

No. 710,186.

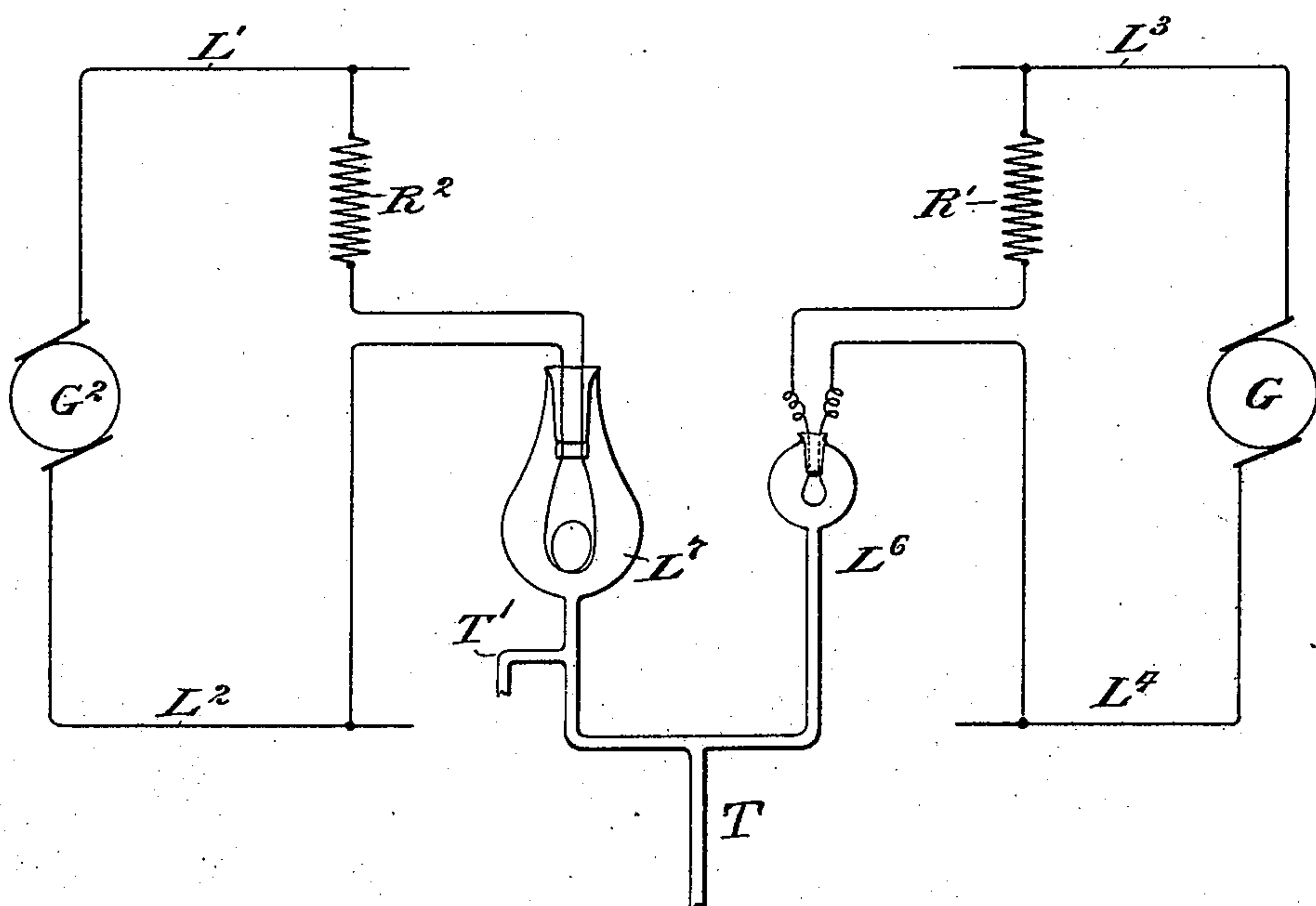
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S. E. DOANE.

METHOD OF EXHAUSTING INCANDESCENT ELECTRIC LAMPS.

(Application filed Dec. 10, 1900.)

(No Model.)



Witnesses  
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# UNITED STATES PATENT OFFICE.

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## METHOD OF EXHAUSTING INCANDESCENT ELECTRIC LAMPS.

SPECIFICATION forming part of Letters Patent No. 710,186, dated September 30, 1902.

Application filed December 10, 1900. Serial No. 39,249. (No model.)

*To all whom it may concern:*

Be it known that I, SAMUEL E. DOANE, a citizen of the United States, residing at Marlboro, in the county of Middlesex and State of Massachusetts, have invented a new and useful Method of Exhausting Incandescent Electric Lamps, of which the following is a specification, reference being had to the accompanying drawing, which is a diagrammatic view illustrating the manner of practicing the same.

Under existing methods of exhausting incandescent electric lamps by or through the agency of chemical means an electrochemical combination is brought about between certain vapors, gases, solids introduced therein, and the residual gases remaining in the lamps after the preliminary exhaustion. In the practice of a method of this description it is necessary that sufficient difference of voltage be maintained in an electric bulb during some portion of the process to cause an electrical current to flow across or through the vacuous space in order to bring about an electrochemical action between the residual gases after the preliminary exhaustion and the gases, vapors, or solids introduced therein for the purpose of effecting the result sought. It is also customary under the practice of existing methods of such exhaustion to pass an electrical current through the filament of the lamp during some portion of the operation in sufficient quantity to heat it very hot. This current when employed in lamps of fifty volts or upward flows, for a portion of the time at least, by two circuits, most of it passing through the filament and heating the same, a very small portion thereof passing across the vacuous space in the bulb. In the exhaustion of lamps of lower voltage it is found difficult to bring about the chemical combination above mentioned. A relatively high voltage is needed in order to cause the current to flow across the vacuous space. This voltage is usually so much higher than the normal voltage of very low voltage lamps that if it be applied to the leading-in wires of the lamp it causes so much current to flow through the filament that it is either immediately injured or destroyed. In the produc-

tion of lamps of lower and still lower voltages the cross-currents in the vacuous spaces are produced less and less readily by the highest voltage which can safely be applied to the lamp. In higher-voltage lamps the voltage ordinarily used suffices for the cross-current flow as well as for the heating-current for the filament. The lowest-voltage lamps which can be exhausted in this manner depends upon circumstances; but ordinarily such methods are not practically effective with lamps under thirty volts.

My invention has for its object to effect this exhaustion in very low voltage lamps by indirect chemical means, and I accomplish this by connecting such lamps on the same vacuum systems with lamps of higher voltages, so that the chemical combinations are brought about in the bulbs of the lamps having the higher voltages. By this means a vacuum tends to form in the lamps of higher voltage. As the gas-pressures in the lamps tend to equalize, the gases flow from the lower-voltage lamps to the lamps of higher voltages until both are exhausted, the chemical combinations having taken place in the higher-voltage lamps only.

For a full and clear understanding of my invention reference is had to the accompanying drawing in detail, in which—

$L^3$   $L^4$   $L'$   $L^2$  represent current feeders or mains connected, respectively, to dynamo or other sources of electrical supply  $G$   $G^2$ .

$R'$  represents a rheostat controlling the current in a low-voltage lamp  $L^6$ , having a heavy filament.  $R^2$  represents a similar rheostat controlling the current in a high-voltage lamp  $L^7$ , in which the chemical combinations are to be effected.

$T$  represents a tube leading to a vacuum pump through suitable shut-off cocks, &c., (not here shown,) depending upon the method of exhaustion to be employed.

$T'$  represents a tube through which vapors or gases may be introduced into the lamp  $L^7$ , where the chemical combinations are to be effected.

The method of procedure is as follows: The filaments of both lamps are heated electrically to the desired temperature after the bulbs



thereof have been sufficiently exhausted, and the further exhaustion of the lamp L<sup>7</sup> is effected by any of the well-known methods, the desired chemical change taking place within this lamp during this exhaustion. The tube T may or may not be necessary, dependent upon the method of exhaustion practiced.

In a prior application filed by me in the United States Patent Office on the 6th day of September, 1900, and bearing Serial No. 29,114, I have described a method of exhausting incandescent electric lamps in which the lamps are connected to a common vacuum system and so electrically interconnected that a current will flow through the gaseous medium from lamp to lamp, and I make no claim hereinafter broad enough to include such a method of operation, the present invention being directed to a method of exhaustion of two or more electric lamps which are not electrically interconnected.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The described method of simultaneously exhausting incandescent electric lamps of different voltage, consisting in first, producing a partial vacuum by withdrawing the air therefrom through a tube or outlet common

to both; second, forcing a vapor or gas into both lamps for the purpose of further perfecting the vacuum, and third, simultaneously passing a current of high voltage through the filament of the high-voltage lamp and a current of low voltage through the filament of the low-voltage lamp until they are both sufficiently heated to dissipate the gases which surround the filaments.

2. The described method of exhausting an incandescent electric lamp of relatively low voltage, consisting in first, simultaneously exhausting the air from it and a companion lamp or chamber connected thereto and enclosing an electrical conductor of relatively high resistance; second, forcing a vapor or gas into the lamp and companion chamber and finally heating both the lamp and the conductor by currents of low and high voltage respectively, until the gases are dissipated.

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

SAMUEL E. DOANE.

Witnesses:

GEORGE A. WHITING,  
WILLIAM H. ROBERTS.