

R. SCOTT.
ARC LAMP.

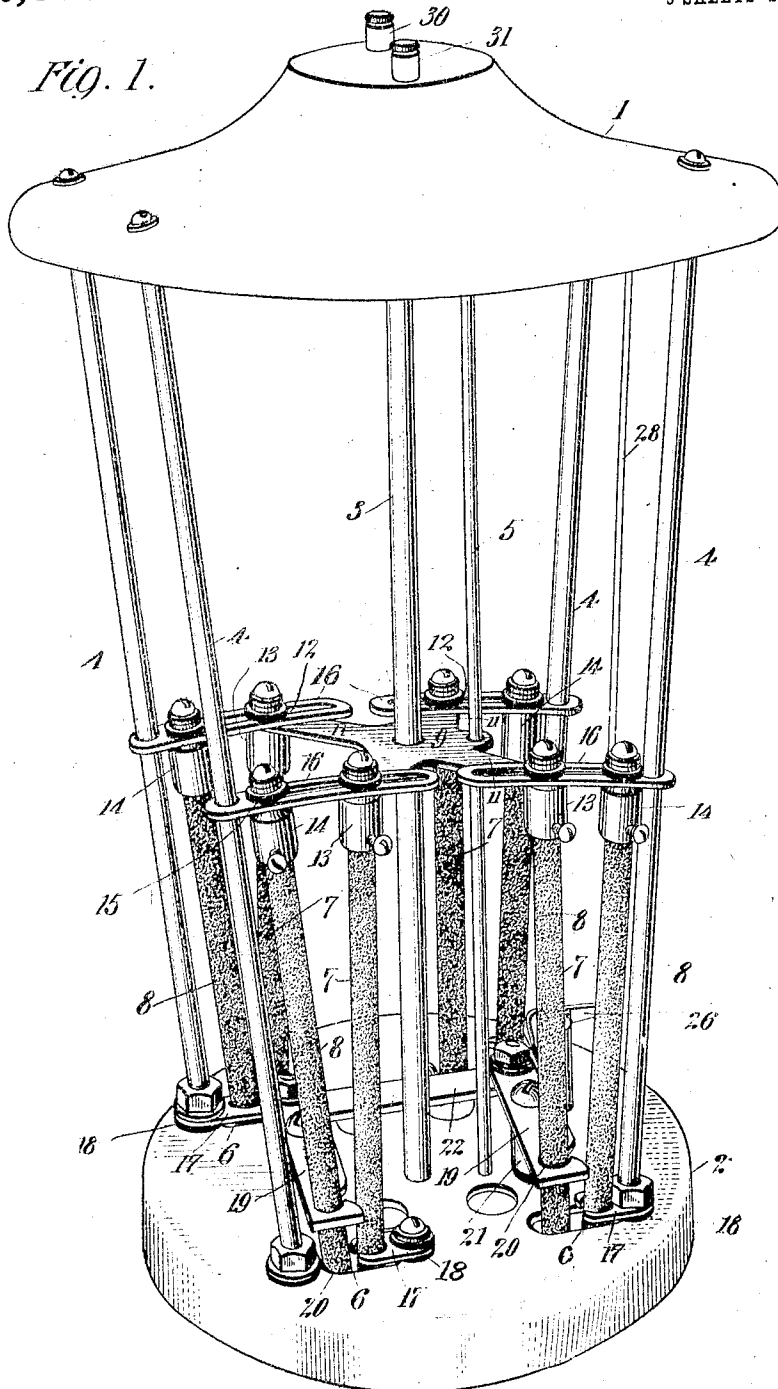
APPLICATION FILED JUNE 15, 1907.

Patented May 27, 1913.

5 SHEETS-SHEET 1.

1,062,857.

Fig. 1.



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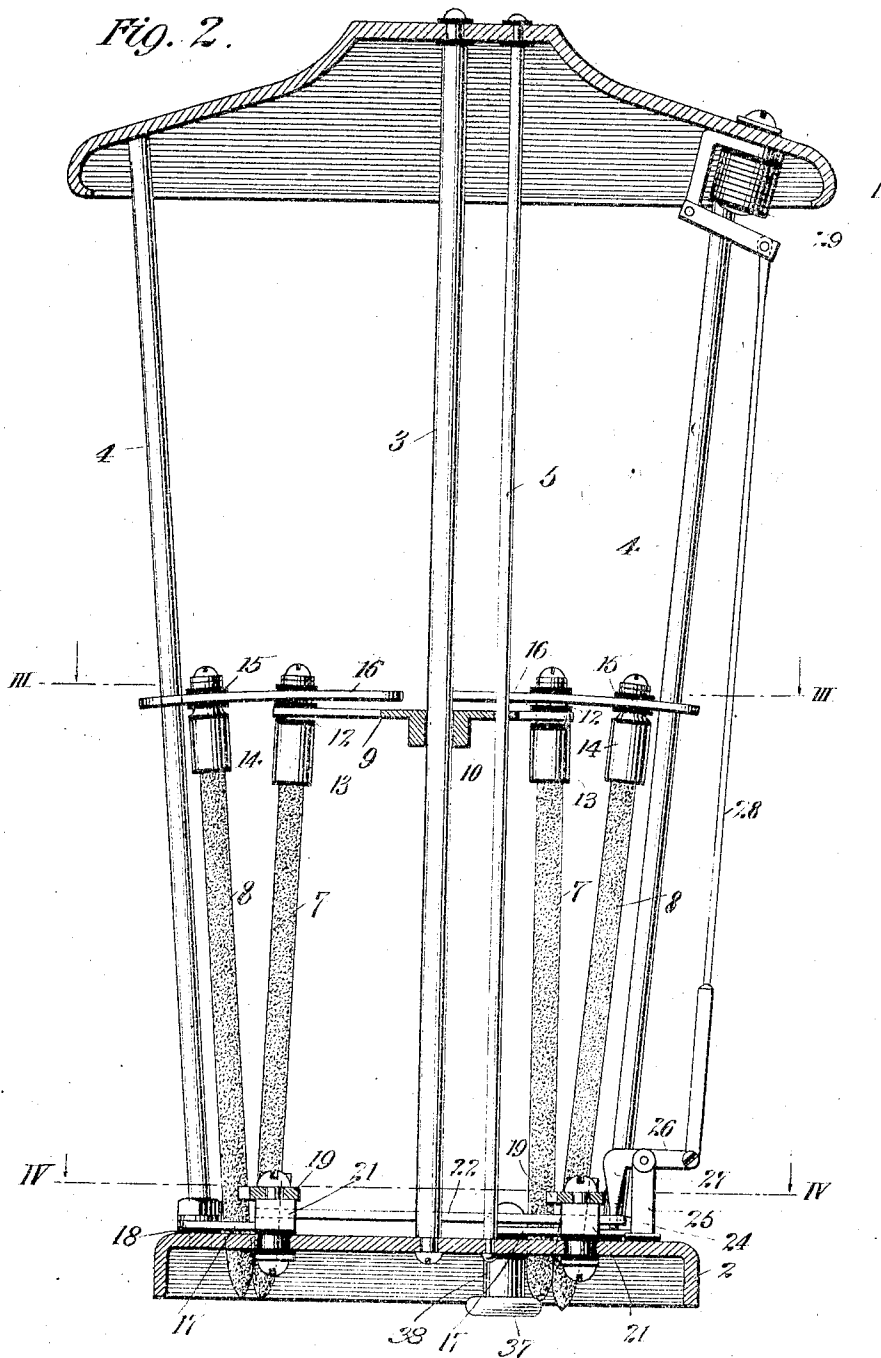
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5 SHEETS—SHEET 2.

Fig. 2.



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5 SHEETS-SHEET 3.

Fig. 3.

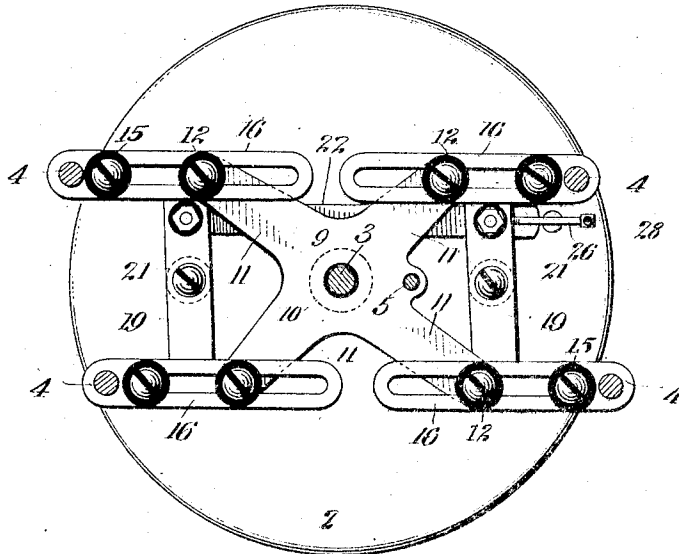
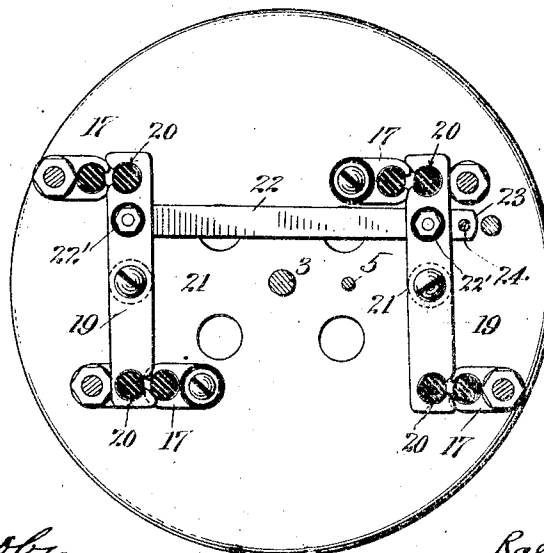


Fig. 4.



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5 SHEETS—SHEET 4.

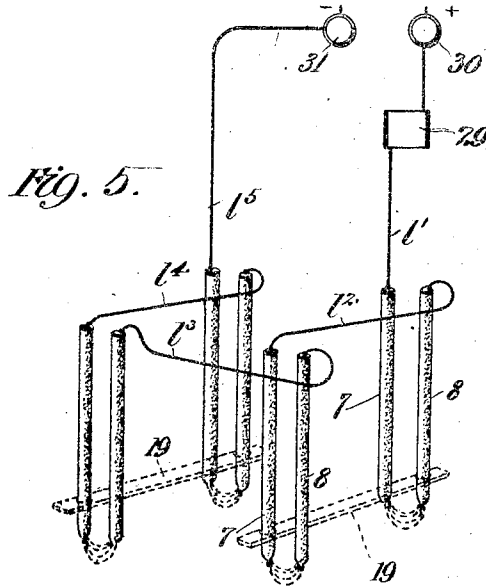


Fig. 6.

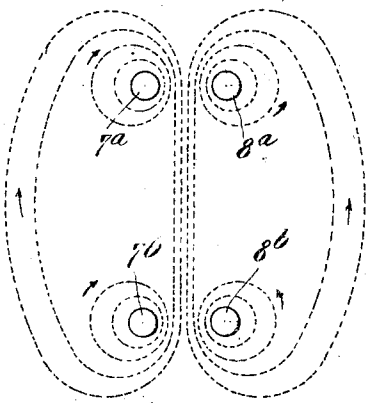
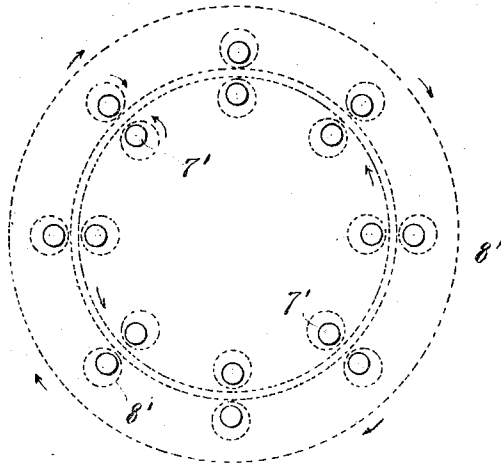


Fig. 7.



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5 SHEETS-SHEET 5.

1,062,857.

FIG. 8.

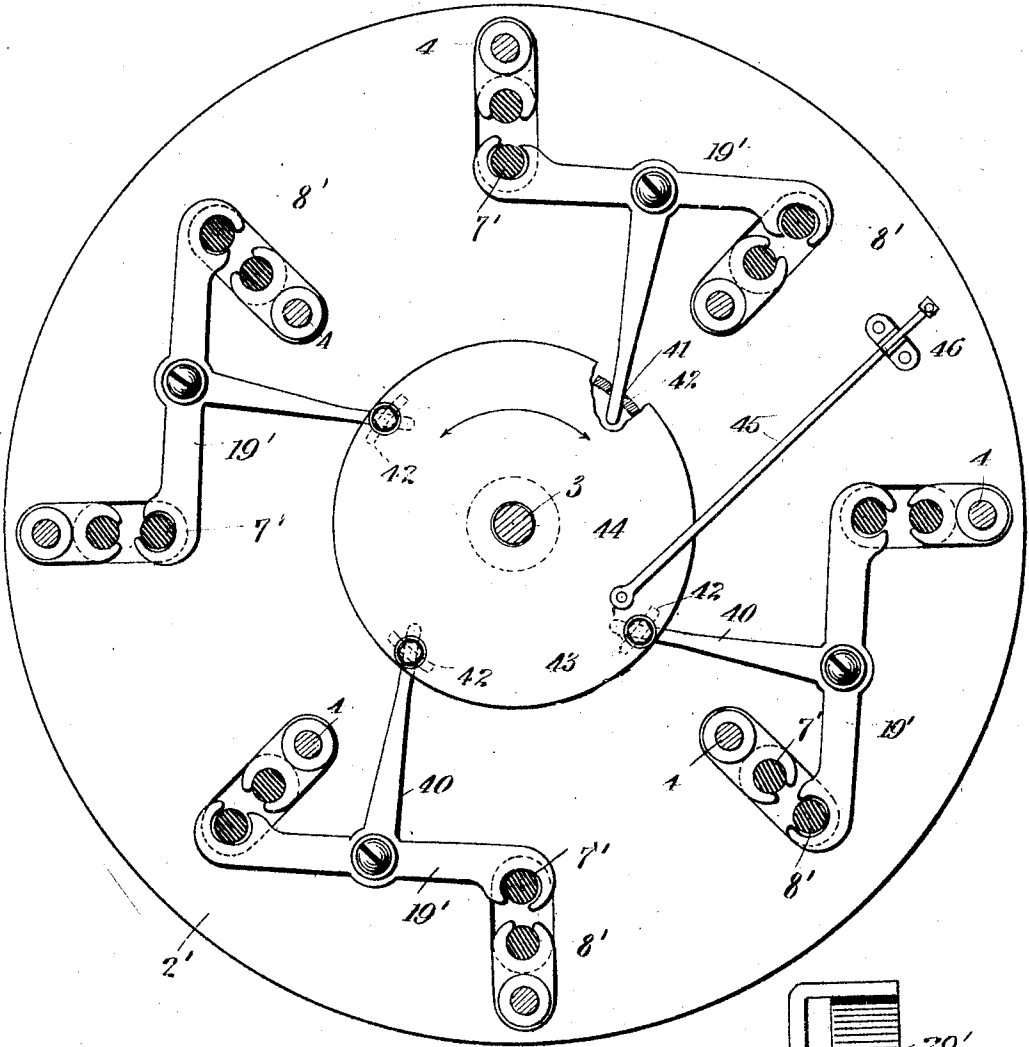


FIG. 10.

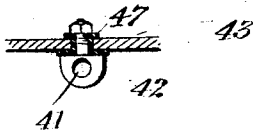
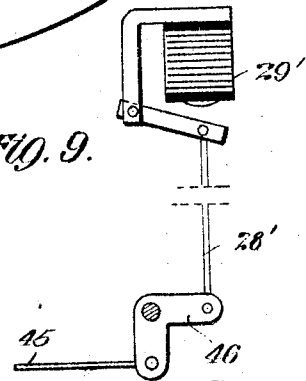


FIG. 9.



Witnesses:

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UNITED STATES PATENT OFFICE.

RALPH SCOTT, OF NEWARK, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
SCOTT ELECTRICAL COMPANY, OF NEW YORK, N. Y., A CORPORATION OF MAINE.

ARC-LAMP.

1,062,857.

Specification of Letters Patent.

Patented May 27, 1913.

Application filed June 15, 1907. Serial No. 379,205.

To all whom it may concern:

Be it known that I, RALPH SCOTT, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Arc-Lamps, of which the following is a full, clear, and exact description.

My invention relates to arc lamps, and more particularly to the so-called "Bremer" or flaming arc lamp in which metallized carbons are used, and in which the arc takes the form of a comparatively long and very luminous flame.

The electric arc when produced between plain carbon electrodes is only luminous to a limited extent, and the most efficient results are obtained when the carbons are not widely separated. On the other hand, with metallized carbons the arc is very luminous, and the best results are obtained with an arc four or five times as long as with plain carbons. Moreover the stability of a long arc between metallized carbons is very much greater than that between plain carbons. For these various reasons flaming arc light mechanism should be capable of producing a normal arc about five-eighths of an inch long in ordinary operation. By the Bremer, Carbone, Baker, and other devices this is done by having downwardly convergent electrodes separated by about one-fourth of an inch at the points and a magnetic field to blow the arc downward from the points and lengthen it to the required extent. This is particularly advantageous, in that it positions the arc most efficiently for the purposes of ordinary illumination, and also causes the electrodes to burn away evenly.

The regulation of the arc is accomplished by changes in the strength of the field and also by altering the separation of the carbon electrodes.

By the present invention I entirely dispense with the usual magnets and parts and regulate the arc in a different way, and which has special advantages hereinafter particularly stated.

By the present invention I also provide novel guiding and positioning and arc striking devices for the electrodes.

Briefly stated the present invention consists in its main aspect in maintaining a plurality of arcs in a predetermined relation to one another, so that their reciprocal or

mutual influence produces all the arc regulation which is required and without the necessity of any mechanical devices for adjusting the separation of the carbons or producing a field to blow the arcs down in accordance with the usual practice.

The invention also consists in the features of construction and combination hereinafter set forth and claimed.

In the drawings: Figure 1 is a perspective view of an arc lamp embodying the principles of my invention; Fig. 2 is a vertical sectional view of the same; Fig. 3 is a section on the line III—III of Fig. 2, looking in the direction of the arrows; Fig. 4 is a similar view on the line IV—IV of Fig. 2, also looking in the direction of the arrows. Fig. 5 is a diagrammatic view showing the circuit connections; Figs. 6 and 7 are diagrams illustrating the nature of the magnetic regulating field produced by the mutual or reciprocal influence of the arc currents in a two-arc lamp and in an eight-arc lamp respectively; Fig. 8 shows a slight modification of the arc striking mechanism which is required with an eight-arc lamp; Figs. 9 and 10 are details of the same.

Referring to the drawings in which like parts are designated by the same reference sign, 1 and 2 indicate respectively upper and lower plates or heads forming part of the main frame of the lamp. These plates or heads are rigidly fixed or joined together by rods 3 and 4, of which 3 is a central or axial vertical rod, while 4 are rods grouped in a series thereabout, and converging at a predetermined angle toward one another and toward the central axis of the lamp. There are as many of these inclined rods 4 as the lamp has arcs. In the form of the invention shown in Figs. 1 to 5, there are four of these inclined rods. 5 designates an additional rod joining the heads 1 and 2 and parallel to the central rod 3. This rod has a guiding function as will hereinafter appear.

The lower head or base plate 2 is perforated for the various electrodes, conveniently with elongated slots 6. The various electrodes depend in converging relation through these slots to a point slightly below the lower face of the base plate 2. 7 and 8 indicate the various electrodes supported in this way. I provide means by which the central series 7 are guided downward ver-

tically while the outer series 8 are guided in an inwardly converging relation with respect to the series 7. For this purpose I provide a carrier 9, having a central hub 10, guided on the rods 3 and 5, and having radially projecting arms 11. 12 indicate insulating bushings at the extremities of these arms, and to which are fixed the sockets 13 for the central series of electrodes 7. The electrodes 8 have corresponding receiving sockets 14, with insulating bushings 15, from which rigidly project in a laterally inward direction, the slotted arms 16. These slotted arms 16 loosely embrace reduced portions of the insulated bushings 12, of the central carrier 9. The slotted arms 16 are very slightly curved on a radius described about the points of electrodes of average length. In addition to the engagement of the arms 16 with the sockets of the central electrodes, these arms have holes at their outer extremities which loosely embrace and are guided by the respective rods 4. The above construction properly guides the electrode sockets 13 and 14, so that the electrodes are constrained to feed downward in properly converging relation and at an equal speed under all circumstances.

It will be noted that the carrier 9 is free to feed downward upon the central rod 3 by gravity and in so doing carries all of the electrodes down with it with an exactly equal degree of movement. This movement is normally resisted by one of the electrodes 7 which rests on a stop or ledge 37. A convenient form of stop or ledge is that illustrated, comprising a circular metallic button pivoted to a downwardly projecting stud 38, from the base 2. As this button only supports the electrode at its tip or outside edge, the arc thereof is not in any degree interfered with. As the electrode burns away, it, together with the entire carrier, and all the other electrodes, is allowed to gradually fall, so that the feed of all the electrodes in the lamp is regulated in this simple way by any single electrode of the set. It will be evident that the feed is automatically made substantially correct in this way under ordinary conditions, since the feed requirements of all the electrodes are the same under the uniform conditions of current, etc., which they necessarily have by their connection and arrangement.

At the lower ends of the electrodes I provide means for initially striking the arcs and thereafter keeping the electrodes properly spaced apart. This mechanism is particularly shown in Figs. 1 and 4 of the drawings, and which constitutes an important part of my invention. Certain of the electrodes are guided in fixed relation through the slots of the base plate 2 by slotted ears 17, fixed to the plate 2, but insulated therefrom by bushings 18. The re-

maining electrodes are guided by pivoted arms 19, through the slotted extremities 20 of which, the electrodes project. The arms 19 are centrally pivoted on insulated studs 21, and connect the inner electrodes of one set with the outer electrode of an adjacent set. This relation secures two entirely separate and important functions. 22 indicates a link which connects the arms 19 so that they move together about their pivot studs 21. The link 6 is insulated from the arms by the bushings 22'. The link 22 projects outwardly at 23, and has a hole 24 therein. 25 indicates a stud upstanding from the base 2, and pivotally supporting a bell crank lever 26, with a downwardly extending arm 27, which engages the hole 24. This bell crank is connected by a link 28, with striking magnet 29. These features of connection between the link 22 and the striking magnet 29 may be of any desired sort.

I will now describe the electrical connections which constitute a very important feature of the invention. In the mechanical features of construction of the lamp, as illustrated in Figs 1 to 4, the electrical connections have been omitted on account of the large number and complexity thereof, which would tend to obscure the showing. It is understood that these connections are made by flexible insulated wires, for example, those having glass beads so as to withstand the heat of the lamp. The connections for a four-arc lamp are shown in Fig. 5. Supposing that 30 and 31 are the terminals of the lamp, current enters at 30, passes through striking magnet 29 to the connection 1', and inner electrode 7, through the arc thereof, to outer electrode 8, through connection 1², to another inner electrode 7, and arc thereof, to outer electrode 8, connection 1³, etc., through the other electrodes, arcs and connections 1⁴ and 1⁵, to the other terminal 31. The nature of this wiring follows certain fundamental principles dependent on theoretical considerations hereinafter stated. It will also be observed that in every case where two electrodes are connected by the pivoted arms 19, that these electrodes are the ones connected by leads 1², 1³, 1⁴, etc. In other words, the pivoted arms 19 connect electrodes which are at identical potential values by the operation of the lamp. This avoids the necessity of any insulation in the structure of these pivoted arms which can be simply stamped of sheet metal, giving a strong, practical and heat resisting construction.

I will now consider the theoretical principles underlying the arrangement of the electrodes and the circuit connections thereof. Referring to Fig. 6, two pairs of electrodes are illustrated and respectively denominated 7^a and 8^a, and 7^b and 8^b. If the current flows down in the two electrodes 7^a

and 7^b, and up in the two electrodes 8^a and 8^b, there will be produced magnetic fields in the direction of the arrows. These magnetic fields are such as to repel the electrodes of each pair from one another on the well known principles of all conductors carrying currents. As the arc at the lower ends of the electrodes is also a conductor carrying current, this is also repelled radially outward, that is, in a downward direction. With a single arc, such action is very slight, except with excessive currents of twelve amperes or more, which are larger than practically efficient. But by having the two pairs of electrodes arranged as shown and carrying current as shown, the magnetic fields assist one another, so that if there were no leakage, the field of each would be twice as strong as it would be otherwise, or, in other words, the field of each arc is substantially as great with six amperes as it would be with twelve amperes if it were alone and isolated. Six amperes is a practical current value for these lamps, and with the field equivalent of twelve amperes, the arc becomes absolutely self-regulating. With two pairs of electrodes the arcs should be quite close together to have this effect, but where four are used, they may be spaced further apart. In case of four pairs of electrodes, the field at each arc would be four times as great as if isolated, provided there were no loss by leakage, etc. This result, of course, is not obtained in practice, because of leakage and air reluctance. However, with four pairs of electrodes, the magnetic field at each is so much strengthened that its arc becomes absolutely self-regulating although only a normal operating current passes through the circuit. With eight electrodes, the same principles apply. In this case current should pass down in all the outside carbons, and up in all the inside carbons, or vice versa. This produces assisting and not opposing fields, as illustrated in Fig 7 of the drawings.

It is merely necessary to briefly consider the regulating action of these magnetic fields. It has been shown that their tendency is to deflect the arcs downward, and thereby lengthen them, so increasing their resistance. Now by regulation is meant keeping the arc of a constant length and constant illuminating value. The regulation is accomplished as follows: If the arc lengthens its resistance increases and the current diminishes. The intensity of the magnetic field is proportional to the current and its corresponding diminution lessens the blowing down action on the arc which immediately shortens, as is required. On the other hand, if the arc shortens, its resistance diminishes, and the current and intensity of magnetic field both increase immediately lengthening

the arc, as is required. This regulating action occurs, and in practice keeps the arcs absolutely steady, provided they are arranged and spaced apart and connected properly in accordance with my invention.

In the case of an eight-arc lamp, a slight modification of the striking mechanism is necessary, and the form thereof is particularly shown in Fig. 8. 2' indicates the base plate of the lamp, and 7' and 8' the various electrodes thereof. 19' are the pivoted arms connecting adjacent electrodes in a manner analogous to the arms 19 of Figs. 1 to 5. Each of these links 19' has an inwardly extending arm 40, the extremity of which is received in a perforation 41, in a swivel stud 42. These studs are swiveled in insulating bushings 47 around the circumference of a circular plate 43, centrally pivoted at 44, on the rod 3. 45 indicates a link connecting this plate 43 with a bell crank lever 46. This bell crank has a link connection 28' with the striking magnet 29' analogous to the parts 28 and 29 already described. It is clear that the energization of this magnet swings the plate 43 angularly so as to move all of the pivoted arms 19', and strike all of the arcs simultaneously, thereafter maintaining the electrodes in a predetermined spaced apart relation.

I consider it an important feature of the present invention that no magnets are required anywhere near the heat zone of the lamp where their insulation is exposed to the radiant heat and accordingly liable to injury. By my invention no magnet is required anywhere near the heat zone, and in case a striking magnet 29 is employed, it may be situated beneath the top plate 1, and therefore very remote from the arcs. In this relation it is amply protected from all unfavorable influences.

What I claim, is:—

1. In an arc lamp, a plurality of downwardly converging electrodes, means for connecting said electrodes in series whereby a plurality of arcs are produced, said electrodes and the arcs thereof alone producing a single magnetic field acting equally on all of said arcs and constituting their exclusive regulating means.

2. In an arc lamp, a plurality of downwardly converging electrodes having means for establishing a plurality of circuits therebetween, said electrodes being arranged to produce a single magnetic field acting equally on all of said arcs and constituting their exclusive regulating means, and means for initially separating the electrodes whereby the arcs are struck.

3. In an arc lamp, a plurality of downwardly converging electrodes, means for connecting said electrodes whereby a plurality of arcs are produced, said electrodes and the arcs thereof all cooperating to assist in the

production of a single magnetic field for furnishing the exclusive regulation of said arcs.

4. In an arc lamp, a plurality of downwardly converging electrodes having means
5 for establishing a plurality of circuits therebetween, said electrodes being arranged to produce a single magnetic field to regulate said arcs, and means including a striking magnet at a remote point from the arcs for

initially separating the electrodes whereby 10 the arcs are struck.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

RALPH SCOTT.

Witnesses:

WALDO M. CHAPIN,
JAMES D'ANTONIO.