(No Model.)

J. E. GILES.

ARC AND INCANDESCENT LIGHTING SYSTEM.

No. 438,619. Patented Oct. 21, 1890.

Fig. 1.

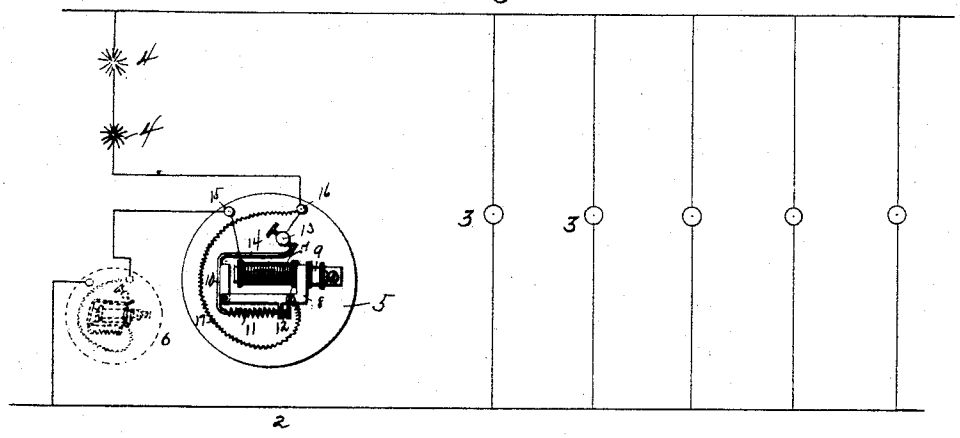
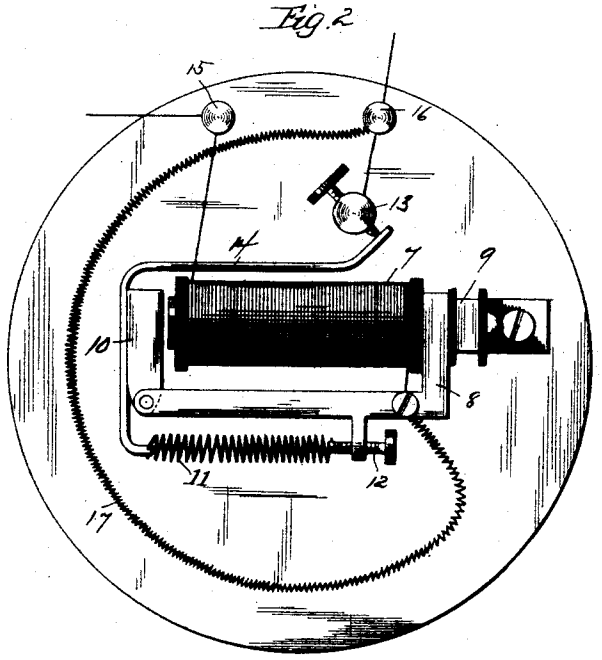


Fig. 2.



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ARC AND INCANDESCENT LIGHTING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 438,619, dated October 21, 1890.

Application filed July 12, 1889. Serial No. 317,311. (No model.)

To all whom it may concern:

Be it known that I, JOHN EDWIN GILES, a citizen of the United States, residing at Hazleton, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Combined Arc and Incandescent Lighting Systems; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

This invention relates to an electric-lighting system in which both arc and incandescent lamps may be used. The combined operation of these two classes of electric lamps in the same system has heretofore been attempted, the arc lamps being usually placed in series relation to the whole incandescent system. It has been proposed to operate the arc lamps in multiple arc by giving each arc branch a considerable permanent resistance. This, however, involves a large loss of energy by reason of this useless high resistance. When arc lamps are used in series relation to the incandescent system, it occurs when there is a change of resistance in the arc from impurities of the carbon or from other causes that the lamps blow and the current at once rises to two or three times its normal strength, thus rendering the light produced impracticable because of the unbearable noise, the danger to the lamps from the overflow of current, and the pumping action produced on the incandescent system and the consequent destruction of the incandescent lamps.

My invention differs from such systems in operating the arc lamps in one or more of the parallel branches of a circuit of constant potential, so that the arc lamps are grouped in parallel branches of the system just as the groups of incandescent lamps are, and I accomplish this result without inserting a high fixed resistance in the branch.

It is an object of my invention to insure a perfect operation of both types of lamps, to prevent the arc lamps from creating wide variations of current strength, and to overcome the disagreeable noise due to changes of current strength in the arc branch. I accomplish these results by placing a series of arc lamps in one of the cross branches of a multiple-arc circuit and placing in the same branch an automatic device for cutting in resistance when the strength of current circulating in said branch varies from a predetermined limit, so that an increase of resistance will instantaneously act to preserve the balance of the system, and not only maintain a uniform intensity of the arc lights, but also of the incandescent lights. This disposition should be distinguished from systems in which a broken lamp is replaced automatically by an auxiliary resistance equal to that of the broken lamp, and from compound systems in which are located arc lamps in series relation to incandescent lamps arranged in multiple arc, the whole number of incandescent lamps passing just enough current to sustain the arc lamps and auxiliary resistance being cut in when one or more lamps fail, and from automatic devices—such as regulators—used at the generator to cut in or out resistance to preserve the current strength of the system, irrespective of the number of lamps burning, to avoid great changes of candle-power, and avoid burning out the armature of the generator.

The invention relates only to circuits of constant potential in which the arc lamps are disposed in the same relation to the main wires as the incandescent lamps, and the primary object is to prevent a noisy arc.

The features of novelty will be definitely indicated in the claims appended to this specification.

In the accompanying drawings, Figure 1 is a diagrammatic view of a system embodying my improvements. Fig. 2 is a view of one form of regulator used in each branch of the multiple circuit.

1 and 2 represent two main supply-wires of a constant potential system, in which 3 3 represent parallel branches, in each of which an incandescent lamp or group of incandescent lamps is located.

4 4 represent a series of arc lamps placed in a similar branch to 3. It is evident that if the arc lamps were connected in this relation without other devices than simple conducting-wires to the two sides of the system the wide change of resistance when an abnormal

arc formed in any lamp would not only interfere with the other arc lamps in the same branch, but would cause a variation in current strength in the system and interfere with the smooth action of the incandescent lamps. In order to prevent this, I place in each branch containing a series of arc lamps a regulating device 5. (Shown on an enlarged scale in Fig. 2.) This device consists of an electro-magnet 7, provided with an extended pole 8, firmly supported on a bracket 9, secured to a suitable base-plate, the bracket being properly insulated from the core, as shown. The extremity of the extended pole supports a pivoted armature 10, carrying a tongue 14, adapted to co-operate with a contact-stop 13, a tension-spring controlled by a regulating-screw 12 normally holding the armature retracted. 15 and 16 are binding-posts connected, respectively, by conductors with the electro-magnet and stop 13. The coils of the magnet are connected with the pole 8 and binding-post 15. A suitable resistance has its terminals connected with the pole 8 and the post 16. In the device as shown in Fig. 2 the resistance is normally out of circuit, and the current passes through the device by two paths—namely, from post 16 to 13, tongue 14, pole 8, coils of magnet and post 15, and from post 16 through resistance 17, pole 8, coils of magnet, and post 15. The greater part of the current will follow the short circuit by way of post 13, but instantly on a rise of current strength armature 10 will be attracted and the short circuit broken, all of the current being then forced to follow the resistance 17, which reduces its strength and holds it down until the arc returns to its normal condition of resistance, when the current strength will fall and the armature 10 will drop off again, restoring the shunt-circuit and bringing the current to its normal strength. The lamp-circuit is at no time interrupted, and the current flowing through the arc branch of the system is preserved at a uniform strength. The device may also be readily adapted to compensate a fall of current strength in the arc by adjusting the tension of the spring 11 so that the armature will be normally attracted, as shown in dotted lines at 6 in Fig. 1. The resistance is normally in circuit in this condition of adjustment, and on a decline of current strength the armature drops off, short-circuiting the resistance by establishing contact at 13′ 14′ and raising the current strength. By inserting two devices in each arc branch it will be seen that a guard will be established against either a rise or fall of current strength. The amount of resistance cut in or out by the regulator will vary somewhat with different lamps and systems. Ordinarily, if two arc-lamps to a cross-branch are used it will not exceed one-tenth of the resistance of said branch.

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

1. In an electric-lighting system, the combination, with a circuit of constant potential, of arc lamps in multiple-arc relation, each cross-branch of the multiple-arc system containing two or more arc lamps, a magnetic regulator in each such branch, and a resistance controlled thereby, said resistance being a fractional part in amount of the normal resistance of the arc branch, to compensate variations in the current strength of the branch due to fluctuations of any arc.

2. In an electric-lighting system, the combination, with a circuit of constant potential, of arc lamps grouped in multiple-arc relation, two or more arc lamps being in each group, and a magnetic regulator for each branch comprising a normally short-circuited resistance, equal in amount to a fractional part of the normal resistance of the arc branch, and a magnet for cutting said resistance into the branch upon a rise of current strength therein.

3. In a combined incandescent and arc lighting system, the combination of a constant potential circuit, incandescent lamps in parallel branches, and arc lamps in parallel branches, each arc branch containing two or more arc lamps, a regulating-magnet with normally-retracted armature, an auxiliary regulating-magnet with normally-attracted armature, and resistances thrown into the branch when either armature is attracted, whereby the branch resistance is varied to compensate a rise or fall of current strength.

In testimony whereof I affix my signature in presence of two witnesses

JOHN EDWIN GILES.

Witnesses:
E. S. DOUD,
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