(No Model.) 2 Sheets—Sheet 1.

J. R. DALES & W. H. MARKLAND.

ELECTRIC LAMP.

No. 344,252. Patented June 22, 1886.

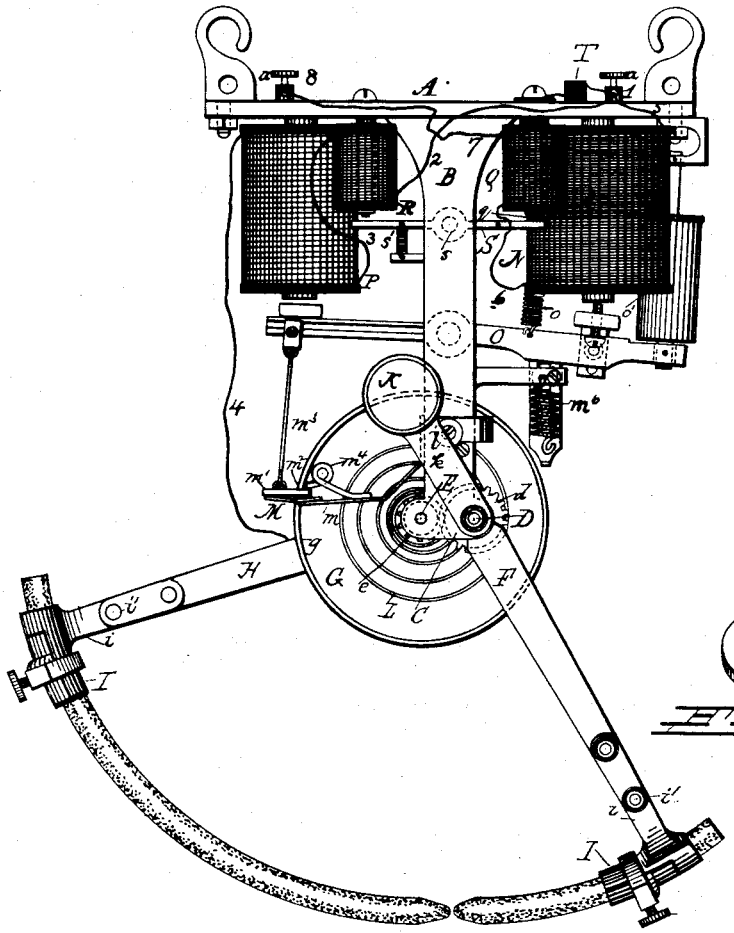

Fig. 1.

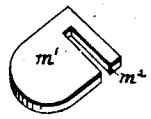

Fig. 4.

WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

J. R. DALES & W. H. MARKLAND.

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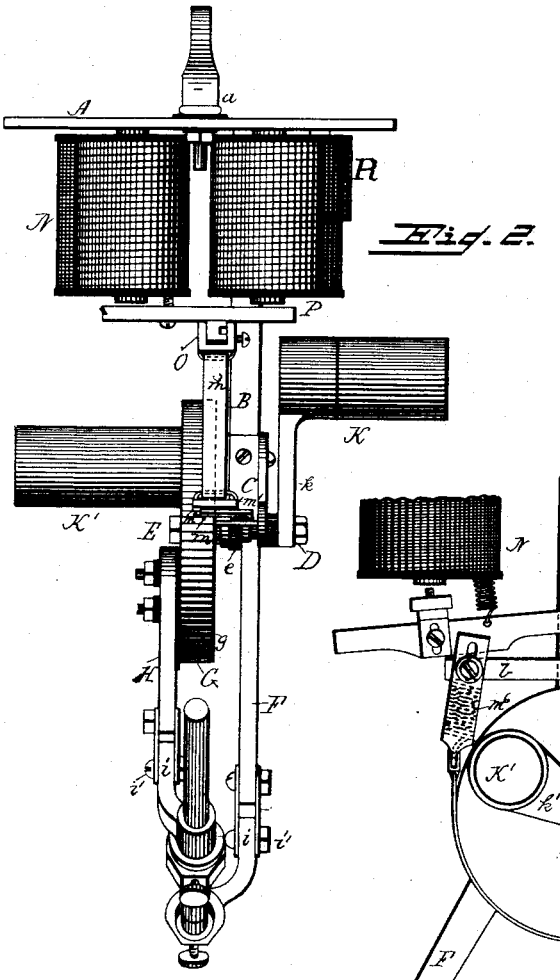

Fig. 2.

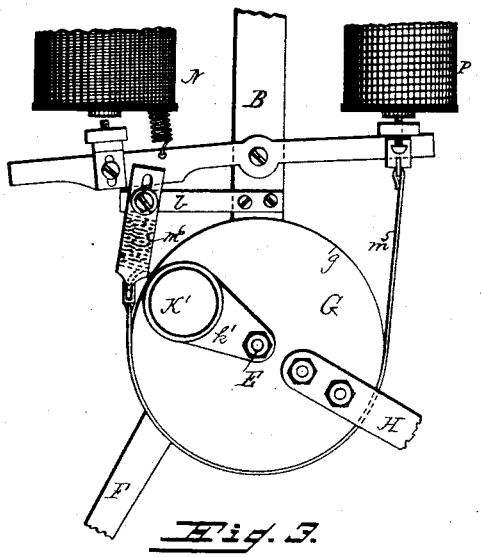

Fig. 3.

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UNITED STATES PATENT OFFICE.

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ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 344,252, dated June 22, 1886.

Application filed September 29, 1885. Serial No. 178,537. (No model.)

To all whom it may concern:

Be it known that we, JOSEPH R. DALES, a citizen of the United States, residing at the city of Philadelphia, State of Pennsylvania, and WYLLIS H. MARKLAND, a citizen of the United States, residing at Altoona, in the county of Blair, in said State, have invented certain new and useful Improvements in Electric Lamps; and we do hereby declare the following to be a full, clear, and exact description of the invention, reference being had to the accompanying drawings, which form part of this specification, in which—

Figure 1 is a side elevation, and Fig. 2 another side or end elevation transverse to Fig. 1, of a lamp embodying our improvements. Fig. 3 is a detail view of modified form of clutch. Fig. 4 is a perspective of clutch-plate.

Our invention relates to that type of arc lamps in which are employed curved carbons; and our improvements have for their principal objects, first, to provide novel means for feeding and for separating the carbons, and, second, to provide a cut-off or safety switch of peculiar construction.

The means for feeding and for separating the carbons comprise two arms pivoted or fulcrumed on the frame of the lamp in such manner as to permit their free or outward ends to approach toward and move from each other; a pair of differential gear-wheels or wheel and pinion which intermesh, and to the shafts of which the swinging arms are secured; a coiled spring secured in a casing or shell, to which one of the swinging arms is fastened; weights for counterbalancing the swinging arms; a clutch which operates on said casing; two differential magnets with an armature-lever common to both, and a connection between said armature-lever and clutch, so that the latter will be duly relaxed to permit the carbons to be fed under the influence of the spring, and will be tightened or clutched, so as to move the arms in opposition to the influence of the spring, to produce separation of the carbons and the establishment of the arc.

The cut-off or safety switch comprises two differential magnets and an armature-lever common to both, with connections of a peculiar character, as hereinafter fully set forth.

In addition to the novel means for feeding the carbons and the peculiar cut-off, our improvements comprise devices for adjusting the carbons to secure their alignment, and also certain details of construction and combinations, as hereinafter fully described.

Referring to the accompanying drawings, A represents a plate forming a part of the frame of the lamp, to which are attached suspension-hooks *a a*. Depending from the under side and middle of this plate is a rigid hanger, B. In a bracket, C, on the lower end of this hanger two short shafts, D and E, have their bearings, and on said shafts, respectively, are a gear-wheel, *d*, and a pinion, *e*, which intermesh. The wheel *d* is double the diameter of pinion *e*.

To the shaft D is secured an arm, F, and to shaft E is secured a drum or spring-casing, G. When said shafts are rotated or rocked, the arm F swings and the casing G turns axially. To said casing G is fastened an insulated arm, H. The arms F and H swing when the shafts D and E are rotated or rocked, and the movements of said arms are toward each other or apart, according to the direction of rotation of said shafts.

Owing to the difference in the diameters of the wheel *d* and pinion *e*, the shafts D and E have differential speeds, and the arm H moves faster than the arm F. The arm H holds the positive electrode and the arm F the negative electrode. Said arms have at their outer ends carbon holders or clamps I I, which are pivoted at *i i* in forks or slots in said arms, and are provided with set-screws *i'*, to permit their adjustment so as to preserve the alignment of the carbons in case of any irregularity of the curvature of the latter, or in the radius of either of them.

The carbons used with our improved lamp are curved and of unequal length, and the feed is designed to maintain the arc at a fixed or substantially fixed point. It is designed to have the feed positive, as opposed to gravity alone, and to depend upon or be aided by the

action of a spring. Accordingly the weight of the carbons and their arms is counterbalanced by weights K K′, secured to arms *k* and *k′* diametrically or nearly diametrically opposed to the arms F and H, and secured to the shafts D and E, and a coiled spring, L, is located in the casing G, having its inner end secured to pinion-shaft E, its outer end being fastened to a pin, *l*, projecting from the hanger B. As the spring L uncoils, it communicates motion to shafts D and E, and causes arms F and H to approach each other, thus feeding the carbons. The spring uncoils whenever the casing G is released from the restraint of a clutch, M, and this release is effected whenever the resistance of the arc becomes superior to that of the shunt-magnet N.

Any suitable form of clutch may be employed to so restrain and release the spring L. One such form is shown in Figs. 1 and 2, and comprises a bracket, *m*, secured to hanger B, and a plate, *m′*, having a slot, m^2, which embraces or fits over the ring *g* of casing G, and is pivotally attached to the lower end of a strap, m^3, whose upper end is secured to one arm of an armature-lever, O. Said armature-lever is pivoted at its center on the hanger B, and is common to both the shunt-magnet N and the main magnet P. The slotted clutch-plate *m′* rests on the bracket *m*, and is held in contact therewith by a spring, m^4, secured to said bracket. Normally the plate *m′* lies in such a plane that the opposite edges of the slot m^2 impinge upon and clutch the rim *g* of the casing G, the main magnet P being then energized and holding the adjacent end of the armature-lever O attracted. This prevents rotation of the casing G under the influence of the coiled spring L; but when the arc lengthens and the shunt-magnet N overpowers the main magnet P the opposite end of the armature-lever O (that is, the end adjacent to the shunt-magnet) is attracted, the effect being that the plate *m′* is lowered or tilted into such a plane that it does not clutch or restrain the casing G, and the latter then rotates under the influence of the coiled spring sufficiently to bring the ends of the carbon pencils together or nearer to each other. The main magnet then receives a larger percentage and the shunt-magnet a smaller percentage of the current, on account of the arc being shorter and of less resistance, thus energizing the former and causing it to attract the adjacent end of the armature-lever O. This lifts or tilts plate *m′*, so that it clutches rim *g*, and turns back the casing G against the influence or pressure of the spring L sufficiently to form the arc or to establish the proper length of the latter. The armature-lever O has a retracting-spring, *o*, and a dash-pot, *o′*, for the purposes for which such devices are usually employed.

A modified form of clutch is shown in Fig. 3, where is illustrated a band, m^5, partly encircling the rim *g* of casing G, and having its opposite ends attached, respectively, to the main-magnet end of the armature-lever O, and to a spiral spring, m^6, secured to a bracket or projection, *b*, on hanger B. When the main magnet is energized, the tension of the band m^5 and its friction on the rim *g* are such as to cause it to clutch, move, and hold the casing G with the same effect as the clutch-plate *m′*, already described; and, conversely, when shunt-magnet N is energized so as to attract its contiguous end of armature-lever O, the band slackens sufficiently to permit the casing G to be rotated under the influence of the spring L, thus moving arms F and H and feeding the carbons, as already described.

The cut-off or safety switch comprises two differential magnets, Q and R, an armature-lever, S, common to both said magnets, and centrally fulcrumed at *s* on hanger B, a resistance, T, and connections and contacts, as hereinafter set forth. The magnet Q is a high-resistance magnet—say about thirty ohms—and the magnet R is of low resistance—say about one-fiftieth of an ohm. The adjacent end of the armature-lever S, when there is no current in the lamp, is held in contact with the core *q* of magnet Q, or with a stop projecting therefrom, by means of a spring, *s′*. The current entering at 1 has three paths open to it. The first path is by connection 2 to magnet R, thence by connection 3 to magnet P, thence by connection 4 to insulated arm H, through the carbons and arm F to frame of lamp, and out at 8. This is the path of least resistance when the carbon points are touching each other, and the current on taking this path energizes the main magnet P and the cut-off magnet R, thus effecting the movement of the armature-lever S away from contact with the core of magnet Q, and the separation of the carbons to establish the arc. When the extension of the arc increases its resistance sufficiently to divert a considerable portion of the current, such portion passing by connection 5 to the shunt-magnet energizes the latter, traveling thence by connection 6 to magnet Q, through latter, and by connection 7 to frame of lamp, and out at 8. When shunt-magnet N is energized, it attracts the adjacent end of armature-lever O, releasing clutch M, and permitting the carbons to be fed by spring action, as already described. In case of any accident, or when, by any means, the arc gets abnormally long, magnet Q attracts armature-lever S, thus cutting out or short-circuiting the lamp, the major part of the current passing by way of the resistance T through the core of the magnet Q (or through any other equivalent circuit outside of said magnet which may be provided for the purpose) and armature-lever S to the frame of the lamp, and said armature-lever being held in contact with said core by the spring *s′*.

While we have described two forms of the clutch, we do not wish to be confined thereto or to either, as said forms may be modified or new ones substituted without changing the es-

sential character of our invention. Neither do we restrict our invention to a coiled spring operating to move the arms when uncoiling, as other forms of springs may be substituted therefor.

We have shown and described the wheel and pinion as of unlike diameters; but this is only necessary when the current is always in one direction, and in using alternating currents the feed-wheels of the lamp should be equal in diameter.

What we claim as our invention is as follows:

1. In an electric lamp, the combination, with two swinging arms which form carbon holders, of a wheel and pinion whose diameters differ, said wheel and pinion intermeshing and their shafts forming the fulcra of said arms, whereby when said shafts are rotated the arms will be moved unequal distances, respectively, and will feed one carbon faster and farther than the other, substantially as shown and described.

2. In an electric lamp, the combination, with two swinging arms which form carbon-holders, and whose fulcra are the shafts of an intermeshing wheel and pinion of unequal diameters, of a spring having connection with one of said shafts, so that in exerting pressure it will move the arms toward each other, substantially as shown and described.

3. In an electric lamp, the combination, with two swinging arms which form carbon-holders, of an intermeshing wheel and pinion of unlike diameters, a spring and its casing, and a clutch for the latter, one of said arms being secured to the wheel-shaft, the casing being secured to the pinion-shaft and having secured to it the other said arm, said parts being constructed and combined for operation substantially as set forth, whereby when the casing is released from the restraint of the clutch the spring causes the arms to move toward each other, as set forth.

4. In an electric lamp, the combination, with two swinging carbon-holding arms, of an intermeshing wheel and pinion of unlike diameters whose shafts are the fulcra of said arms, a coiled spring which is connected with and acts upon one of said shafts, a casing for said spring, a clutch which operates on said casing, a main-circuit magnet of low resistance, a shunt high-resistance magnet, an armature-lever common to both said magnets, and a connection between said clutch and armature-lever, whereby when the electric current energizes the main magnet the clutch acts on the casing and moves the arms apart, and when such current energizes the shunt high-resistance magnet the clutch is released and the arms caused to move toward each other under the influence of the spring, substantially as shown and described.

In testimony that we claim the foregoing we have hereunto set our hands.

JOSEPH R. DALES.
WYLLIS H. MARKLAND.

Witnesses as to J. R. Dales's signature:
R. DALE SPARHAWK,
M. D. CONNOLLY.

Witnesses:
ROY A. TRAKER,
J. A. RITCHEY.