12, which rest freely upon the upper washer, permits these tappets to follow the variations in the interval between the rods *a* in such a manner that the manufacture of these parts does not call for absolute precision, while all danger of stoppage in the operation of the lamp is obviated.

Second. The tightening of the lower portion of the globe upon the asbestos washer *i* effects an absolutely hermetic closing, while at the same time mounting and dismounting may be readily effected, a condition which is especially advantageous for inclosed-arc lamps. In addition to this the replacement and cleaning of the inclosing vessel or globe may be effected very readily, as it is only necessary to release the carbon *o* in lifting the regulator and to withdraw the sockets *f* from the pins *e*, upon which they are fixed, thereby permitting not only ready changing of the lower carbon, but also enabling the globe to be cleaned at leisure after having replaced it, if necessary, by a clean globe ready mounted.

Third. The general arrangement above described of regulation and mounting is applicable equally well to arc-lamps burning in the open air as to inclosed-arc lamps, and the apparatus may be appropriately surrounded by a trellis or other protecting device adapted to it in any suitable manner.

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. An electric-arc lamp, a regulator comprising the combination of an electromagnet, a lower central core movable within said electromagnet and rigidly connected with but electrically insulated from the upper carbon, a counter-spring lodged in the said core and adapted to be compressed between this latter and a movable cap arranged above and in the axis of the electromagnet, two brakes pivoted and bearing upon the movable cap and adapted to wedge the guide-rods in such a manner that the tension of the spring combined with the attraction of the core permits of fixing the regulator or of causing it to slide as a whole in order to maintain constant the interval separating the carbons and consequently the intensity of the current.

2. An arc-lamp, comprising a pair of guide-rods, a frame slidably mounted upon said guide-rods and provided with friction-brakes for engaging the same, a solenoid provided with a member for modifying the magnetic field, an armature made in sections, one of which is stationary relatively to said solenoid and the other movable relatively thereto, brakes mounted upon said frame and connected with said movable section of said armature, means for mounting a carbon upon said movable section and for connecting another carbon with said guide-rods, and means for supplying an electrical current to said solenoid and said carbons.

3. An arc-lamp comprising a pair of guide-rods, a frame slidably mounted thereon, a cap loosely mounted upon said frame and movable relatively thereto, an electrically-operated device for actuating said cap relatively to said frame, brake-shoes carried by said frame and normally free to grip said guide-rods, levers connected with said brake-shoes and provided with free ends, said free ends resting loosely upon said cap to compensate virtual differences in the space between said guide-rods at various points.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

RENÉ FROMENT.

Witnesses:
GRISON BROUSSAC,
EDWARD P. MACLEAN.