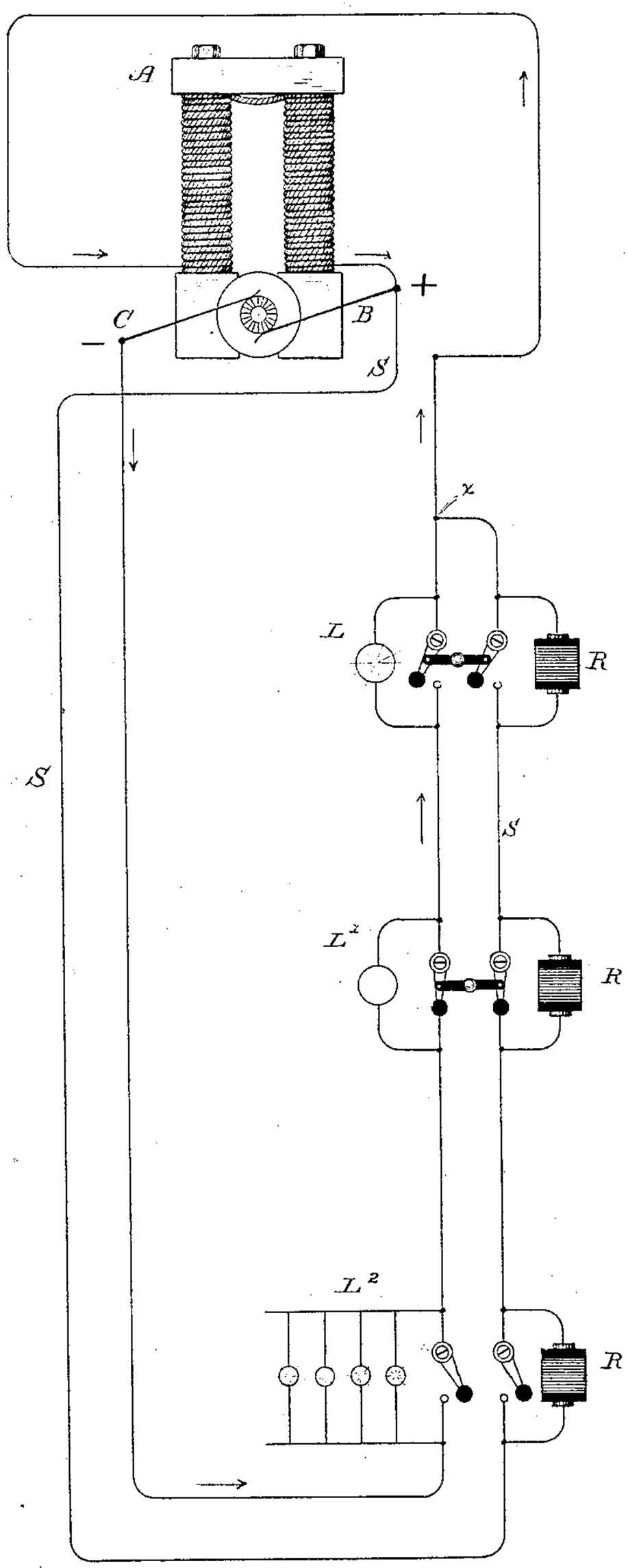
(No Model.)

W. M. THOMAS.

REGULATOR FOR SYSTEMS OF ELECTRIC DISTRIBUTION.

No. 307,690. Patented Nov. 4, 1884.



WITNESSES

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REGULATOR FOR SYSTEMS OF ELECTRIC DISTRIBUTION.

SPECIFICATION forming part of Letters Patent No. 307,690, dated November 4, 1884.

Application filed March 7, 1884. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM M. THOMAS, of Grand Rapids, in the county of Kent and State of Michigan, have invented an Improved System of Electric Circuits for Lamps and other Instruments, of which the following is a specification.

The object of my invention is to provide for keeping the volume of current flowing through a lamp or lamps or other consumer of electrical energy in a circuit constant, so that, for example, each lamp in a circuit will burn with a uniform or standard candle-power, notwithstanding variation of resistance in the circuit caused by switching lights in or out. This object I accomplish effectively by employing a supplemental wire, which accompanies the main-line wire throughout its circuit, and which I call the "regulating" or "governing" line. This regulating-line is connected with all the switches of the main circuit used to throw in or out the respective lights or other appliances, and is provided with a resistance at each switch equal to that of each lamp or loop of lamps, as the case may be, so that the resistance of the regulating-line may be varied when the lamp or loop is thrown into or out of circuit.

My invention relates, primarily, to organizations of the class involving a dynamo-electric generator—that is, one in which the generated current energizes the field-magnet. Heretofore in electric lighting systems involving the use of such machines the lamps have been, so far as connection in series is concerned, either placed directly in the circuit in series, so that when any lamp was cut out the resistance of the external circuit of the generator was decreased, causing an increase in the candle-power of the lamps remaining in the circuit, or they have been placed in series in the circuit and shunted by adjustable resistances.

I am aware that generators working electric-light circuits have been provided with a shunt of adjustable resistance at the generating-station, so that the amount of current passing through the coils of the field-magnet, and consequently the current generated by the machine, could be varied or adjusted to suit the working conditions of the external circuit. I do not, therefore, claim, broadly, a shunt of adjustable resistance placed around the coils of the field-magnet of the generator; but my invention contemplates a novel arrangement of the lamps, the shunt or regulating circuit, and resistances in said circuit. By my organization the electro-motive force of the generator-circuit can be controlled at each lamp to compensate for variations of resistance in the main circuit, caused by the switching in and out of lamps, so that a substantially uniform candle-power for each lamp is maintained.

The accompanying drawing is a diagram view illustrating the invention.

A is an ordinary dynamo-electric generator of any of the well-known types. B is the positive brush, and C the negative brush. The main circuit is indicated by the solid arrows, and is shown as running from the negative brush C through the main line and field-magnet coils of the generator to the positive brush B. At several points in the circuit, L L′ L^2, I have shown a lamp or lamps placed in a loop or branch of the circuit, with a switch in the main circuit, as is usual. A shunt-circuit, S, accompanies the main circuit to a distant point in the circuit where the last lamp is located, and is there connected at *x* with the main circuit. At each lamp or group of lamps the shunt S is provided with a switch and a resistance, R, placed in a loop in the shunt in the same manner that the lamp is placed in the main circuit. Now, if all the switches are closed, so that the direct line of the shunt and main circuit is completed, a shunt of minimum resistance will be completed from the negative brush C by the main circuit (indicated by the solid arrows) to the point *x*, and then by the shunt S to the positive brush, so that little, if any, current will pass through the coils of the field-magnet, and consequently a minimum current will be generated and the amount of work done reduced to the lowest point. Obviously, now, any increase of resistance in the shunt will cause a greater amount of current to pass from the point *x* by the main circuit through the coils of the field-magnet, and consequently an increased current will be generated by the machine. If, therefore, the lamp at L be thrown into the cir-

cuit by opening its switch and the resistance R be thrown into the shunt, there will be a corresponding increase of the current generated sufficient to maintain the required candle-power at the lamp L. The switches at L′ and L², or any other points in the circuit where lamps may be located, may be operated with like effect, and when any lamp is extinguished or cut out of circuit the resistance corresponding to it will also be cut out of the shunt, thus decreasing the resistance of the shunt and consequently the current generated. The resistances R should be ordinary adjustable resistances, so that they may be regulated to give the desired candle-power to each lamp.

Instead of placing a single lamp in a single branch in the main circuit, as shown at L and L′, I may place a number of lamps in multiple-arc circuit, as shown at L². These details, as well as others having reference to the relation of resistance to candle-power and such other matters, are subjects of detail for the electrical engineer, and are well understood.

Instead of having switches independently operated, as at L², they may be connected by a suitable cross bar, so as to operate them simultaneously, as indicated at L and L′, or any other suitable device for simultaneous operation may be employed. Devices also for gradual make and break of the direct circuits by the operation of the switches may be employed. They are well known, however, and need no description or illustration.

I have shown my invention as applied to a single dynamo electric generator operating a single lamp-circuit. It is obvious, however, that in those systems in which the field-magnets of a number of generators are energized by a primary exciting-generator the resistance of the loop or circuit serving to excite the coils of any one machine may be varied in the manner illustrated, and I consider such an arrangement within the scope of my invention. It is also obvious that where a number of loops or independent lamp-circuits are worked from a single generator the shunt may be so arranged with reference to the lighting-circuits that its resistance may be controlled as herein described. In fact, the controlling-circuit, whatever may be its character, may accompany the lamp-circuit and its resistance be varied, as described, to control the electromotive force of the working-circuit.

I have described my invention as specially applicable to electric lighting; but, as remarked at the beginning of this specification, the same arrangement precisely may be employed for operating motors or other electrical instruments or machines.

I am aware that the patent of Edison, No. 248,422, shows an arrangement of multiple-arc circuits for automatically regulating the generative force of the generator by regulating the current energizing the field-of-force coils simultaneously with controlling the lamps; and I do not, therefore, claim such subject-matter broadly.

I claim as my invention—

1. The combination of an electric generator, lamps, or electric instruments placed in series in the circuit of said generator, an electric conductor or circuit which accompanies the generator-circuit, and the current traversing which regulates the amount of current generated by the machine, and means for varying the resistance of said regulating circuit or conductor at each of the lamps or instruments in the circuit of the generator when one of said instruments is thrown into or out of circuit.

2. The combination of an electric generator in which the coils of the field-magnet are included in the generator-circuit, electric lamps or instruments placed in the circuit of said generator, a shunt-circuit placed around the coils of the field-magnet and accompanying the circuit in which the lamps or instruments are placed, and means for varying the resistance of the shunt as the instruments are thrown into or out of circuit, for the purpose described.

In testimony whereof I have hereunto subscribed my name this 4th day of March, A. D. 1884.

W. M. THOMAS.

Witnesses:
WM. H. POWERS,
J. H. MARSHALL.