(No Model.)

E. & F. W. HEYMANN.

ELECTRIC LAMP.

No. 348,972. Patented Sept. 14, 1886.

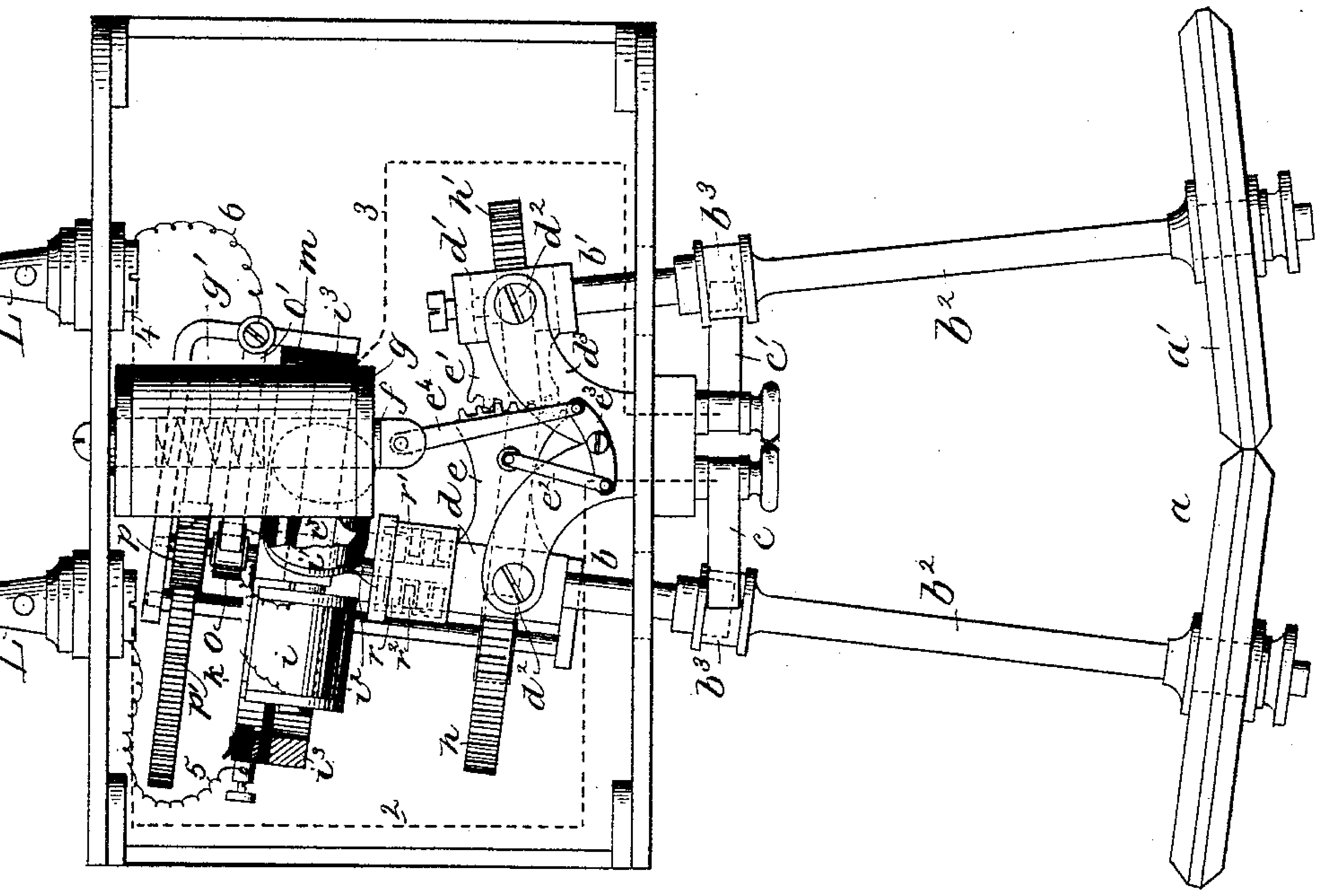

Fig. 1.

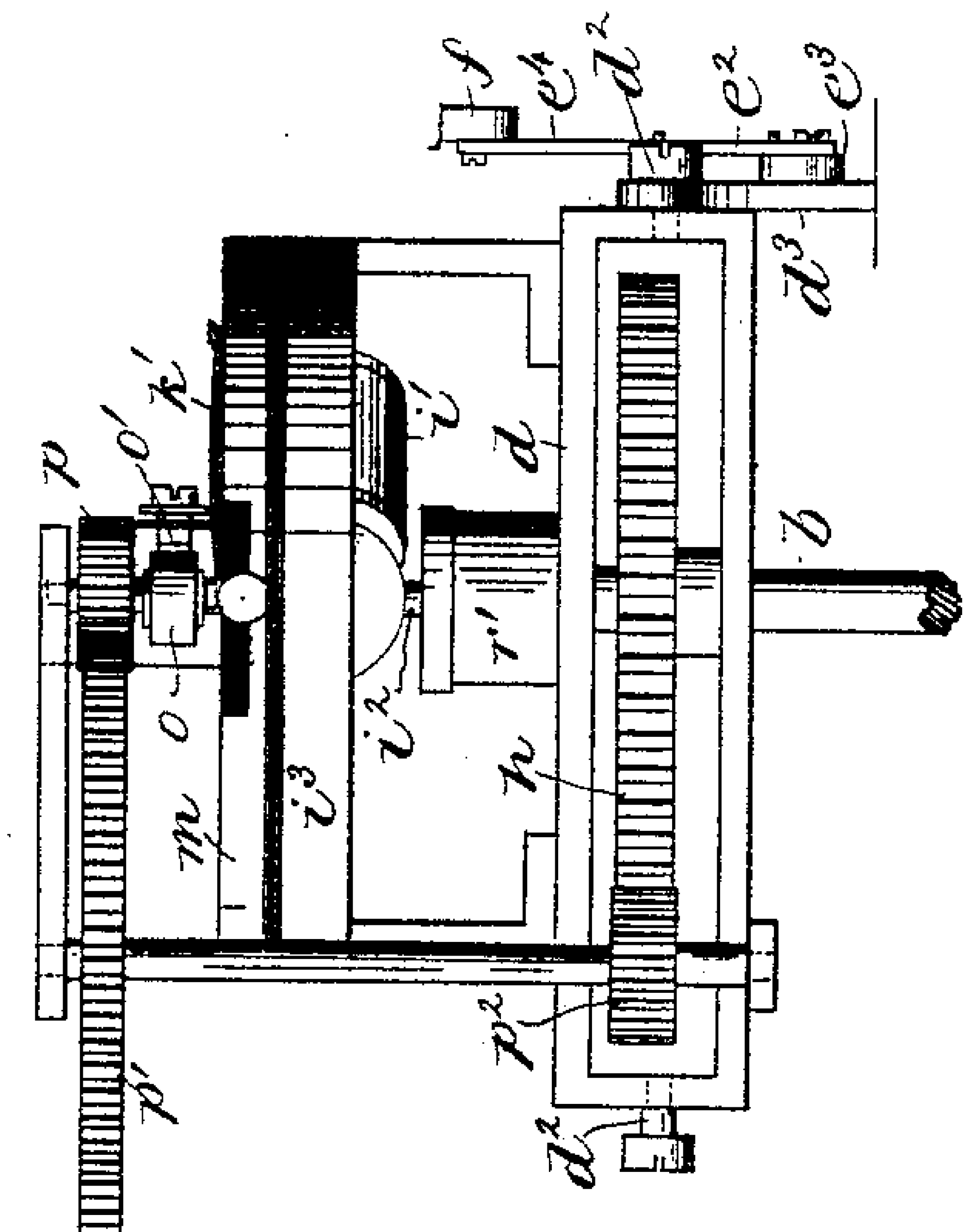

Fig. 2.

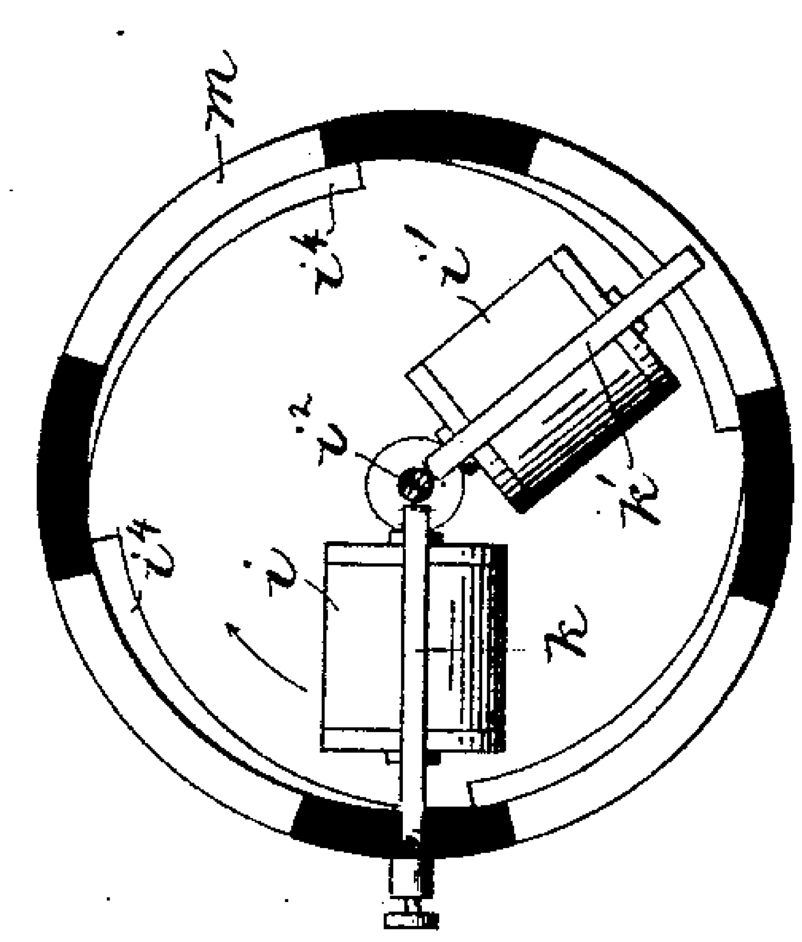

Fig. 3.

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UNITED STATES PATENT OFFICE.

EDWARD HEYMANN AND FRANK W. HEYMANN, OF BOSTON, MASSACHUSETTS, ASSIGNORS OF ONE-HALF TO JOHN I. CLAPP, OF SAME PLACE.

ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 348,972, dated September 14, 1886.

Application filed October 12, 1885. Serial No. 179,619. (No model.)

To all whom it may concern:

Be it known that we, EDWARD HEYMANN and FRANK W. HEYMANN, residing in Boston, Suffolk county, State of Massachusetts, have invented an Improvement in Electric Lamps, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

Our invention relates to an electric lamp of that class in which the arc is maintained between the edges of disks which are rotated to present new portions at the arc as the edges of the disks burn away. In lamps of this class as heretofore made the disks have in most cases been rotated continuously by clockwork, and in other cases they have been rotated by an electromotor operated by the current which sustains the arc or a derived portion thereof, and in the latter class of lamps the movement of the disks has been intermittent, depending on variations in the strength of the current produced by variations in the length of the arc.

The present invention consists, essentially, in a lamp having disks of carbon or suitable material between the edges of which the arc is maintained, and an electromotor by which the disks are rotated continuously while the lamp is in operation. The disks are normally in contact when the lamp is not in operation, and means are provided for drawing them apart to establish the arc when the current begins to flow.

Figure 1 is a front elevation of an electric lamp embodying this invention, the sides of the case or frame-work inclosing the actuating mechanism being removed. Fig. 2 is an end elevation of the mechanism by which the disks are rotated, and Fig. 3 a plan view of the motor which rotates the disks.

The disks a a', of carbon or other suitable material, between the edges of which the arc is maintained, are fastened upon shafts b b', being preferably insulated from the upper portion of said shafts and electrically connected with the lower portion, b^2, thereof, which are provided with contact-surfaces b^3, to which the current is conveyed by contact-springs c c', connected in an electric circuit, as will be described.

The shafts b b' have bearings in frames d d', pivoted at d^2 in brackets or supports d^3, fastened upon the lower plate, A, of the main frame or case of the lamp, the said frames d d' having an oscillating movement on their pivots in order to permit the disks a a' to approach or recede from one another according as the diameters of the said disks vary, the shafts b b' passing through elongated openings in the plate A to admit of such movement. In order to oscillate the said frames so as to separate the disks a a' and establish the arc when the lamp is first set in operation, and to permit them to gradually approach one another in proportion as they burn away at their edges, the said frames d d' are provided with segmental gears e e', one of which is connected by a link, e^2, with one arm of a lever, e^3, the other arm of which is connected by a link, e^4, with the armature or core f of the electro-magnet or solenoid g, which core is acted upon by a retractor or spring, g', tending to turn the gears e e' in the direction to move the disks a a' toward one another.

The shafts b b' are provided with gears h h', by which they are caused to rotate simultaneously, the said gears being so proportioned as to make the speed of rotation of one disk about twice as rapid as that of the other, this being the relative proportion at which they are consumed. The shafts are actuated in their rotary movement by a continuously moving electromotor of any suitable or usual construction, shown in this instance as consisting of electro-magnets i i', fastened upon a shaft, i^2, and surrounded by a ring, i^3, of iron or magnetic material, having spiral or eccentric projections i^4, which operate as armatures for the magnets i i', when energized, and produce a rotary movement of the said magnets, owing to the greater mass of the armatures at one side than at the other side thereof, in the usual manner. The said magnets are alternately placed in circuit when the pole of each comes opposite the more remote or thinner portion of the armature by a commutator consisting of springs k k', each connected with one terminal of one of the said magnets and bearing on a ring, m, having alternate spaces of conducting and insulated material, the conducting-spaces being all connected with a source of electricity, and the other terminal of the magnets i i' being connected with a collar, o, on the shaft i^2 and insulated therefrom, from which collar the circuit is continued by a spring, o'. The shaft i^2 acts upon the gear h through an intermediate train of speed-reducing gearing, p p' p^2, so that the said gear h and the disks a a' are kept rotating with a slow uniform movement as long as the commutator-ring f and spring o' are connected in a circuit through which a current of sufficient strength is flowing.

While the ring i^3 with its projections i^4 may be spoken of as the armature of the magnets k k' of the motor, it is more proper in speaking of the motor as a whole to call the connected magnets k k' the armature, as they are the part set in motion by the variations in magnetic condition produced by the electric current.

The shaft i^2 is preferably provided with a regulating device consisting of wings r, turning in a vessel or cylinder, r', provided with corresponding wings, r^2, and containing a liquid which thus resists the rotation of the wings r and shaft i^2, and prevents sudden changes in the velocity of the rotary movement. The entire motor, including the commutator and gearing, is supported on and oscillates with the frame d.

The circuit external to the lamp is connected with binding-screws L L′, from the former of which the circuit is continued by conductor 2 to the contact-spring c, and thence through the portion b^2 of the shaft b, the disk a, the arc, disk a', portion b^2 of the shaft b', and contact-spring c', which is connected by wire 3 with one terminal of the magnet g, the other terminal of which is connected by wire 4 with the binding-screw L′, thus completing the circuit. The motor is shown in this instance as connected in a shunt or branch circuit around the arc, the binding-post L being connected by wire 5 with the commutator-ring m, and the spring o' being connected by wire 6 with the binding-post L′.

In operation, when a current begins to pass through the external circuit connected with the binding-posts L L′ the main portion of the current passes through the circuit 2 3 4, so that the magnet g is energized and attracts its armature or core f, which, through links e^4 e^2 and lever e^3, oscillates the frames d d', drawing the disks a a' apart and establishing the arc, the resistance of which causes a sufficient portion of the current to pass through the shunt 5 6 and motor-magnets i i' to rotate the latter, producing a continuous uniform rotation of the disks a a', which are thus gradually burned away at their edges. The reduction in diameter of the disks as they are gradually consumed tends to lengthen the arc, which in turn tends to weaken the magnet g, so that its retractor g' will prevail, and, acting on links e^4, e^2, and lever e^3, will move the disks a a' toward one another, thus restoring the arc to its proper or normal length.

It will be seen that the movements of the armature or core f produce a lateral feed of the disks a a' toward one another, which is analogous to the feed produced by the clutch of the lamp of usual construction, in which the arc is maintained between the opposite ends of sticks or pencils that are in line with one another, and consequently the core f may be electrically controlled in any usual manner corresponding to the control of the clutch of such lamps, according to the use to which the lamp is to be put. For instance, if several of the lamps were to be operated in series, the magnet g might be partly in the main and partly in a shunt circuit; or it might be wholly in a shunt-circuit and its attractive force act on the gear e e' in the direction to draw the disks a a' together, its retractor then normally keeping them apart, in which case the current in starting would first flow wholly through the said shunt-magnet, which would be energized and draw the disks together, and then, being shunted or weakened by the closing of the circuit between the said carbons and deviation of the current through the main circuit, the retractor of said shunt-magnet would operate the carbons until an equilibrium was established by the increasing resistance of the arc between the consequent increasing strength of the magnet and the force of its retractor when the arc reached its normal length.

The motor might be in the main circuit instead of in a branch thereof, in which case the resistance of its magnet-coils would be properly reduced; but we consider it better to have it in a shunt-circuit, as shown.

We claim—

1. The carbon disks and shafts therefor provided with gears meshing together, and a bearing-frame for one of the said shafts pivoted on an axis substantially at right angles to said shaft and in the plane of rotation of the gear, combined with an electromotor having a revolving armature and connecting mechanism between said armature and the carbon shaft, whereby the latter is rotated, and, through the gearing described, also rotates the other carbon shaft, substantially as set forth.

2. In an electric lamp, a carbon disk and supporting-shaft therefor, combined with a co-operating electrode, and a frame having bearings for the said shaft movable to vary the position of the disk relative to the co-operating electrode, and an electromotor having a revolving armature supported on the said frame and movable therewith, and connecting mechanism between the said armature and carbon shaft, substantially as described.

3. The carbon disks, and shafts therefor, and pivoted bearing-frames for the said shafts, combined with segmental gears connected with said bearing-frames and meshing together, and an electro-magnet or solenoid and its armature or core connected with the said frames, substantially as described.

4. In an electric lamp, a carbon disk, and supporting-shaft therefor, and a co-operating

electrode, combined with an electromotor having a revolving armature, and connecting mechanism between said armature and the shaft of the carbon disk, and a speed-governing device connected with the said revolving armature, substantially as described.

5. In an electric lamp, a carbon disk and shaft therefor, and a pivoted bearing-frame for said shaft turning on an axis substantially at right angles thereto, and a co-operating electrode, combined with an electro-magnet, and its armature connected with said bearing-frame, and an electromotor having a revolving armature connected with the said shaft, the said motor being in a shunt around the arc, substantially as described.

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

EDWARD HEYMANN.
FRANK W. HEYMANN.

Witnesses:
JOS. P. LIVERMORE,
H. P. BATES.