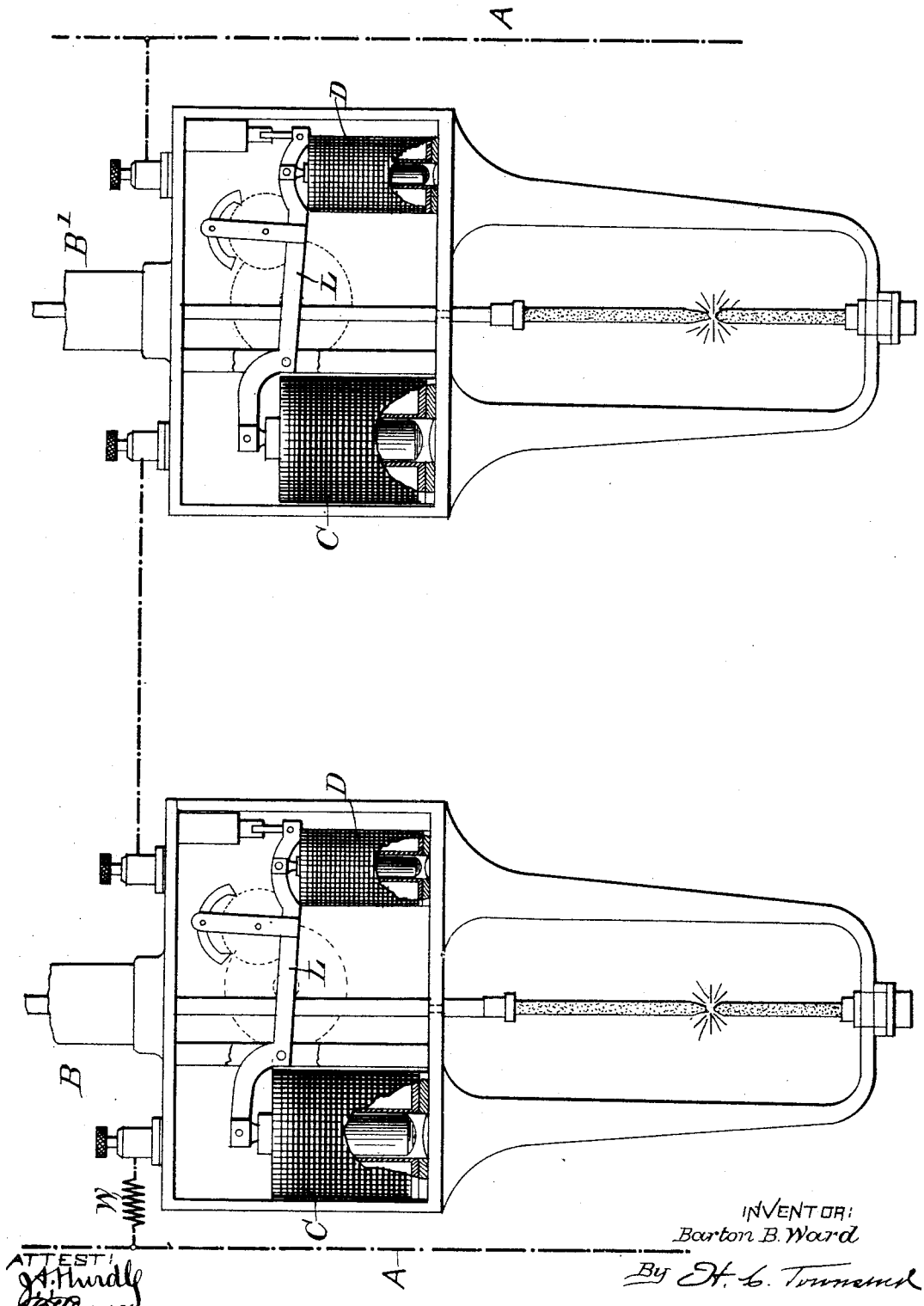
(No Model.)

B. B. WARD.

ELECTRIC LIGHTING SYSTEM.

No. 484,479. Patented Oct. 18, 1892.



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UNITED STATES PATENT OFFICE.

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ELECTRIC-LIGHTING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 484,479, dated October 18, 1892.

Application filed March 1, 1892. Serial No. 423,331. (No model.)

To all whom it may concern:

Be it known that I, BARTON B. WARD, a subject of the Queen of Great Britain, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Running Arc Lamps in Series from Constant-Potential Circuits, of which the following is a specification.

My invention relates to the running of electric-arc lamps in series from constant or approximately-constant potential circuits, or, in other words, under conditions where the current in the series portion of the circuit will be varied in amount in all the devices in series with one another through a disturbance in the normal or adjusted resistance of any one or more of said devices in the series.

The object of my invention is to cause the arc lamps run in series with one another under such conditions to feed and operate with substantial independence, or, in other words, with the substantial uniformity or independence of operation that exists when arc lamps of the usual construction having main and derived circuit magnets are run in series on a constant-current circuit.

As is well known in the art, lamps run in series on constant-current circuits have their main magnet of low resistance and their derived circuit-magnet of high resistance adjusted to cause a feed to take place on a variation in their relative power caused by a variation in the resistance of the branch containing the arc. On a constant-current circuit the lamps will feed with practical independence, because the current in the whole circuit being automatically kept constant the lamp whose arc varies will be the only one in which the normal adjustment of relative power on the main and derived magnets will be affected in such way as to produce a feed, the normal relation being maintained in other lamps of the series because the general-current flow on the circuit is not disturbed. With lamps running in series on a constant-potential circuit, however, the increase in the length of arc in one lamp will not only affect the relative power or condition of the magnets in that lamp alone, but the adjusted relation of power in the magnets of other lamps will also be affected to a greater or less extent, because there is a variation of resistance in the circuit in the lamp whose arc lengthens the more rapidly and no corresponding variation of potential, so that the total current flowing through other lamps will vary, and magnetic conditions are therefore produced tending toward causing a feed, which may take place in any one of such other lamps, owing to the more delicate adjustment of their mechanism or the nicer construction or condition of their parts. Hence it will frequently happen that those lamps will feed in which the arc is of less length than in others, and the final result is that the arcs will differ greatly in length, some gaining on the others, until finally the carbons of one may burn with an abnormally-short arc and feed together or the carbons of another may draw a long arc and break the circuit or go out.

The aim of my invention is to obviate these difficulties and to obtain such a practical independence of action in the lamps that each shall feed only in response to changes in the condition of its own arc and shall not readily respond to or be affected by changes in the condition of the current on the circuit due to the action of the lamps in series with it in the same branch from the constant-potential main.

To this end my invention consists in the combinations of apparatus and circuits hereinafter described, and more specifically stated in the claims.

In the drawing I have illustrated in general diagram and side elevation an apparatus embodying my invention.

A A indicate constant-potential mains or circuits adapted to supply translating devices in any number of branches connecting said mains.

B B′ indicate two arc lamps run in series with one another in a branch connected with said mains. As will be readily understood, other branches might contain similar lamps running other translating devices—as, for instance, incandescent lamps.

In the present case the mains A A may be constant-potential mains of about one hundred and ten volts, which are adapted to run two ordinary arc lamps in series, each requiring approximately forty-five to fifty volts, the voltage being cut down to the proper amount

by the interposition of a suitable resistance, as at W. This resistance forms no part of my invention, nor is my invention limited to the voltage of any particular main, as I have in many cases operated lamps in the same manner ten in series across mains of five hundred volts potential.

C indicates the main-circuit magnet or branch, and D the derived-circuit magnet therefor. Each magnet has, as shown, a movable core, which cores are suspended or attached to the lever L, pivoted at *a*, said lever being connected to the usual feeding or regulating mechanism, which is not herein particularly described, as it may be of any desired character for operating upon the carbons in the usual manner; nor are the circuits to the lamp particularly described, as they may be of any proper character, it being understood that the main-circuit coils C are in a circuit through the carbons and the arc, while the derived-circuit coils are in a branch around the arc. The fulcrum of the lever L is, preferably, much nearer the magnet C than the magnet D, the difference in leverage being, approximately, as three to one.

Opposite the end of the core for C and in rather close proximity thereto is arranged a mass of iron or other magnetic substance, and preferably opposite the end of the core for D is also arranged a mass or body of iron. The core of C moves in very close proximity to the body or mass of iron. The ends of the cores may be beveled or the masses of iron may be rounded or conformed, as shown, or may be otherwise shaped, as desired. The main point is to provide the mass of iron opposite the end of core C and, preferably, opposite that of D also. This mass of iron may be independent of the frame of the lamp, but is preferably the frame of the lamp, as indicated.

It will be seen that the lamp as thus constructed constitutes a magnetic circuit from one to the other of the cores; but this is not necessary, as the frame or base-plate upon which the cores are mounted, and which in the lamp shown consists of iron, might be divided vertically by a non-magnetic line or plane, as indicated by the dotted line. The lamps are constructed both with this mass or body of iron, and when so constructed will be found to work with substantial independence—that is to say, if the arc lengthen in lamp B beyond the adjusted or desired amount the magnet system of that lamp would alone act to cause a feed and that of B′ will not be affected. If, on the contrary, under the conditions of circuits and connections shown, the mass of iron should be omitted and the cores and coils of the usual construction be employed, it will be found that, while the arc of lamp B might lengthen so that a feed would be required therein in preference to a feed in B′, nevertheless the lamp B′ would be the first to feed, and vice versa; but with the mass or body of iron arranged in close proximity to the end of the core, as shown, the lamps will work and control themselves independently of one another. This independence of operation I attribute to the action of the mass of iron in slowing or making more sluggish the operation of each lamp, the presence of the iron at the core ends giving an action just sufficient to hold the lamp in check and prevent any operation except that due entirely to the lengthening of its own arc. In other words, the presence of the iron near the core of the magnet operates to hold the lamp mechanism in check against any action which it might tend to have through a disturbance of the general flow of current on the branch due to the lengthening of the arc in another lamp and to prevent it from acting except through the lengthening of its own arc and the consequent greater action of its derived-circuit magnet. Whether this explanation of the action of the lamps and the causes which produce the difference in operation when the mass of iron is employed, as described, and in the relation assumed, be correct or not, the fact is that by numerous experiments and tests I have demonstrated the beneficial operation of the iron mass in the organizations of circuits and apparatus described, and have satisfied myself that by the use of it the want of independence, which would exist if the cores were of the ordinary proportion used in arc lamps for constant-current circuits and the iron were omitted, will be avoided.

What I claim as my invention is—

1. The combination, with two or more arc lamps run in series on a constant-potential circuit and each having a main and derived circuit magnet, as described, of a mass or body of iron in close proximity to the movable core of the main-circuit magnet in each lamp, as and for the purpose described.

2. The combination, with electric-arc lamps run in series on constant-potential mains and each having a main and a derived circuit-magnet with a movable core, of a mass of iron opposite the ends of the cores for both magnets in each lamp of the series.

3. The combination, with the electric-arc lamps run in series from constant-potential mains and each having main and derived circuit magnets with movable cores hung or attached to the opposite ends of a lever having its pivotal point nearer the main-circuit coil, of a mass or body of iron in close proximity to the ends of the cores for the main-circuit magnet of each lamp in series.

Signed at New York, in the county of New York and State of New York, this 26th day of February, A. D. 1892.

BARTON B. WARD.

Witnesses:
WM. H. CAPEL,
THOS. F. CONREY.