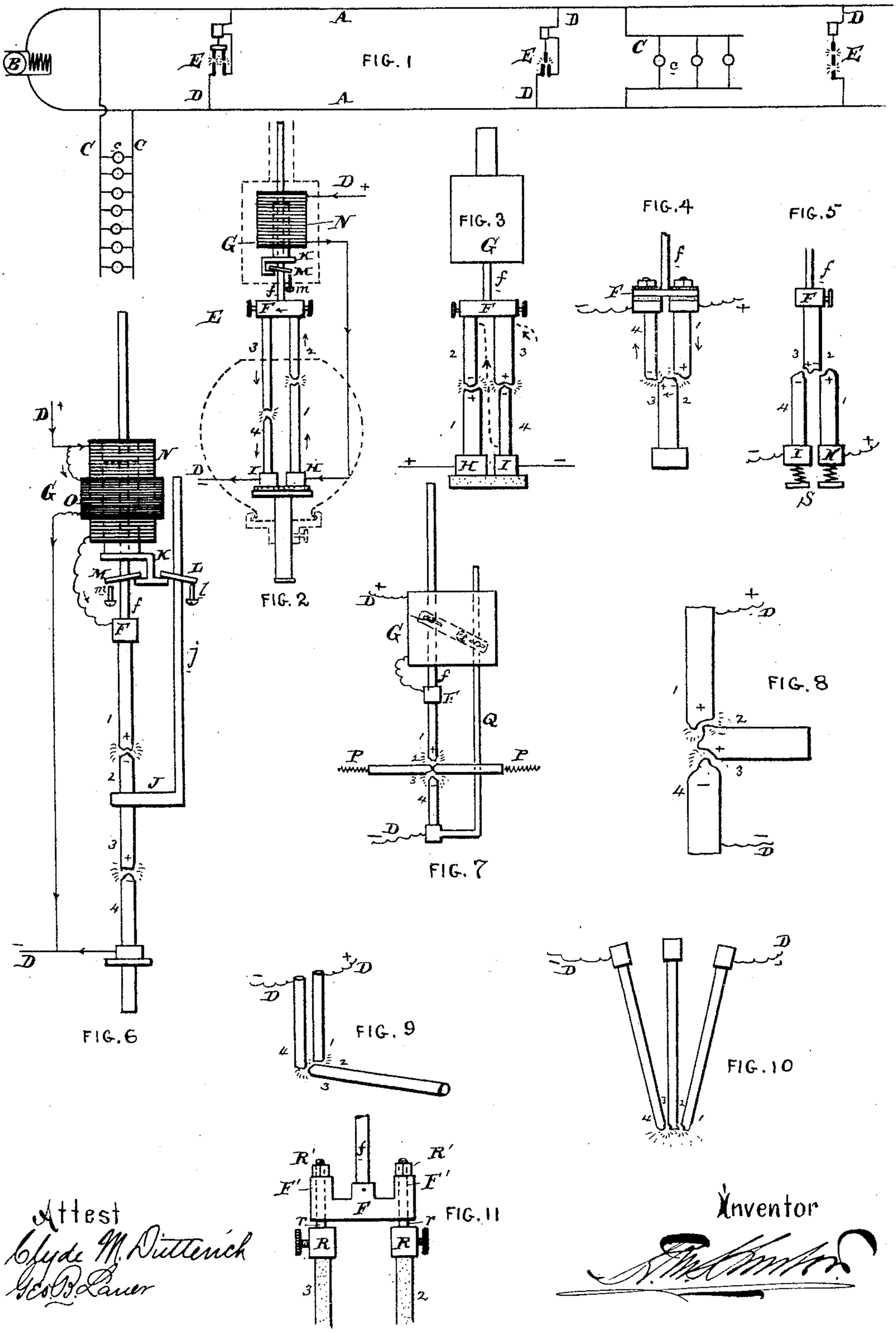
(No Model.)

R. M. HUNTER.

ELECTRIC ARC LAMP.

No. 497,450. Patented May 16, 1893.



Attest
Clyde M. Dittenich
Geo. B. Lauer

Inventor
R. M. Hunter

UNITED STATES PATENT OFFICE.

RUDOLPH M. HUNTER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE THOMSON-HOUSTON ELECTRIC COMPANY, OF CONNECTICUT.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 497,450, dated May 16, 1893.

Application filed September 22, 1892. Serial No. 446,504. (No model.)

To all whom it may concern:

Be it known that I, RUDOLPH M. HUNTER, of the city and county of Philadelphia and State of Pennsylvania, have invented an Improvement in Electric-Lighting Systems and Lamps Therefor, of which the following is a specification.

My invention has reference to electric lighting systems and lamps therefor, and consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings which form a part thereof.

This application, Case No. 227, while relating to certain peculiarities of the system, is more particularly directed to the construction of arc lamps adapted to incandescent circuits.

Heretofore it has been customary in employing arc lamps on incandescent circuits, to arrange two arc lamps of the ordinary voltage in series with each other so as to produce substantially a resistance which would require a voltage of one hundred to one hundred and ten volts to make the lamps burn properly. The use of two lamps, where one would suffice, is objectionable from many standpoints. In the first place, it requires double the support in the form of poles, or where one pole is employed it requires expensive construction to support both lamps, and also requires increased stability in the pole. Furthermore, there is double the expense in the cost of lamps, as we have two lamps where one alone should be necessary. In those cases where but one lamp is employed with auxiliary resistances, or in lieu of idle coils employing incandescent lamps in parallel, we have a loss of current due to dissipation in heat, or we have incandescent lamps operating under unfavorable conditions. The variations in the arc, or fluctuation in the current due to the act of the regulator of the lamp will make the incandescent lamps be constantly fluctuating in their brilliancy, which is exceedingly annoying if said lamps are on a circuit which is brought into a building for lighting it. If the lights are left in the street they are useless, as the arc lamp is all that is required and they are simply burning without an object. Furthermore, the peculiar work to which they are subjected will soon cause them to be burned out and necessitate their being replaced by new ones.

The object of my invention is to overcome these objections by employing a single arc lamp in a cross circuit between incandescent mains, but so arranging the lamp that the required resistance is produced by the maintenance of two arcs controlled by the same regulator. By this method I employ a single lamp at any one place in the incandescent mains. I use but a single regulator for both arcs, and in practice I form the arcs so that the two of them would consume about the same current in watts as is consumed in an ordinary arc lamp, thus making the lamp economical in operation. The method of my maintaining the two arcs with the same regulator may be varied considerably as will be understood by an examination of the various drawings forming part of this application, and as a better understanding will be had by consulting the said drawings, I will now refer to them.

Figure 1 is a diagram illustrating the electric circuits and the location of the various lamps therein relatively to each other. Fig. 2 is an elevation of an electric lamp adapted to the incandescent circuits and embodying my invention. Fig. 3 is an elevation of a modification thereof. Figs. 4 and 5 are elevations showing different modified arrangements of the carbons. Fig. 6 is a side elevation of an electric lamp also embodying my invention in a modified form. Fig. 7 is another elevation illustrating a still further modification of my invention. Figs. 8, 9, and 10 are general views illustrating other arrangements of the carbons for carrying out my invention; and Fig. 11 is an elevation of one form of carbon holders.

A are the incandescent mains, and B is the source of electric energy for generating constant potential current.

C are local circuits branching from the mains A and containing incandescent lamps *c* in parallel in the well known manner.

D are cross mains between the incandescent mains A and contain the arc lights E, which may have any of the peculiar constructions set out in Figs. 2 to 11. In the diagram Fig. 1, several constructions of car lamps under my general invention are indi-

cated; especially those more fully illustrated in Figs. 2, 3, 4, 5, and 6 which are taken as examples.

I will refer to the several figures in succession so as to avoid confusion.

In Fig. 2 we have four carbons 1, 2, 3, 4, of which carbons 1 and 4 are held in insulated supports H and I at the base of the lamp, and carbons 2 and 3 secured to a common metallic holder F directly carried by the rod *f* of the regulator G. The regulator may be of any suitable construction that shown being a simple form very similar to the well known type of Brush lamp. It consists of a solenoid N in the circuit D adapted to raise a core K having a ring holder to operate the clamping ring M which lifts or releases the rod *f* in feeding the carbons. A screw *m* actuates the ring M when the core is lowered to permit the rod *f* and the carbons 2 and 3 to fall. The circuit after leaving the solenoid N passes to the holder H at the base of the lamp, and finally emerges from the holder I, also at the base of the lamp. The arrows indicate the direction of the current. It will be perceived that the two arcs are in series and yet they are controlled by the same regulating apparatus G. As indicated, the carbons 1 to 3 are made longer than the carbons 2 and 4, since from the well known principle of the consumption of carbons in arc lamps, it will be seen that with carbons of uniform diameter the arc on the right hand side will travel downward with greater rapidity than the arc on the left hand side.

In the construction shown in Fig. 3, we have the same general character of lamp as that in Fig. 2, but in this case the carbons are of the same length, and the positive carbons are twice the sectional area of the negative carbons. In this construction the arcs burn down uniformly. It is evident that the current may be delivered to carbon 2 first and then conveyed to carbon 1, and then to carbon 3, and finally to carbon 4 as indicated in dotted lines in Fig. 3. This will insure both craters being on the bottoms of the upper carbons.

In the construction shown in Fig. 4, we have the two upper carbons insulated from each other and operated in connection with the single lower carbon. The current passes through the carbon 1, then to the side of the lower carbon marked 2, and leaves the side of the lower carbon marked 3, and passes to the negative carbon marked 4. In this case the lower carbon has no direct connection with the wire circuit D.

In the case shown in Fig. 5, we have just the reverse to what is shown in Fig. 4. There is one upper carbon and two lower carbons, the latter being insulated from each other and connected with the cross circuit D.

In the construction shown in Fig. 6, we have three carbons arranged one above the other, the lower carbon 4 being held stationary, and the upper carbon 1 and middle carbon 2—3 being both fed downward by the same regulator G. The regulator G consists of a solenoid N in the direct circuit D and arcs of the lamp, and is adapted to operate the lifting core K. The lifting core operates a ring M adapted to lift or release the carbon rod *f* having the holder F at the bottom and thereby regulate the carbon 1. The stop *m* is adapted to trip the ring M to free the rod *f* at the proper moment. The middle carbon 2—3 is carried by a holder J which has a vertical rod *j*, the movement of which is controlled by a ring L operated by the lifting core K and a stop *l*. The parts *f*, *j*, *m*, *l*, and solenoid N are all supported in a suitable frame work (not shown) as is customary in arc lamps. O is a shunt or high resistance coil to counteract lifting effect of the solenoid N, and is in a shunt circuit about the arcs of the lamp in the well known manner. In this construction of lamp, it is evident that by the proper adjustment of the parts both arcs may be maintained.

In the construction shown in Fig. 7, we have two horizontal carbons 2—3 meeting at the center and pressed into contact by springs P. An upper carbon 1 is arranged above the juncture of the carbons 2—3, and a lower carbon 4 is arranged below said juncture and preferably in line with the carbon 1. The holders *f*, F, and Q of the respective carbons 1 and 4 are operated in manner well known in focusing lamps, and are controlled by any well known form of regulator G. In this manner two arcs are maintained by it, one between carbon 1 and the horizontal carbons 2—3, and the other between the horizontal carbons and the lower carbon 4. The carbons 1 and 4 move toward or from each other and the intermediate carbons as will be well understood.

In the construction shown in Fig. 8, we have a single horizontal carbon 2—3 and a vertical upper carbon 1, and a lower carbon 4. The current passes from the circuit D to the carbon 1, then through carbon 2—3 to carbon 4 maintaining two arcs. This construction is similar in character to Fig. 7, or to Fig. 5 if the carbons 1 and 4 were turned into a horizontal position.

In Fig. 9 we have carbons 1 and 4 arranged parallel and at right angles to a carbon 2—3. This would be similar to Figs. 4, 5 or 8 if the carbons 1 and 4 were turned parallel and at right angles to the carbons 2—3.

Fig. 10 illustrates another modified arrangement of the carbons which would be similar to Fig. 9 or to Figs. 4 and 5 with the three carbons turned up into substantially the same plane and pointing in the same direction.

Fig. 11 illustrates the preferred method of supporting the movable carbons in their holder F. The lifting rod *f*, is secured to the head or holder F, and this is provided with vertical guides F′ at a distance apart in which rods *r* work; said rods being provided with ad-

justable nuts R′ at the top and the clamp R at the bottom in which the carbons are secured. The carbons made thus have a slight independent adjustment, so that if there was any irregularity in the length of the carbons after the lamp was put out of circuit the respective carbons would come into contact to permit the lamp to readily light up. The lamp would not light if one of the carbons did not touch the lower corresponding carbon. It is quite evident that any other equivalent device may be employed for this purpose, as for instance, supporting the carbons upon elastic supports substantially as indicated at S in Fig. 5. When the upper carbon or carbons descend this construction would permit a positive contact with both the lower carbons 1 and 4.

I do not confine myself to any of the mere details of construction, and these may be modified and changed in various ways as will readily appear to any one skilled in the manufacture of electric arc lamps.

Having now described my invention, what I desire to secure by Letters Patent is—

1. In an arc lamp, the combination of two vertically independent adjustable holders adapted to support independent carbons, a third carbon holder adapted to maintain the carbons in position for forming two arcs, an electric regulator to move the carbons relatively to or from each other to maintain the arcs, and an electric circuit including the regulator in series with the insulated carbon holders, whereby the current is caused to successively traverse the regulator and both arcs.

2. In an arc lamp, the combination of two carbon holders, an additional carbon holder to support one or more independent interposed carbons having no direct connection with the electric circuit, an electric regulator for moving the additional carbon holder and interposed carbons to maintain the arcs, and an electric circuit including the electric regulator and also including the two carbon holders first mentioned in series, whereby the current is caused to pass from one carbon holder through the carbons to the additional carbon holder which is operated by the regulator and thence through the carbons to the remaining carbon holder and to line.

3. In an electric lamp, the combination of two carbon holders insulated from each other, a third carbon holder F having vertically adjustable current supporting clamps carried thereby, an electric regulator to move the third carbon holder F vertically, and an electric circuit including the regulator and the two first mentioned carbon holders in series.

4. In an electric lamp, the combination of two insulated holders, two carbons of different lengths adapted to said holders, a third holder, two carbons of different lengths adapted to said third holder, a regulator adapted to move the carbons relatively to or from each other to maintain two arcs respectively between the long carbons and the short carbons, an electric circuit including the regulator mechanism and the several arcs in series, and adjustable supports for two of the carbons and their holder or holders whereby they shall insure contact with the other carbons when the lamp is cut out of circuit.

In testimony of which invention I have hereunto set my hand.

R. M. HUNTER.

Witnesses:
ERNEST HOWARD HUNTER,
HELEN L. MOTHERWELL.