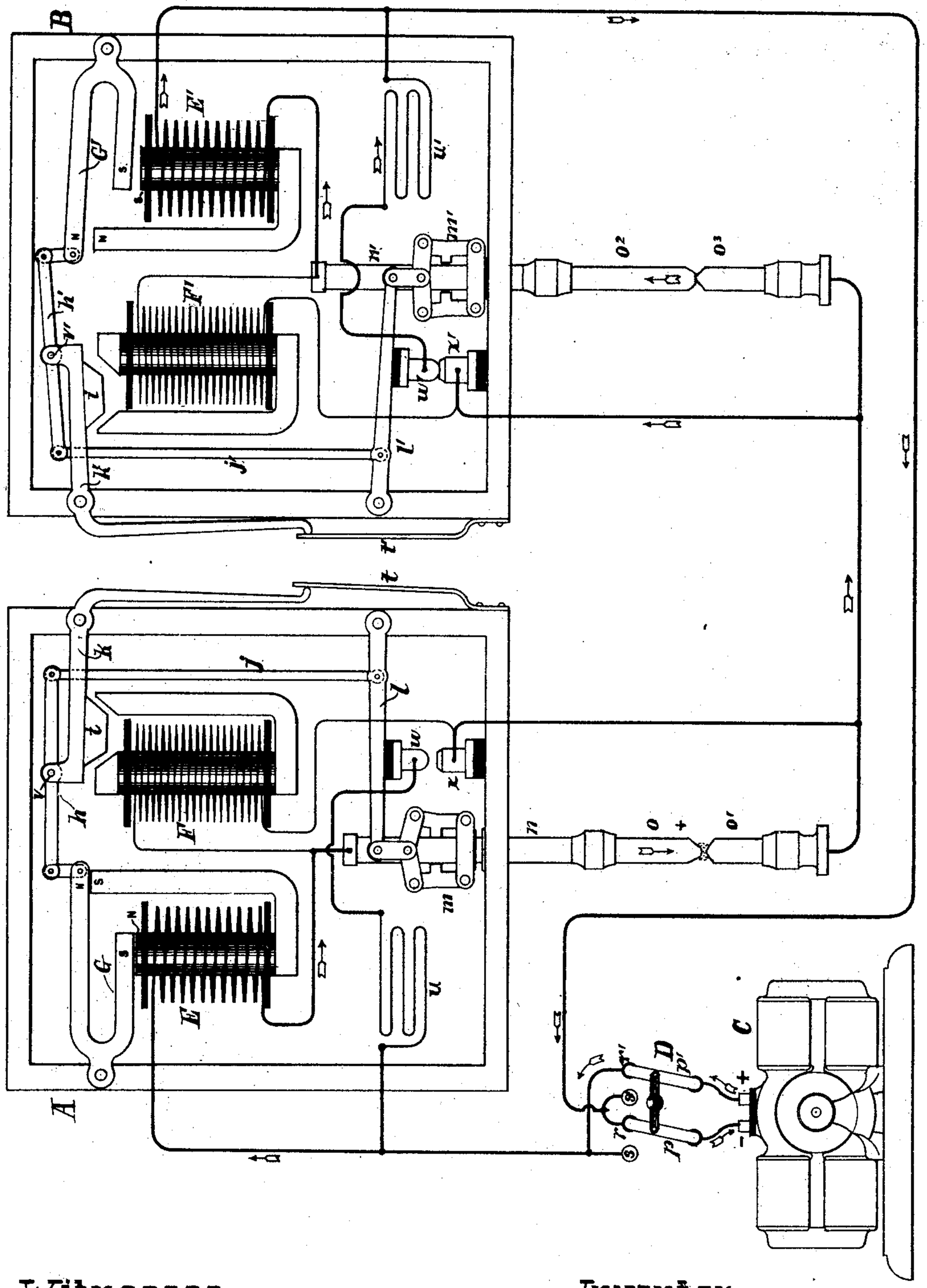
(No Model.)

C. E. SCRIBNER.

ELECTRIC ARC LAMP.

No. 502,471. Patented Aug. 1, 1893.



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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. 502,471, dated August 1, 1893.

Application filed March 4, 1891. Serial No. 383,779. (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. 256,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to electric arc lamps, and its object is to provide means whereby two arc lamps placed in series in the same electric circuit may be made to burn successively.

In the operation of my invention I provide at any place at which illumination is desired for a longer time than the period of burning of a single lamp, a group of two lamps, in series, one after the other, each of which is so constructed that when a current is sent through the group in one direction only one lamp will burn, the mechanism of the other remaining inoperative; when the current is made to traverse the two lamps in the opposite direction, the other of the lamps comes into operation and the first becomes idle and is shunted out of circuit by the action of its cutout. At the central station or point from which current is supplied to the lamps, I provide a switch or other means for reversing the direction of the current through the circuit containing the lamps. When the current is first sent through the circuit, one of the two lamps, it being dependent as to which one upon the direction of the current, will come into operation; an arc will be formed between its carbons, and the lamp will continue to burn, the current passing through the other lamp without affecting its mechanism; when the carbons of the first lamp are nearly consumed, an attendant, by the switch or other suitable means, reverses the direction of the current through the circuit, when the second lamp at once comes into operation, and the first is extinguished. Any number of such groups, up to the limit of the capacity of the source of current, may be connected in the same circuit; only one lamp of each group will be lighted at one time; when at the proper time the direction of the current is reversed, the remaining lamps of each group will be lighted, and the first will be extinguished. The lamps may be provided with safety cutouts in the well known manner.

For accomplishing the result described, in the construction of lamps embodying my invention, I provide for the "lifting magnet," or that magnet whose office it is to first separate the carbons to form the arc, an armature of steel permanently polarized, which may be of any well known shape best to serve the purpose. This armature is arranged in such relation to the core and poles of the "lifting magnet" that when the core of the latter is magnetized in a certain direction, corresponding to the direction of the current in the magnet coils, the armature will not be attracted and will thus fail to perform its function of separating the carbons; but if the magnet have the direction of its magnetization reversed, the armature will be attracted, and the lamp will operate as usual. The two lamps of one group have their respective lifting magnets so magnetized in relation to their armatures, that when a current is flowing through both lamps, the lifting armature of one lamp is attracted and held and therefore that lamp will burn, while the armature of the other lamp is not attracted and does not bring its dependent mechanism into operation.

My invention will be more clearly understood by reference to the accompanying drawing.

In the drawing I have shown, somewhat diagrammatically, two arc lamps, A, B, of well known form, in series, that is, one after the other, in the circuit of a dynamo C; interposed in the circuit between the dynamo and the lamps, I have shown a reversing switch D, by means of which the direction of the current through the lamps may be reversed.

I will now proceed to describe more fully the construction and operation of my invention, referring to the lamp A at the left of the drawing.

E is the "lifting magnet" of well known type, included directly in the circuit.

F is the "feeding magnet," with coils of high resistance and placed in shunt around the arc.

The magnet E is provided with the polarized armature G, pivoted at one end to the frame A, and linked at the other to a rocking lever *h*. The magnet F is provided with an armature *i*, attached to bell crank lever *k*, which is pivoted at its angle to the frame A; that extremity of the lever *k* which carries the armature is provided with a lug which serves as a fulcrum for the rocking lever *h*, and to which the latter is pivoted near its center; the other extremity is pressed toward the lamp frame by the spring *t;* the other extremity of the rocking lever *h* is attached by link *j* to the lever *l*, which is pivoted at one end to the frame A and to the other end of which the clutch *m* is hung. Through this clutch passes the carbon rod *n*, which carries at its lower end the carbon *o*, one of the pair *o*, *o'*. The lever *l* carries an insulated contact *w*, which rests normally upon an insulated block *x;* the contact *w* is connected through a resistance to the circuit at the point at which it enters the lamp; contact *x* is connected to the circuit at the point at which it leaves the lamp. Thus when the contacts *w*, *x* are closed, as when the lamp is at rest, a shunt circuit including a resistance is provided around the lamp in the well known manner. The mechanism of lamp B is exactly similar to that of lamp A.

The circuits of the lamps may be readily traced, and are as follows: Considering the current to enter at the positive terminal of lamp A, it divides, and a portion passes through the resistance, through the contacts *w*, *x*, to the bottom of the lamp; another portion flows around the coil of main magnet E, thence the greater portion of it flows through the carbon rod *n*, carbons *o*, *o'* to the bottom of the lamp; a small portion flows around the high resistance coil of feed magnet F, and to the bottom of the lamp; thence the current passes to the bottom of the second lamp, where it again divides; a portion flows through the contacts *w'*, *x'*, resistance *u'* and out; another part flows up the carbons o^2, o^3, carbon rod *n'*, and still another through the high resistance coil of magnet F', to carbon rod *n'*, where the two latter currents unite, traverse the coil of magnet E' and out.

The operation of the system is as follows: Current flows from the positive pole of dynamo C, through the springs *p*, *p'* and contacts *r*, *r'*, of switch D, through lamps A and B, as traced. If now the direction of winding of the main magnet coils E and E' be the same, and the direction of magnetization of the armatures G and G' be the same, then under the conditions shown in the drawing the armature G will be attracted and will move toward the poles of the magnet E. Its motion will be communicated through the link to rocking lever *h*, which will turn upon its fulcrum *v*, which is as yet held immovable by the force of the spring *t*, and thus will raise the lever *l* and clutch *m*, and at the same time will separate the contacts *w*, *x* and open the shunt circuit through the lamp; the clutch will close upon the carbon rod *n* and lift it, and an arc will be formed between carbons *o* and *o'*. As the carbons are consumed, the arc grows longer and its resistance is increased, consequently more current flows through the magnet F in shunt of the arc; its strength is thereby increased, and it draws down its armature *i*, lowering the fulcrum of rocking lever *h*, and thus the lever *l* and clutch *m*, and decreasing the length of the arc. The lamp is so adjusted that when the strength of the magnet is considerably increased, the bottom of the clutch rests upon the floor of the lamp; the clutch now releases the rod *n* slightly and allows it to slide down a very small distance; the arc is thereby decreased in length, and the magnet F resumes its normal strength, and the armature *i* and its dependent mechanism their normal positions. In case anything prevents the descent of the carbon rod *n*, the magnet F attracts its armature still farther, until the contact *w* rests upon the contact *x*, shunting the lamp out of circuit. Meanwhile, the current will be passing through the magnet coil E' in a direction to cause armature G' to be rather repelled than attracted, and consequently the lamp B will remain inoperative. When the carbons *o*, *o'* of lamp A are nearly consumed, the switch springs *p*, *p'* are moved over upon the contacts *s*, *s';* the current now passes in at the lifting magnet of lamp B, through this lamp, thence up through the carbons of lamp A and through its cutout circuit, and returning to the dynamo; the armature G' of lamp B is now attracted and armature G of lamp A remains uninfluenced.

It is obvious that the cutout circuits of the two lamps are not necessary, but are useful adjuncts to the lamps; they play no necessary part in the operation of the mechanism of the lamps, but serve to reduce the resistance of the lamp when it is idle, and prevent the opening of the circuit when the carbons are burned out.

It will be observed that in the drawing I have shown the two lamps connected in series in reverse order, that is, the lower carbon of one lamp is connected to the lower carbon of the other. When the two lamps are connected in this manner, the two electro magnets E, E' may be wound in the same direction, and the two armatures G, G' may be similarly magnetized and in such a direction that in that lamp which is lighted the positive carbon shall be uppermost.

It is obvious that with the exercise of ordinary mechanical skill, my invention may be applied to any lamp in which the separation of the carbons to form the arc is performed by an electro magnet attracting its armature. It is, moreover, obvious that my invention might be employed in connection with that class of lamps in which the carbons are normally held apart and their approach and subsequent separation is brought about by the

same electro magnet, which during the operation of the lamp is in shunt of the arc and effects the feeding of the carbons. Thus, it will be seen, I am enabled to connect in series in the electric circuit a number of arc lamps so constructed and arranged that they are divided into two groups; all the members of one group are adapted to operate with a current of one polarity, and all the members of the other group are adapted to operate with a current of the other polarity.

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

1. The combination in an electric arc lamp of a main lifting magnet and an armature controlled thereby adapted to actuate the lifting mechanism of the lamp, a portion of the magnetic circuit of said electromagnet being permanently polarized, whereby the lifting mechanism is actuated by current in a particular direction only through the lifting electromagnet, substantially as described.

2. In combination, two arc lamps connected in series in the same circuit, each provided with an electro magnet having a permanently magnetized armature which, when it is attracted to the magnet, actuates mechanism operating to separate the carbons of the lamp to form the arc, and having the relative magnetizations of their respective lifting magnets and polarized armatures, so arranged that the armature in one lamp shall be attracted to its electro-magnet and that in the other shall not be attracted to its electro magnet when a current is sent through the circuit of both lamps, in the manner and for the purpose specified.

3. Two arc lamps connected in series in reverse order in the same circuit, each being provided with an electro magnet included in the main circuit or in a branch circuit therefrom, and with a permanently magnetized armature adapted to be attracted to the electro magnet when the magnetization of the electro magnet is in one direction, and when so attracted to actuate mechanism operating to separate the carbons to form the arc, and each having the relative magnetizations of its polarized armature and its electro magnet so arranged that a current of given direction sent through both lamps shall cause the electro magnet of one lamp to attract its polarized armature, and the electro magnet of the other lamp to leave its polarized armature unattracted, in combination with a source of electricity included in the same circuit with the lamps, and a switch or other suitable means for reversing the direction of the current through the lamps, in the manner and for the purpose specified.

4. In combination, two electric arc lamps in series in the same circuit, lifting magnets in each of said lamps and a movable armature for each of said lifting magnets controlling the lifting mechanism of its particular lamp, some portion of the magnetic circuit of each of said lifting magnets being permanently polarized, the polarity of the different magnets being so arranged with respect to each other that one attracts its armature while the other does not, whereby the lifting mechanism of only one lamp is energized when a current is sent through both, substantially as described.

In witness whereof I hereunto subscribe my name this 17th day of February, A. D. 1891.

CHARLES E. SCRIBNER.

Witnesses:
FRANK R. MCBERTY,
ELLA EDLER.