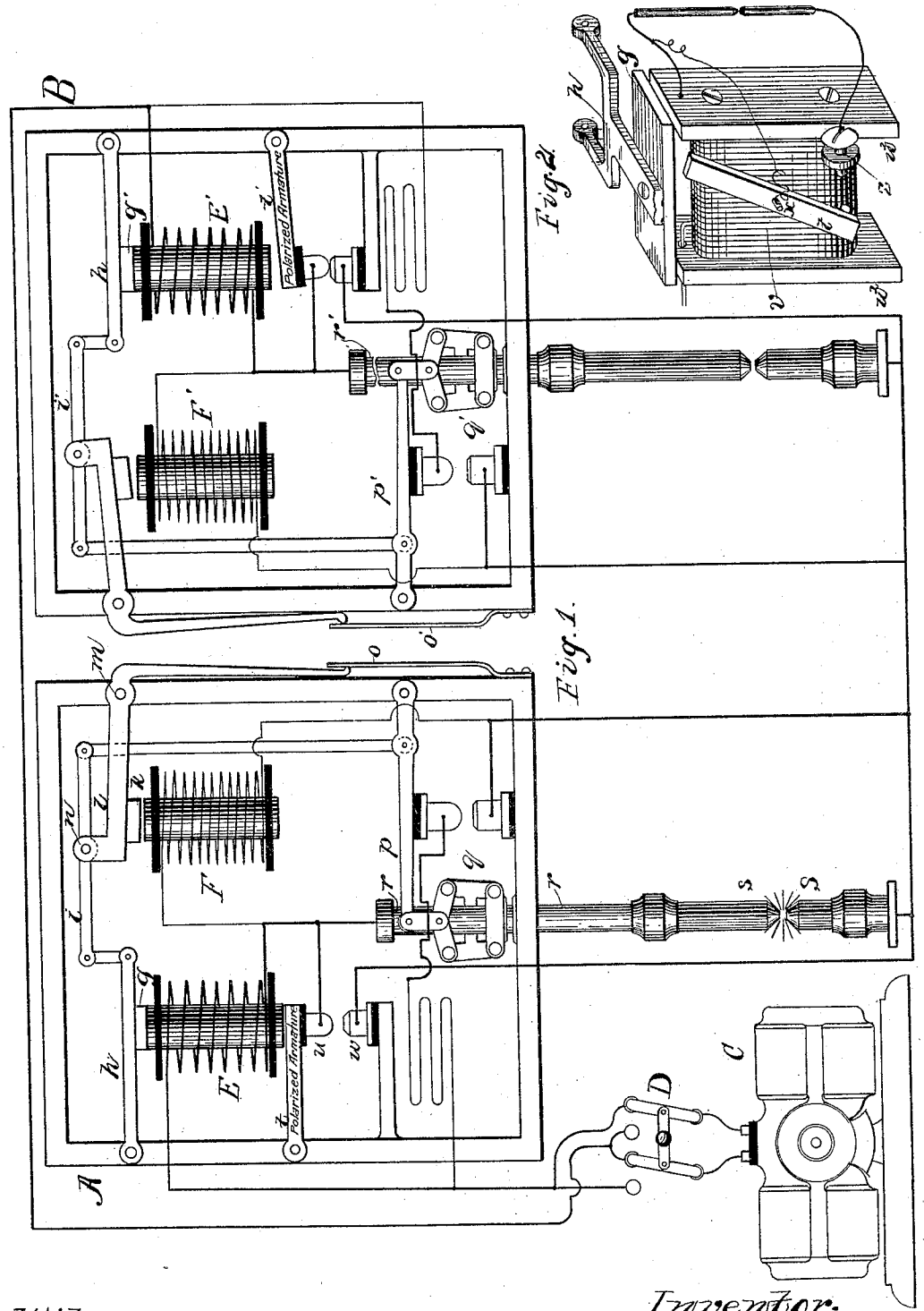
(No Model.)

C. E. SCRIBNER.

ELECTRIC ARC LAMP.

No. 543,900. Patented Aug. 6, 1895.



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UNITED STATES PATENT OFFICE

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN ELECTRIC COMPANY, OF SAME PLACE.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 543,900, dated August 6, 1895.

Application filed March 12, 1891. Serial No. 384,762. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SCRIBNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Electric-Arc Lamps, (Case No. 257,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to electric-arc lamps. Its object is to provide a lamp which shall fail to operate when the current is in other than a predetermined direction, and to provide means whereby two arc lamps placed in series in an electric circuit may be caused to burn successively. To accomplish the first of these results I provide, included in the main circuit of the lamp or in a branch circuit therefrom, an electromagnet having a permanently-polarized armature normally held away from the poles of the electromagnet, but adapted to be attracted thereto, and in connection with the polarized armature a contact which, when the armature is in its unattracted position, is closed against a second contact-piece and completes a short circuit around the arc.

The desirability of providing some means for accomplishing the result described is obvious. It is customary to arrange the circuits of a lamp so that the positive carbon is the upper one of the pair, and since in that case the rate of consumption of the lower carbon is only one-half that of the upper carbon provision is made for a lower carbon of about one-half the length of the upper one. If now the direction of the current be reversed, the lower carbon will be consumed and the clamps destroyed.

To accomplish the second result I connect two such lamps in series, preferably in reverse order, and arrange the magnets of the mechanism of each in such relation to those of the other that when a current is sent through both in a given direction the carbons of one lamp shall be short-circuited, while those of the other shall be left not shunted. Thus when the current traverses the two lamps the short-circuiting contacts of one lamp are opened and an arc is formed and persists between the carbons of that lamp, but the armature of the second lamp remains uninfluenced and its carbons remain short-circuited. At any desired time, as when the carbons of the first lamp are nearly consumed, the direction of the current through the pair is reversed. The electromagnet of the second lamp now acts upon its polarized armature and removes the short circuit from around its carbons, while the arc at the first lamp becomes short-circuited. I connect any number of pairs of lamps so arranged up to the limit of the capacity of the source of current in series in the same circuit. The current is first sent through the circuit in one direction, when the lamps divide themselves into two groups, one group in which the magnetic relations of the electromagnets to their polarized armatures is such that the armatures will be attracted and the short circuits removed from around the arcs, the other group in which the magnetic relations of the electromagnets to their polarized armatures is such that the armatures shall not be attracted and the carbons are short-circuited. Thus all the lamps of one group will be immediately brought into operation. When it is desired to bring the idle group into operation, the direction of the current in the circuit is reversed. The short-circuits around the carbons of the second group of lamps are thus opened, while the carbons of the first group become short-circuited.

Having thus generally described my invention, I will now proceed to describe it in greater detail with reference to the accompanying drawings, Figures 1 and 2, which are illustrative thereof.

I shall indicate parts by letters of reference, similar parts being designated by similar letters of reference.

In Fig. 1 I have shown diagrammatically two arc lamps A B, of well-known form, included in series in reverse order in the circuit of a dynamo C. Included also in the circuit between the dynamo and the lamps is a reversing-switch D, by which the direction of the current through the circuit may be reversed at pleasure. I have shown the polarized amatures as adapted to be acted upon

by the lifting-magnets—that is, those electromagnets which serve to initially separate the carbons to form the arc.

Referring to lamp A, Fig. 1, E is an electromagnet included in the main circuit of the lamp. F is an electromagnet of high resistance connected in shunt of the arc. The electromagnet E is furnished with an armature *g*, attached to the lever *h*, which is pivoted at one end to the frame A and is linked at the other end to the rocking lever *i*. The electromagnet F, or the "feed-magnet" is furnished with an armature *k*, attached to the bell-crank lever *l*, which is pivoted at its angle *m* to the frame A. That arm of lever *l* which carries armature *k* is provided with a lug and pivot *n*, which serves as the fulcrum for rocking lever *i*. The other arm of lever *l* is pressed toward the frame of the lamp by a spring *o*. The other end of the rocking lever *i* is linked to the lever *p*, which is pivoted at one end to the frame A and to the other end of which the clutch *q* is hung. The carbon-rod *r* passes vertically through the clutch *q* and carries at its lower end the carbon *s*, one of the pair *s s'*.

The lamps are provided with automatic cut-outs of ordinary form. Fixed to the lever *p* is an insulated contact-piece, which, when the lamp is idle, rests upon a corresponding contact-anvil fixed upon, but insulated from, the floor of the lamp. When these pieces are thus closed together, they complete a shunt through a resistance between the poles of the lamp.

Below the lifting-magnet E, I have shown a polarized bar *t* pivoted at one end of the frame and having its other end adapted to be attracted to the electromagnet, when the magnetization is in the right direction in relation to that of the permanent magnet *t*. The bar *t* carries at its movable end the contact-piece *u*, which, when the bar is unattracted, rests upon the contact-anvil *w*.

The coils of the magnets E E′ are wound in the same direction and the magnets *t t′* are magnetized in the same direction. The bottoms of the lamps are shown connected together. Hence when the current is through both lamps the lifting-magnets are magnetized in opposite directions, and hence one armature *t* or *t′* is attracted and the other remains uninfluenced. The magnets *t* and *t′* are preferably so magnetized that that lamp in which the positive carbon is the upper one shall burn.

The operation of the lamps shown will be readily understood. In their idle condition the carbons rest together. When the current first traverses the lamps the armatures *g g′* are attracted to the electromagnets E E′. The motion of the armatures is communicated through the systems of levers *h h′*, *i i′*, and *p p′* to the clutches *q q′*, which are raised, and as they are raised clamp upon the rods *r r′* and separate the carbons. At the same time the magnet E attracts its armature *t* and opens the short circuit around the carbons of lamp A, and an arc is formed between them. The armature *t′*, however, is not attracted, and hence no arc is formed between the carbons of that lamp and no current passes through its shunt-magnet.

As the resistance of the arc at lamp A increases, more current passes through feed-magnet F. The armature *k* is attracted in opposition to the spring *o* and lowers the fulcrum of rocking lever *i*, and consequently the clutch and carbon rod. When the resistance of the arc becomes sufficiently great, the magnet F draws down its armature until the bottom of clutch *q* touches the floor of the lamp, when the jaws of the clutch open slightly and allow the carbon-rod and carbon to descend a slight distance. The arc is brought to its normal length and normal resistance and the system of levers resume their normal positions. When at the proper time the direction of the current in the circuit is reversed, the armature *t* remains unattracted and the shunt-circuit, which it governs, closed, and the carbons of lamp A are out of circuit. Armature *t′*, however, is attracted and lamp B burns as lamp A had previously.

In Fig. 2 I have shown a view of a lifting-magnet detached from the lamp-frame, provided with its usual armature and lifting-lever and with a form of polarized armature which I have found well adapted to use in lamps of this class. The wire is wound upon the core *v*. The pieces *w w′* serve as pole-pieces to conduct the lines of force to the armature *g*. Armature-lever *h* is partly shown. The magnet *t* is pivoted at *x* to the frame of the lamp and is placed in electrical connection with the circuit at the point of entering the carbon-rod by a flexible connection. An adjustable insulated contact *z* in electrical connection with the bottom of the lamp is so placed that a contact on the bar *t* shall rest against it when the bar is in its alternate position.

I have sometimes placed the contact-piece *z* in such relations to the magnet *t* that when the magnet was attracted, or, in the arrangement shown in Fig. 2, when it was thrown to the other side, it should operate to close a shunt around the arc. This may be in some cases preferable, but such a variation evidently does not depart from the substance of my invention.

Although it is for obvious reasons preferable it is still not necessary to connect the two lamps of a pair in reverse order—that is, to connect the lower carbons together. If the two lamps were included in series in the ordinary manner one of the coils of that electromagnet which governs the polarized armature might be wound in the opposite direction to the other, or one of the armatures might be polarized in the opposite direction to the other.

I do not limit myself to the employment of the armature *t* in connection with the main

lifting-magnet of an arc lamp. I have sometimes employed an auxiliary magnet included in the main circuit to effect the same general result, or a magnet in shunt of the arc or of a resistance included in the main circuit might be similarly employed.

It will be seen that the cut-out circuits do not form any part of my invention nor take any part in the operation of the lamp. Other forms of cut-out might be applied to these lamps, or the cut-out might be omitted altogether.

It is obvious that my invention might be applied to many other forms of arc lamps. With the exercise of ordinary skill one familiar with the art to which my invention pertains could adapt it to any form of arc lamp known in the art.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination with two arc lamps, of an electro-magnet and a polarized armature therefor provided in connection with each of said lamps, a pair of contacts controlled by each of said armatures for cutting the respective lamps into and out of circuit, said electro-magnets being wound relatively to their respective polarized armatures so that current in one direction will actuate one of said armatures to cut one lamp into circuit, while current in the opposite direction will actuate the second armature to cut the second lamp into circuit.

2. The combination of two arc lamps connected in series in reverse order, in an electric circuit, each provided with, included in the main circuit or in a branch circuit therefrom, an electro magnet having a permanently polarized armature adapted to assume one of two positions, in accordance with the magnetic relation of the polarized armature to the electro magnet, which polarized armature is provided with contacts adapted to be closed when the armature is in one of its positions, and when closed to complete a short circuit around the carbons of its lamp, and each lamp having the relation of the magnetizations of its electro magnet and polarized armature so arranged with reference to the other lamp that a current through both lamps shall cause the carbons of one lamp to be short circuited, as and for the purpose described.

3. The combination with two arc lamps connected in series in an electric circuit, of an electro-magnet and polarized armature therefor provided in connection with each of said lamps, a pair of contacts controlled by each of said armatures adapted when in contact to close a short circuit about the carbons of the lamp to which said contacts belong, said electro-magnets being wound relatively to their respective armatures so that current in one direction will actuate one of said armatures to open the contacts controlled thereby and thus cut the carbons of the lamp into circuit, while the current in the opposite direction will actuate the second armature to cut the second lamp into circuit.

In witness whereof I hereunto subscribe my name this 3d day of March, A. D. 1891.

CHARLES E. SCRIBNER.

Witnesses:
ELLA EDLER,
GEORGE L. CRAGG.