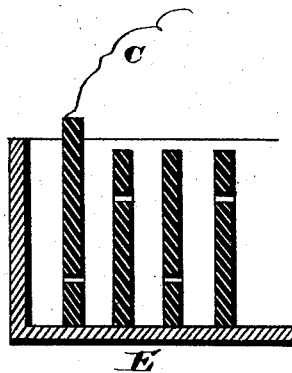
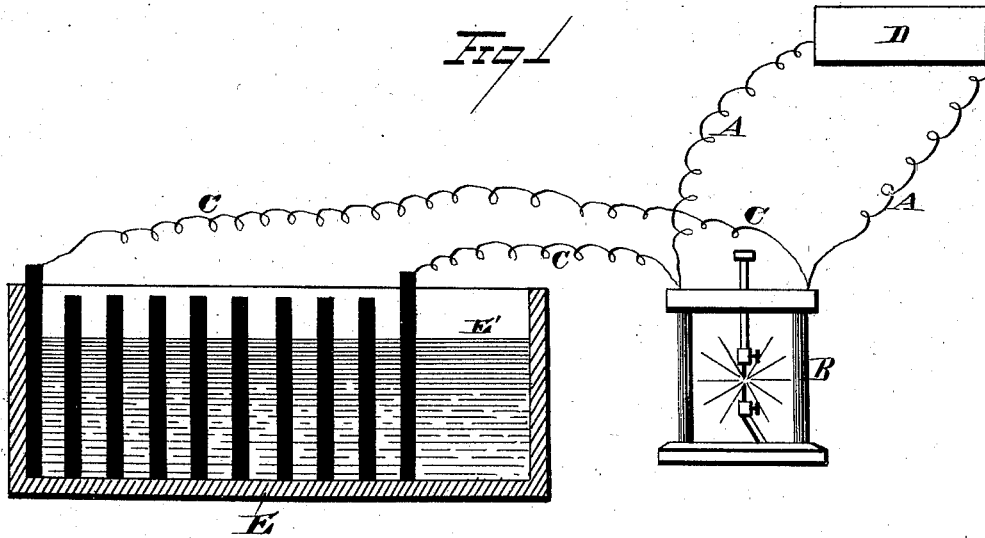


C. F. BRUSH.
Electric-Light Apparatus.

No. 219,212.

Patented Sept. 2, 1879.



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Fig. 2.

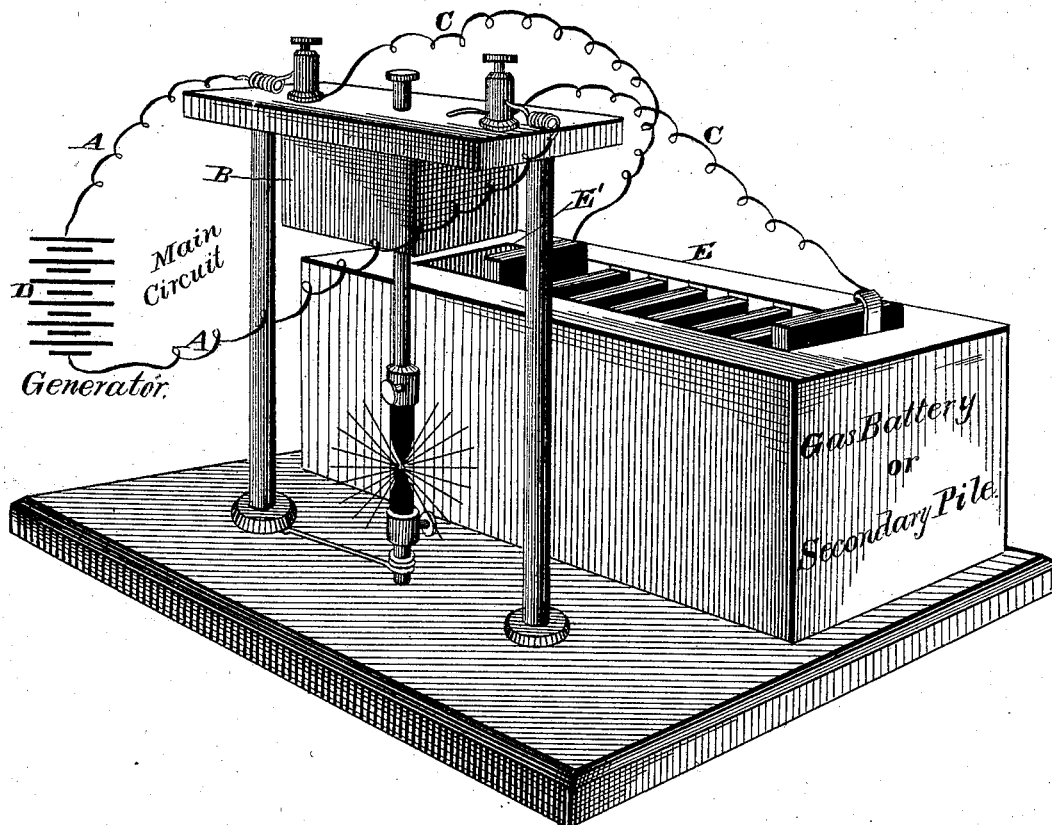
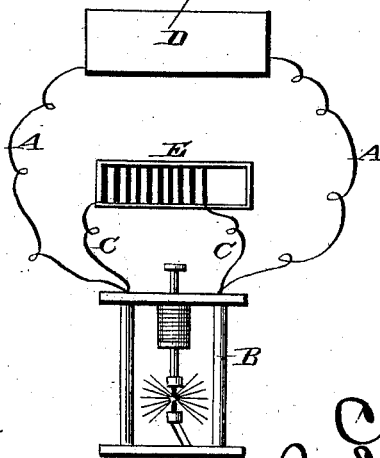


Fig. 3.



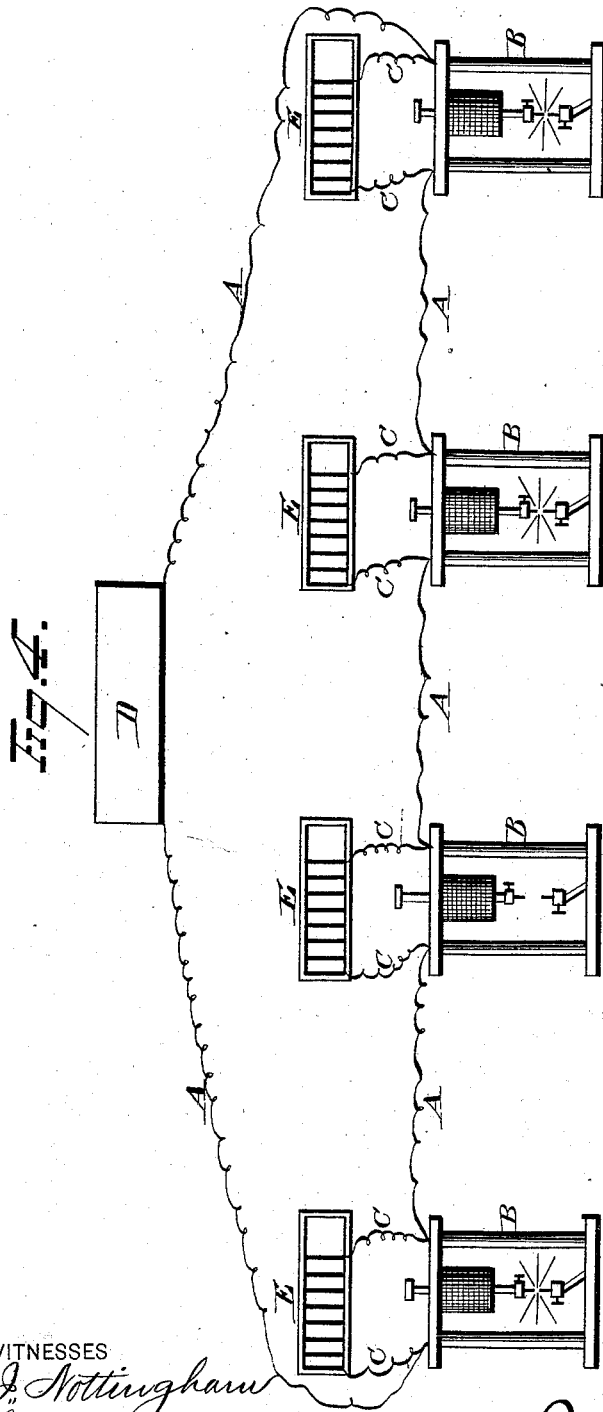
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UNITED STATES PATENT OFFICE.

CHARLES F. BRUSH, OF CLEVELAND, OHIO.

IMPROVEMENT IN ELECTRIC-LIGHT APPARATUS.

Specification forming part of Letters Patent No. **219,212**, dated September 2, 1879; application filed January 14, 1879.

To all whom it may concern:

Be it known that I, CHARLES F. BRUSH, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Electric-Lighting Apparatus; and I do hereby 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 pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to electric-light mechanism; and it consists in a device whereby any automatic regulator of the carbon points may be caused to perform its regulating functions when operated in an electric circuit the current through which is of constant, or nearly constant, strength.

Most of the electric-light regulators at present before the public depend for their operation upon the varying strength of the electric current through the circuit in which they are operated, the varying strength of current being due to varying resistance of the voltaic arc between the carbons as their distance changes; but when such a regulator is placed in an electric circuit the whole resistance of which is much greater than that of the voltaic arc of the said regulator, then the regulator ceases to properly regulate its carbons, because its changing resistance does not correspondingly affect the strength of the current passing through it. This condition of affairs will occur when one or more other regulators are operated in the same circuit, or when other work is being done by the current.

I fully accomplish my design by connecting one of the terminals of a gas-battery or secondary pile with the circuit on one side of the regulator and the other terminal with the circuit on the other side of said regulator. I thus provide two passages for the current—one through the regulator and one through the gas-battery—between which the current will divide itself; but when the current has passed through the secondary pile a short time the latter will set up an opposing electro-motive force of a strength depending on the number of elements composing it. This number may be so chosen that the opposing electro-motive

force of the pile shall be sufficient to balance the difference of electrical potential of the main current at opposite sides of the regulator when the latter is maintaining its normal arc between its carbons, and thus nearly or entirely arrest the passage of current through the pile; but when, owing to the combustion of the carbons, or other cause, the arc between them increases in length, then a corresponding portion of the current passes through the secondary pile. This is due to the increased resistance of the arc, and consequently increased difference of potential of the main current at opposite sides of the regulator, by reason of which the opposing electro-motive force of the pile is overbalanced. This shunting of a portion of the current away from the regulator allows it to feed its carbons forward until their normal distance is restored, when the whole, or nearly the whole, current again passes through the regulator.

It will now be evident that if the current through the regulator be entirely interrupted, accidentally or otherwise, the whole current will pass through the secondary pile, thus remaining unbroken. If the resistance of the pile is small, the current will experience but little more retardation than when working the regulator, work being done in chemical action instead of producing heat and light in the regulator.

Any of the well-known forms of gas-battery or secondary pile may be employed for the purpose, provided the elements are sufficiently large; but I prefer a very simple form, consisting of a suitable number of thin plates of carbon placed transversely at short distances from each other in a trough of suitable insulating material. The spaces between the plates are nearly filled with acidulated water, and the end plates are connected with wires, which form the terminals of the pile.

It will now be evident that each of the carbon plates, except the end ones, performs the functions of an entire element—hydrogen appearing on one side of it, and oxygen on the other side. There being no necessity of collecting and keeping separate the gases evolved, as is done in some forms of gas-battery, they are allowed to escape into the atmosphere.

A suitable reservoir, *E'*, may be provided

in connection with the trough for holding a supply of acidulated water to make up for loss due to decomposition and evaporation. If the plates are not made to fit perfectly water-tight in the trough, or are perforated with one or more small holes, the liquid from the reservoir will gradually find its way into all the spaces between them, thus keeping them supplied. A cover may be placed over the trough to retard evaporation.

It is evident that the secondary pile may be located at any convenient distance from the lamp or other electric device which it is intended to regulate, the two being connected by wires properly arranged.

I find in practice that from twenty to forty of the carbon elements are required to balance an ordinary electric arc, the number depending on the length of the arc and the volume of current producing it—an increased length of arc requiring a greater number of elements, and an increased volume of current with same length of arc a lesser, and vice versa.

In the drawings, Figure 1 is a diagrammatic illustration explaining my invention, wherein are shown a dynamo-electric machine or any other electrical generator, one lamp, and a gas-battery, or a secondary pile, all properly connected. Fig. 2 is an isometric view of an apparatus or system according to my invention. Fig. 3 is a diagram showing my system with one lamp in the circuit. Fig. 4 is a diagram illustrating a system of several lamps and their respective secondary piles or gas-batteries, with generator and connections according to my invention.

A is the line of the main circuit, which circuit is originated by any suitable generator, D.

B is an electric lamp or light regulator, or any electric engine, one or more of which are placed in the main circuit. C C represent connections between one lamp or electric engine and its accompanying gas-battery or secondary pile E.

What I claim is—

1. The combination, with an electric-light regulator, of a gas-battery or pile whose terminals are electrically connected with the main circuit, respectively, on opposite sides of said regulator, substantially as set forth.

2. The combination, with an electric-light regulator, of a gas-battery or secondary pile, the two being electrically connected in manner adapted to provide different passages for the main circuit, between which the current divides itself, one of said passages being through the regulator and the other through the gas-battery, substantially as set forth.

3. The combination of an electric-light regulator and a gas-battery or secondary pile, the two being electrically connected and adapted substantially as described, whereby, after the current has passed through the secondary pile for a short time, the latter will develop an electro-motive force antagonistic to the main current of the lamp, and proportionate to the number of elements composing said secondary pile, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES F. BRUSH.

Witnesses:

JNO. CROWELL, Jr.,
W. E. DONNELLY.

1,500 words