

(No Model.)

2 Sheets—Sheet 1.

H. P. BROWN.

INCANDESCENT ELECTRIC LIGHTING.

No. 330,464.

Patented Nov. 17, 1885.

Fig. 2.

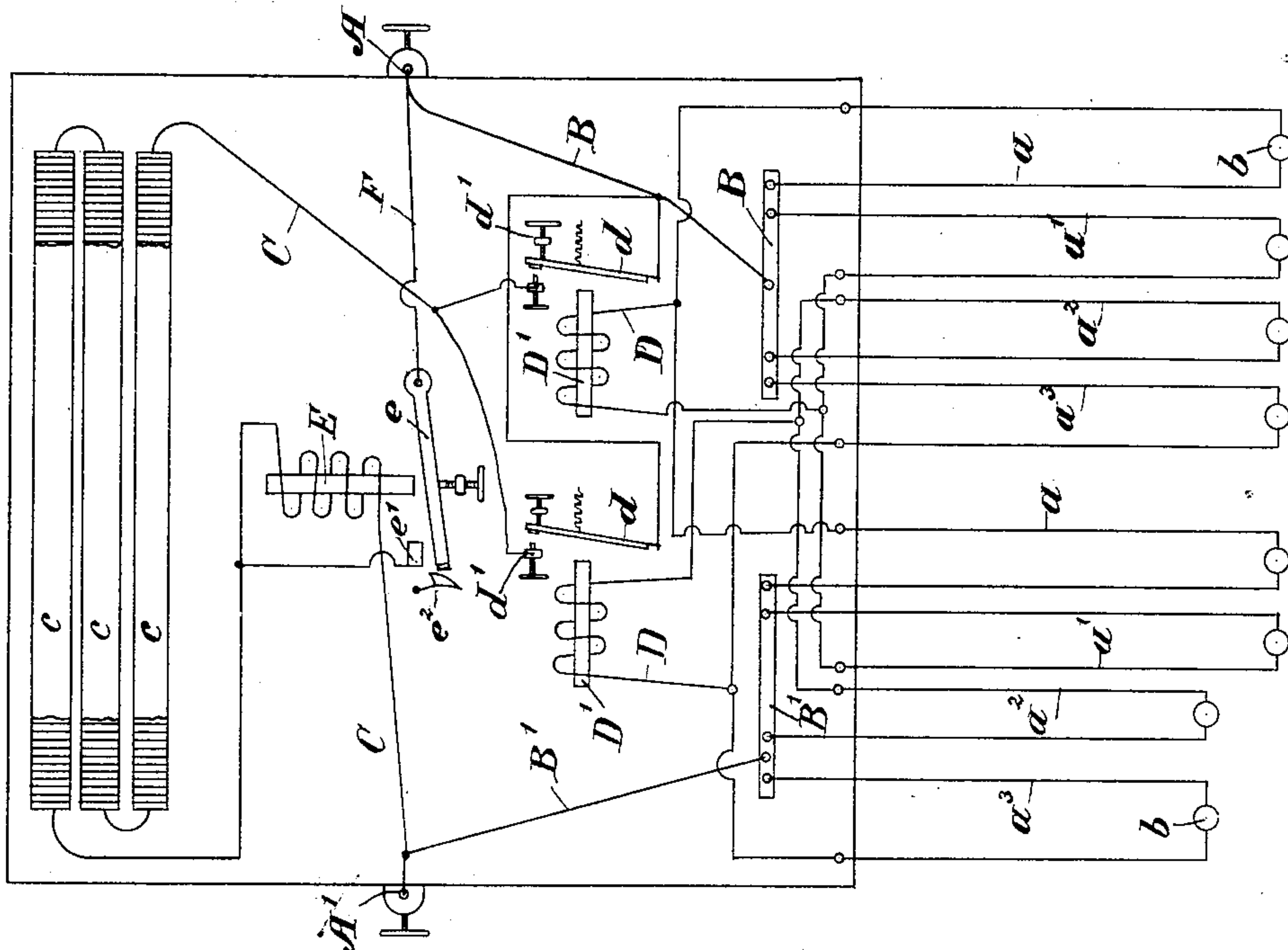
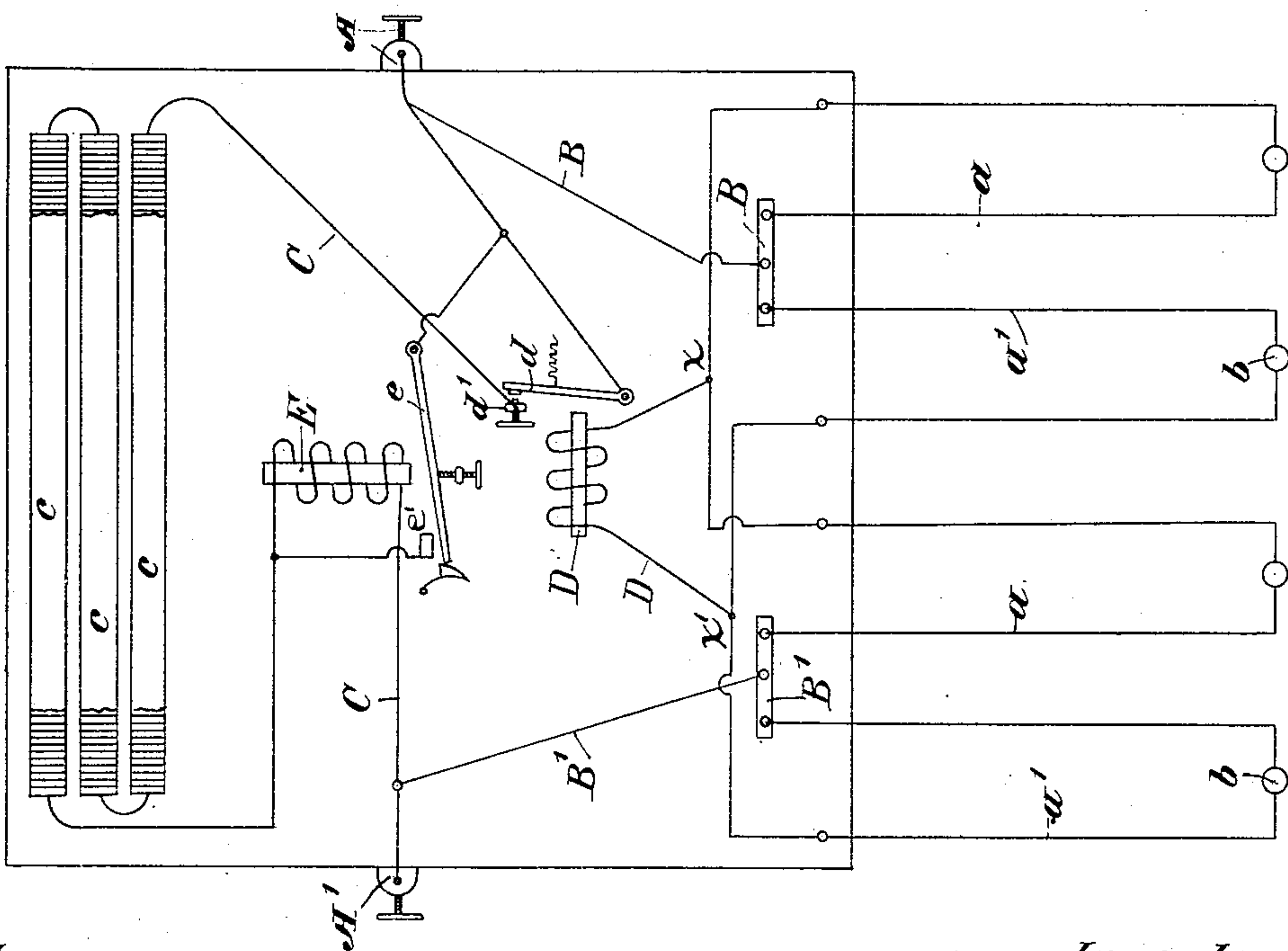


Fig. 1.



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Fig. 4.

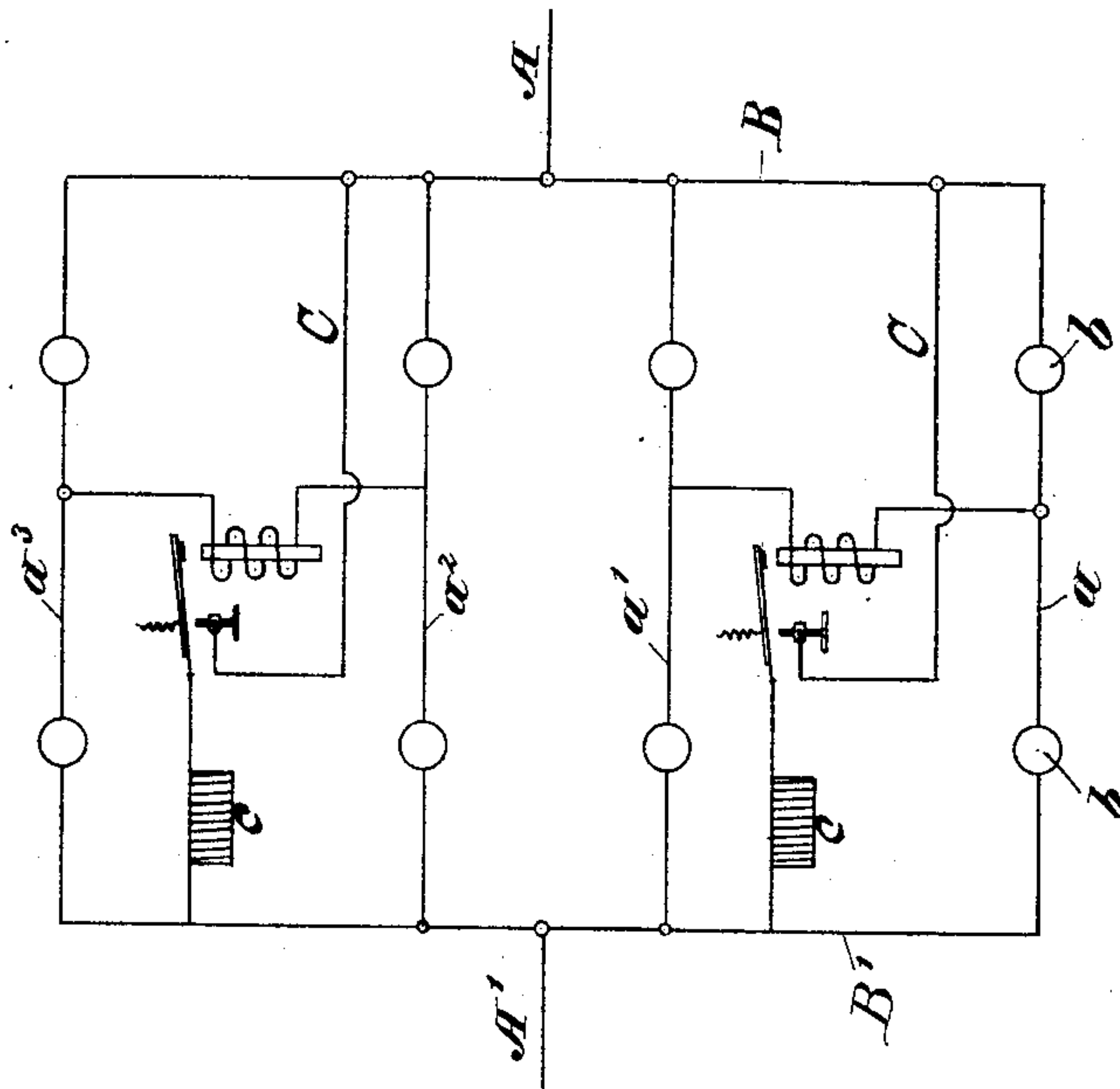
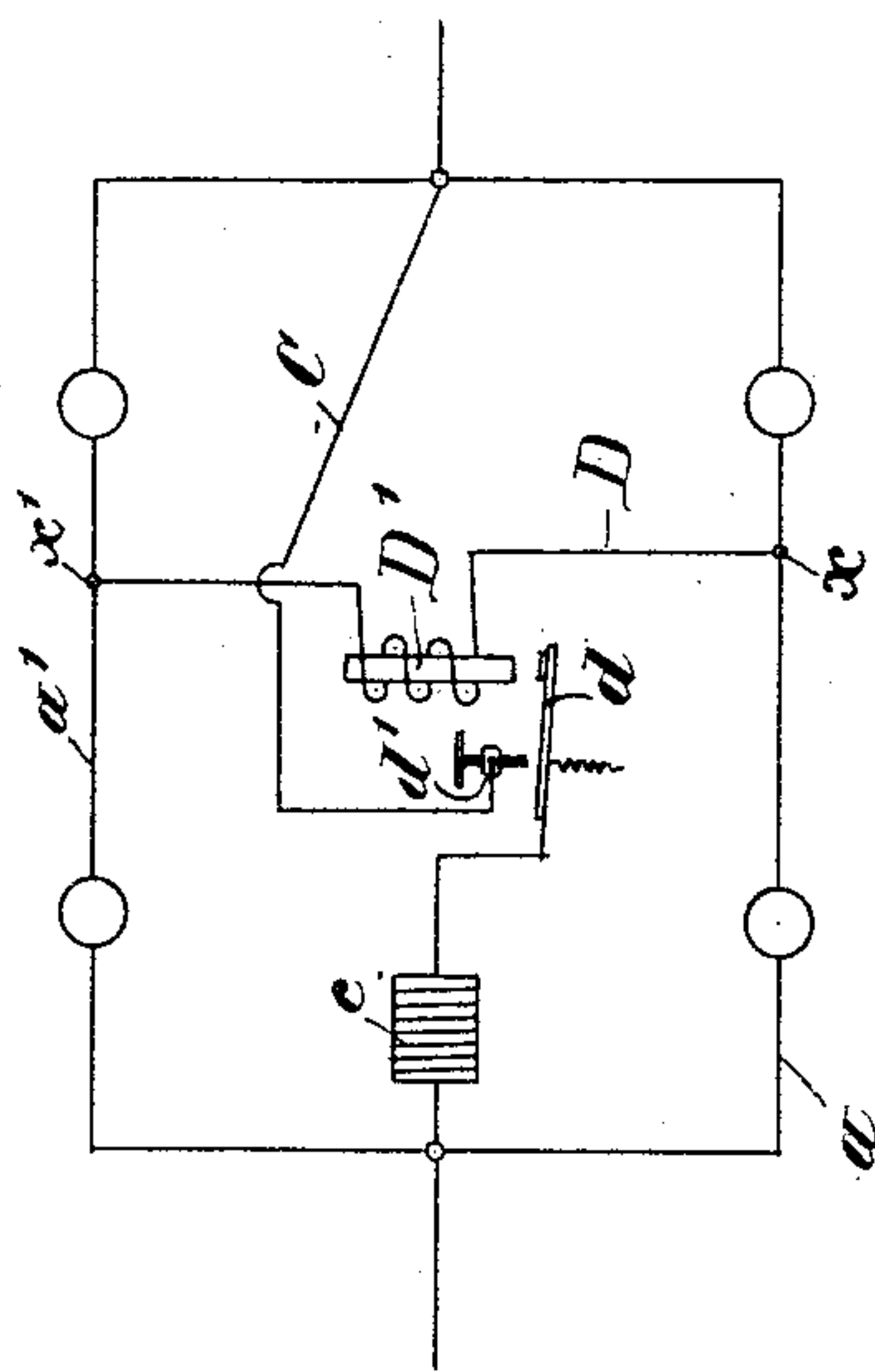


Fig. 3.



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UNITED STATES PATENT OFFICE.

HAROLD P. BROWN, OF CHICAGO, ILLINOIS.

INCANDESCENT ELECTRIC LIGHTING.

SPECIFICATION forming part of Letters Patent No. 330,464, dated November 17, 1885.

Application filed June 5, 1885. Serial No. 167,715. (No model.)

To all whom it may concern:

Be it known that I, HAROLD P. BROWN, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Incandescent Electric Lighting, of which the following is a specification.

This invention relates to a system or arrangement of circuits for operating incandescent electric lights.

In the present invention, instead of providing each lamp in the group with a separate shunt-circuit provided with a resistance equal to that of the lamp to take the place of the lamp in the group in the case of the failure of the latter, as has usually been the method of operating incandescent lamps in parallel or multiple arc, I so arrange the circuit that a single resistance may automatically take the place of any lamp in the group that happens to fail, whichever one it may be. In case two or more lamps fail, or a greater number than the resistance is calculated to compensate for, all the lamps in the group are automatically turned out, to guard against injury.

In the accompanying drawings, which form a part of this specification, and in which similar letters of reference indicate like parts, Figure 1 is a diagram view illustrating my invention as applied to four lamps. Fig. 2 is a similar view, showing the same as applied to eight lamps. Figs. 3 and 4 are diagram views showing the same arrangement of circuits as in Figs. 1 and 2, but in a more simple form. The device for cutting all the lamps out in case of the failure of more than two of the lamps is omitted in Figs. 3 and 4.

In said drawings, A A' represent the main circuit, and B B' the lamp-circuit or parallel conductors, in or between which the incandescent lamps *b b b b b*, &c., are arranged on the cross-wires *a a' a² a³*, each cross-wire having two lamps thereon in series. C is a circuit in the nature of a shunt, having a resistance, *c*, therein, preferably equal to that of two lamps. D is a circuit extending from a point, as *x*, between the lamps, on one cross-wire, as *a*, to a point, as *x'*, between the two lamps on another cross-wire, as *a'*, and in which is included an electro-magnet, D'. The armature-lever *d* of this electro-magnet opens the

circuit C at *d'*, except when a current is flowing through the circuit D, and pulls up the armature-lever. The shunt or resistance circuit C has included therein an electro-magnet, E, which operates to cut all the lamps out whenever the amount of current on the circuit C reaches a certain extent or limit, owing to the failure of more than one lamp. For example, this is done by the increase of current on the shunt or resistance circuit C pulling up the armature-lever *e*, and thus closing at *e'* the short circuit F, so that no portion of the current will then pass through either the lamps or the resistance. To prevent the armature-lever *e* breaking the short circuit the moment the current ceases, I provide a spring-catch, *e²*, or other suitable device for retaining the switch *e* in position to keep the short circuit closed.

In the present invention I have made a practical application of the principle of the well-known "Wheatstone bridge" to the operation of groups of incandescent lamps, and the system operates on that principle. When all the lamps of the group are burning, the current will divide equally between the cross-wires *a* and *a'*, Figs. 3 and 1, or *a*, *a'*, *a²*, and *a³*, Figs. 4 and 2, and no current will pass along the wires D. The moment any one of the lamps fails a current is set up on the circuit D, thus causing the magnet D' to close the shunt or resistance circuit C. In case a second or third lamp fails, the increase of current due thereto on the shunt-circuit C will cause the electro-magnet E to close the short circuit F, and thus cut out all the lamps. In Fig. 4 I have shown two separate resistances *c* and circuits C.

Two or more lamps may be arranged in series on each wire *a a' a²*, &c; and the system is applicable to other translating devices than incandescent lamps.

I claim—

1. The combination of a main circuit, A, with a lamp-circuit, B, cross-wires *a*, having two or more lamps each thereon in a series, a shunt or resistance circuit, C, having resistance *c* therein, a circuit, D, connecting said wires *a* at points between the lamps thereon, and an electro-magnet, D', in said circuit D, for closing said circuit C in case of the failure of one of the lamps, substantially as specified.

2. The combination of a group of lamps arranged in multiple series, with two or more lamps on each cross conductor or wire, with a shunt or resistance circuit and a relay-circuit
5 extending between said cross-conductors having an electro-magnet therein for closing said shunt or resistance circuit in case of the failure of one of the lamps, substantially as specified.
- 10 3. The combination of a group of lamps arranged in parallel, but with two lamps on each cross-conductor, with a shunt or resistance circuit, a relay-circuit extending between said cross-conductors having therein an electro-magnet for closing said shunt or resistance
15 circuit, a short circuit, and an electro-magnet in said shunt or resistance circuit for closing said short circuit when the amount of current on said shunt reaches a certain limit, substantially as specified.

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Witnesses:

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