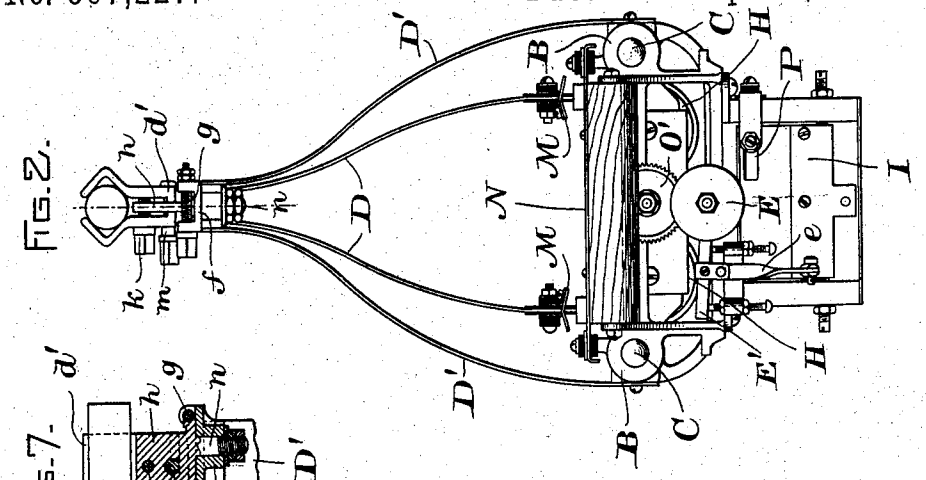
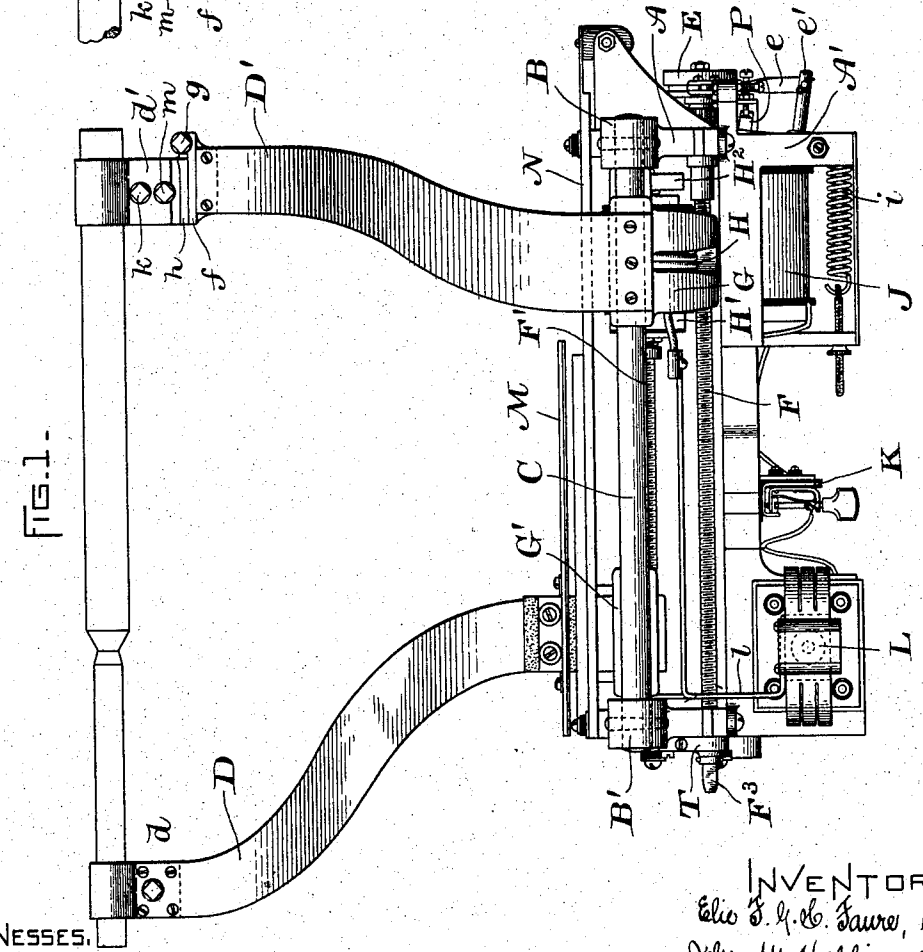
(No Model.) 3 Sheets—Sheet 1.

E. F. G. H. FAURE & J. MacHAFFIE.

ELECTRIC ARC LAMP.

No. 567,227. Patented Sept. 8, 1896.





WITNESSES.
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FIG. 3.

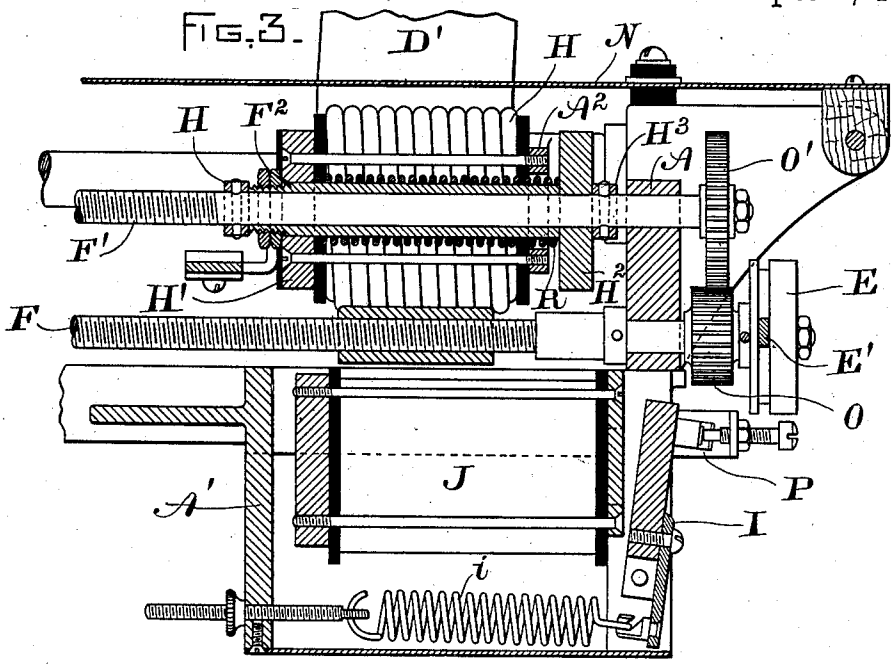

FIG. 4.

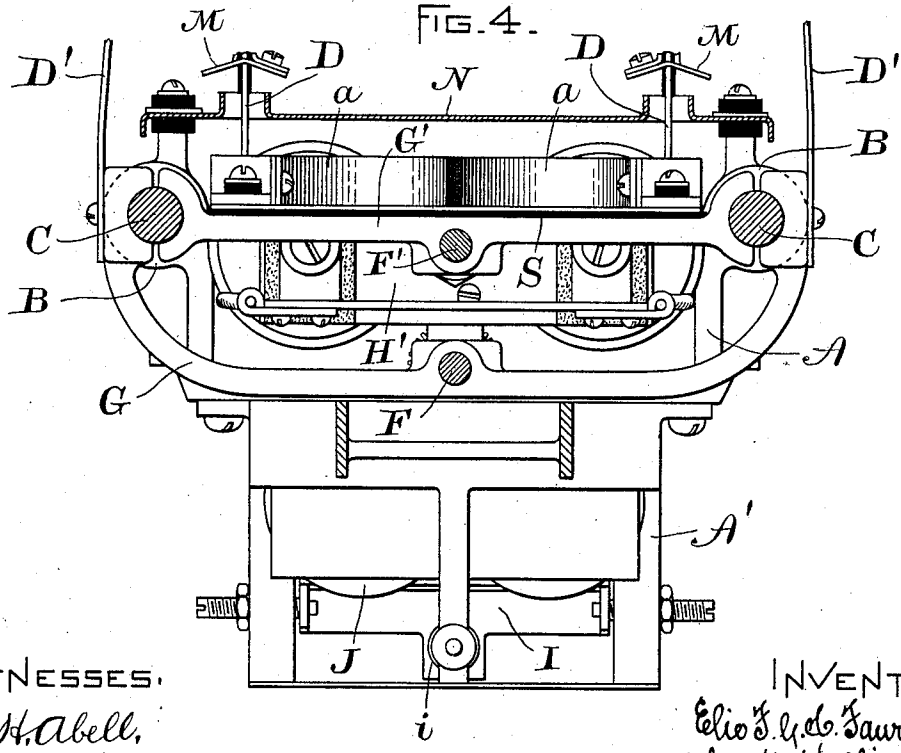

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FIG. 5.

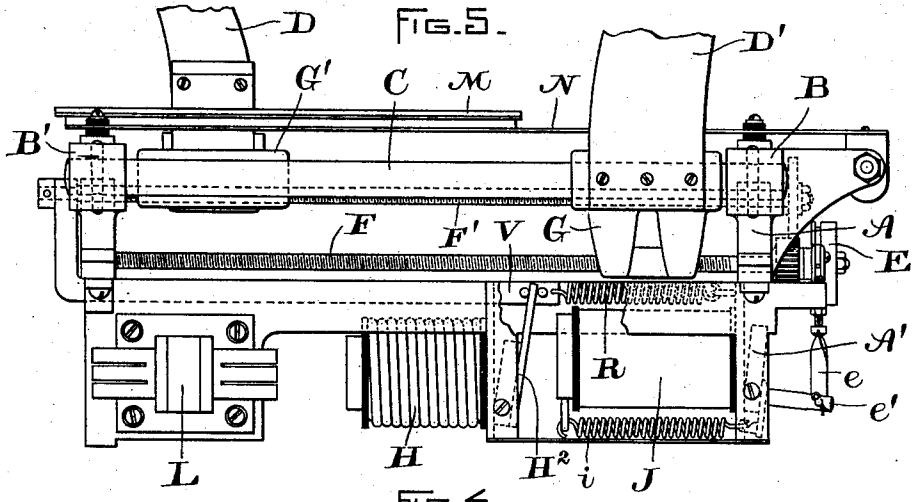


FIG. 6.

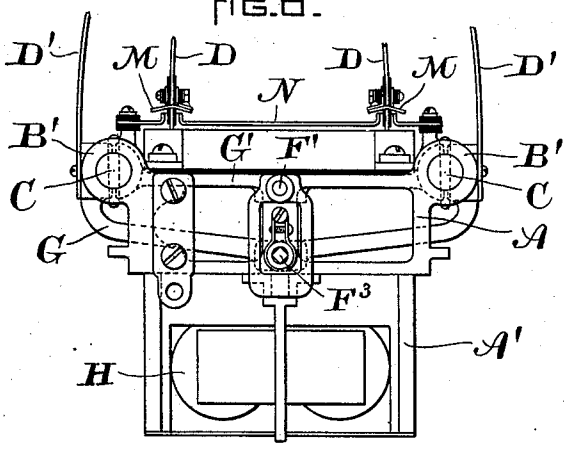
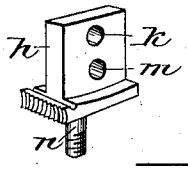
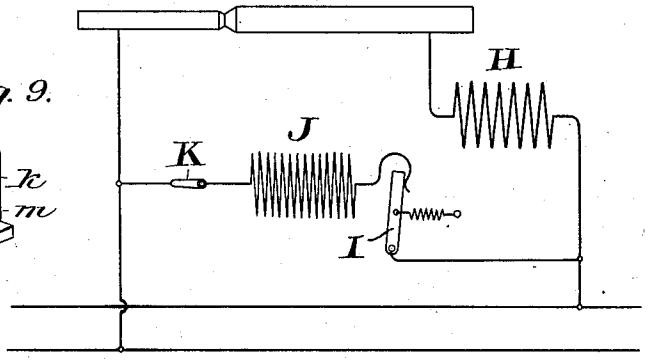


FIG. 8.

Fig. 9.





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John MacHaffie, by
Geo. R. Bridgett, Atty.

UNITED STATES PATENT OFFICE.

ELIE F. G. H. FAURE AND JOHN MACHAFFIE, OF SCHENECTADY, NEW YORK, ASSIGNORS TO THE GENERAL ELECTRIC COMPANY, OF NEW YORK.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 567,227, dated September 8, 1896.

Application filed March 20, 1896. Serial No. 584,042. (No model.)

To all whom it may concern:

Be it known that we, ELIE F. G. H. FAURE, a citizen of the Republic of France, and JOHN MACHAFFIE, a subject of the Queen of Great Britain, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Focusing Arc-Lamps, (Case No. 371,) of which the following is a specification.

The present invention relates to focusing arc-lamps used for search-lights or other apparatus requiring lamps of high candle-power. We show it applied to a lamp of the horizontal type.

One object of the invention is to provide a feed mechanism which, by a simple change, made without taking the lamp apart, may be made to feed the carbons at the same or varying rates of speed. In carrying out this feature of the invention two feed-screws having the same pitch are provided. To each screw is connected a carbon-holder carriage in such a manner that the carbons may be fed toward each other as they are consumed at the proper rate of speed to maintain the arc at a given focal distance from the reflector. The desired rate of speed for each feed-screw is obtained by means of gearing connected between the screws and feed mechanism. By changing the ratio between the gears any rate of speed may be secured, as for example, an equal speed in an alternating-current lamp where the consumption of the carbons is equal, or unequal speeds in a direct-current lamp where carbons with different rates of consumption are used.

The invention further relates to the construction of and supports for the carriages to which are secured the carbon-holders. Mounted on either side of the frame or forming a part thereof are two guides extending longitudinally. These guides are so arranged that one surface forms supports for one carriage, and the other surface supports the other carriage. By constructing the carriages so that one is somewhat smaller than the other, and arranging it to work on the inner surfaces of the guides, the other on the outer, the two carriages are enabled to pass each other as they are fed forward by suitable mechanism. This construction has the advantage of shortening the lamp materially, for it permits of a double use of the guides throughout their length, instead of, as in other existing lamps, using only a portion of their length for each carriage.

The carbon-holders are secured to the carriages and have a curve or incline away from them. This permits of the base or frame of the lamp being made shorter, and by reason of the arrangement of the carriages above referred to carbons of a standard length may be used and the amount consumed be as great as in lamps of other makes. The length of the guides is reduced to approximately one-half of the length of those in other existing lamps. In other words, it is equal to the distance traveled by the carriage carrying the carbon having the greater rate of consumption.

A further advantage is obtained in the present construction of carbon-holders in that they are made thin in the direction of the beam of light. This does away with practically all the shadows so objectionable in lamps of this class.

The invention also relates to the arrangement of the parts of the lamp in such a manner that the mechanical parts, such as the carriages and feed-screws, are in one half of the lamp, and the electrical parts, such as the contacts and feed and starting magnets, in the other. This greatly facilitates the making of repairs on the lamp and the inspection of the parts.

The invention also relates to certain details of construction more fully pointed out in the description and claims.

In the accompanying drawings, attached to and made a part of this specification, Figure 1 is a side elevation of a lamp embodying the invention. Fig. 2 is an end elevation. Fig. 3 is a partial longitudinal section. Fig. 4 is a transverse section. Fig. 5 is a side elevation of the lamp with the mechanical and electrical parts arranged in separable parts of the structure. Fig. 6 is an end elevation of the same, and Fig. 7 is a detail of the carbon-clamp, Fig. 8 being a diagram of connections. Fig. 9 is a detail view of a part of the carbon-clamp.

The frame or body of the lamps is made in two pieces A A', secured together in any suitable manner. Lugs B B' are cast on the sides of the frame A, and in these lugs are mounted rods C, on which the two carbon-holder carriages G G' are adapted to travel. The frame is provided with a top plate N, which protects the operating mechanism of the lamp from dust and dirt. As the carbon-holder carriage G' works on the inside of the rods C C, slots are provided in the plate N to allow the arms of the carbon-holder D to project above the top of the plate. To prevent the carbon-dust from settling in the slots above mentioned, protecting devices M are mounted on the arm in such a manner that they travel to and fro with the carbon-holder. The arms of the carbon-holders D D' are made of sheet metal and so disposed that they are thin in the direction of the beam of light. This prevents a shadow being cast, as would be the result if the supports were of any other shape. By giving them a backward slant or curve away from their supports and so disposing the ends that one set will pass inside of the other the lamp is made shorter in its linear dimension and no wider than is consistent with rigidity.

Contacts L are mounted on either side of the frame A' in a manner so that they will engage with suitable external contact devices. Connection is made from contact L to the series starting-coil H by means of the copper strip *l*. A connection from the contact L to the shunt feed-magnet is made through the snap-switch K.

The feed-screws F F' are each cut with a thread having the same pitch, the difference in their speed to compensate for the different rate of burning of the carbons being obtained by means of the gears O O'. The former is mounted on the screw F and rotates with the clutch E, which is controlled by means of the armature I of the shunt-magnet J through the medium of the clutch-lever E', strap *e*, and rod *e'*. The spring *i* brings the armature I back to its normal position. An adjustable friction device T is mounted on the end of the feed-screw F to regulate its movement. One end of the feed-screw F is provided with a squared portion F^3, on which a handle is mounted when it is desired to operate the lamp by hand. A make-and-break device P is mounted in any suitable way and operated by means of the armature I of the magnet J.

The series magnet H in Figs. 1 and 3 is secured to the cross-piece A^2 of the frame A by means of suitable screws. Around a portion of the feed-rod F' is a sleeve F^2, passing through the yoke H' of the magnet and provided with nuts for adjusting the travel of the armature H^2. To prevent the sleeve F^2 from moving with respect to the feed-screw, collars H^3 and H^4 are employed and secured to the screw by means of pins. The spring R is adapted to be compressed when the armature H^2 is attracted, and the gear O is made with teeth sufficiently long to allow the gear O' on the end of the screw F' to slide to and fro as the armature is attracted or released by the magnet H.

The feed-screw F is secured against lateral movement and provided with teeth having the same pitch as those on F', the difference in their speed being obtained by varying the relation of the operating-gears. If, for example, it was an alternating-current lamp and the carbons were consumed equally, then the relation of the gears would be one to one. It is evident from the above that the same lamp can be used for a variety of conditions by simply varying the relations of the gears.

The carriages G and G' are each provided with a screw-threaded portion, which engages with the feed-screws F F'. On the ends of the carriages are formed semicircular bearings engaging with the round rods C C and making a good working fit therewith. The bearings, as shown, extend about half-way around the rods; but this particular arrangement is not essential, any arrangement permitting the carriages to pass each other being within the invention.

The frame of the lamp is in circuit with the positive side of the system, and the negative side or carbon-holder D is insulated from the carriage G' by mica or other insulating material S. Connection between the holder D and the negative side of the lamp is made by means of the flexible strips of copper *a a*, which are connected to the negative contact, corresponding to contact L, (shown in Fig. 1,) on the opposite side of the lamp.

Figs. 5 and 6 show the frame A A' made in two parts, as before, the feed-screws F F', carriages G G', and carbon-holders carried by the top part, and the series-wound starting-magnet H and the shunt-feed magnet J carried by the other part. In this case R is an extension-spring instead of a compression, as in the other figures. This is connected to a rod V, provided with suitable bearings allowing it to slide back and forth. The outer end of this rod is bent upward and secured to the feed-rod F' in any suitable manner, so that when the magnet H attracts its armature H^2 the rod will be moved from right to left and draw the arc, as before. In other respects the lamp is the same as described above.

The advantage to be derived from this construction will be readily understood, for it enables the lamp to be quickly taken apart, and when the trouble lies in the electrical mechanism it is not necessary to dismantle the upper part of the lamp, and vice versa.

It is desirable to provide means for adjusting one carbon with relation to the other, and in Fig. 7 is shown the carbon-clamp *d'*, composed of a plate *f*, secured to the arms D' and provided with lugs which form bearings for the adjusting-bolt *g*. Extending upward from the plate is an inverted-T-shaped piece *h*, to which the plates forming the holder are

clamped by means of the bolt *k*. The bolt *m* is formed with an eccentric, and by turning this the carbon is raised or lowered in a vertical direction. One edge of the T-shaped piece *h* is provided with teeth engaging with the bolt *g*, and by rotating the bolt movement in a horizontal direction is obtained around the stud *n* as a center.

Referring to Figs. 3 and 8, the operation of the lamp will be described. The carbons, when no current is flowing, are in contact with each other, and the series magnet H is so arranged that when energized the armature H^2 is attracted and the negative carbon mounted in the clamp *d* and carbon-holder D, carried by the carriage G′, are moved along in a horizontal plane away from the positive carbon, thus drawing the arc. The current flowing through the shunt-magnet coils J increases as the arc grows longer, until the magnetizing force of the coils is greater than that of the spring *i*, and the armature I is attracted, pulling the lever *e* and feeding the carbons toward each other by the clutch E, gears O O′, and feed-screws F F′, to which are secured the carriages G G′. The armature, on being attracted, breaks the shunt-circuit at P. The armature is returned to the normal position by means of the spring *i*, and the shunt-circuit is again established.

What we claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination in a focusing arc-lamp, of a plurality of feed-screws having the same pitch, gearing to vary the rate of feed between the screws, and means for moving one screw longitudinally with respect to the other.

2. In a focusing arc-lamp, the combination of feed-screws for the positive and negative carbons, having the same pitch and occupying parallel planes, gearing to vary the rate of feed between the screws, and a magnetically-operated device for moving one feed-screw in a longitudinal direction independent of the other.

3. In a focusing arc-lamp, the combination of a frame, guide-rods mounted on the frame, carriages adapted to travel and pass each other on the rods, feed-screws having the same pitch connected to and adapted to actuate the carriages, a friction-clutch controlled by a shunt-magnet to actuate the screws, and a friction device in engagement with one of the feed-screws.

4. In an electric-arc lamp, the combination of positive and negative carbon holders, carriages for supporting the holders, and a common support for the carriages permitting them to pass each other.

5. In an electric-arc lamp, the combination of positive and negative carbon holders, carriages for supporting the holders, and a common support for the carriages permitting them to pass each other in the same plane.

6. In an electric-arc lamp, the combination of positive and negative carbon holders, carriages for the holders, a common support for the carriages permitting them to pass each other, and feed mechanism for feeding the carbons together as they are consumed.

7. A focusing arc-lamp provided with carriages for supporting the positive and negative carbon holders, the carbon-holders having a slant or curve away from each other and bearings permitting the carriages to pass one another.

8. A focusing arc-lamp provided with carriages for supporting positive and negative carbon holders, each having a slant or curve away from the other, and one of the carbon-holders being arranged to pass inside of the other.

9. In a focusing arc-lamp, the combination of a frame, rods mounted on the frame, a carriage adapted to travel on the inner portions of the rods, and a carriage adapted to travel on the outer portions of the rods.

10. In a focusing arc-lamp, the combination of a frame, rods mounted on the sides of the frame, carriages adapted to travel and pass each other on the rods, and carbon-holders supported by the carriages, each having a curve or slant away from the other.

11. In a focusing arc-lamp, the combination of a frame, guides mounted on the frame, a carriage for the positive-carbon holder traveling on the outer portions of the guides, a carriage for the negative-carbon holder traveling on the inner portions of the guides, the carbon-holder carriages being arranged to pass each other while feeding the carbons toward each other.

12. In a focusing arc-lamp, the combination of carbon-holders, carriages for the holders, side rods to support the carriages, working on the inside and outside of the rods respectively and half-round bearings for the carriages arranged to pass each other on the rods.

13. In a focusing arc-lamp, the combination of carbon-clamps mounted on carbon-holders having a curve or slant away from each other, and carriages for the holders provided with common supports arranged to pass each other in feeding the carbons together.

14. The combination in an electric-arc lamp, of a frame provided with guides, a carriage for the negative-carbon holder adapted to travel on the inner surfaces of the guides, a carriage for the positive-carbon holder adapted to travel on the outer surface of the guides, and arms for the carbon-holders separated at the base but approaching each other at the top, the arms of one carriage arranged to pass between the arms of the other carriage.

15. In an adjusting-clamp for an electric-light carbon, the combination of a plate secured to the carbon-holder, an inverted-T-shaped piece pivoted to the plate, two clamping-pieces secured to the inverted T, a clamping-bolt, an eccentric for moving the carbon

in a vertical plane, and a bolt engaging with teeth on one end of the inverted T, for moving the carbon in a horizontal plane.

16. In a focusing arc-lamp, the combination of a frame separable into two parts, the line of division being in a plane parallel with the carbons, carbon-holders, guides and feed-screws being carried by one half of the frame, and the starting and shunt magnets by the other half of the frame, the two halves being so arranged that they may be separated without taking the whole lamp down.

In witness whereof we have hereunto set our hands this 19th day of March, 1896.

ELIE F. G. H. FAURE.
JOHN MACHAFFIE.

Witnesses:
B. B. HULL,
A. F. MACDONALD.