No. 875,205. PATENTED DEC. 31, 1907.

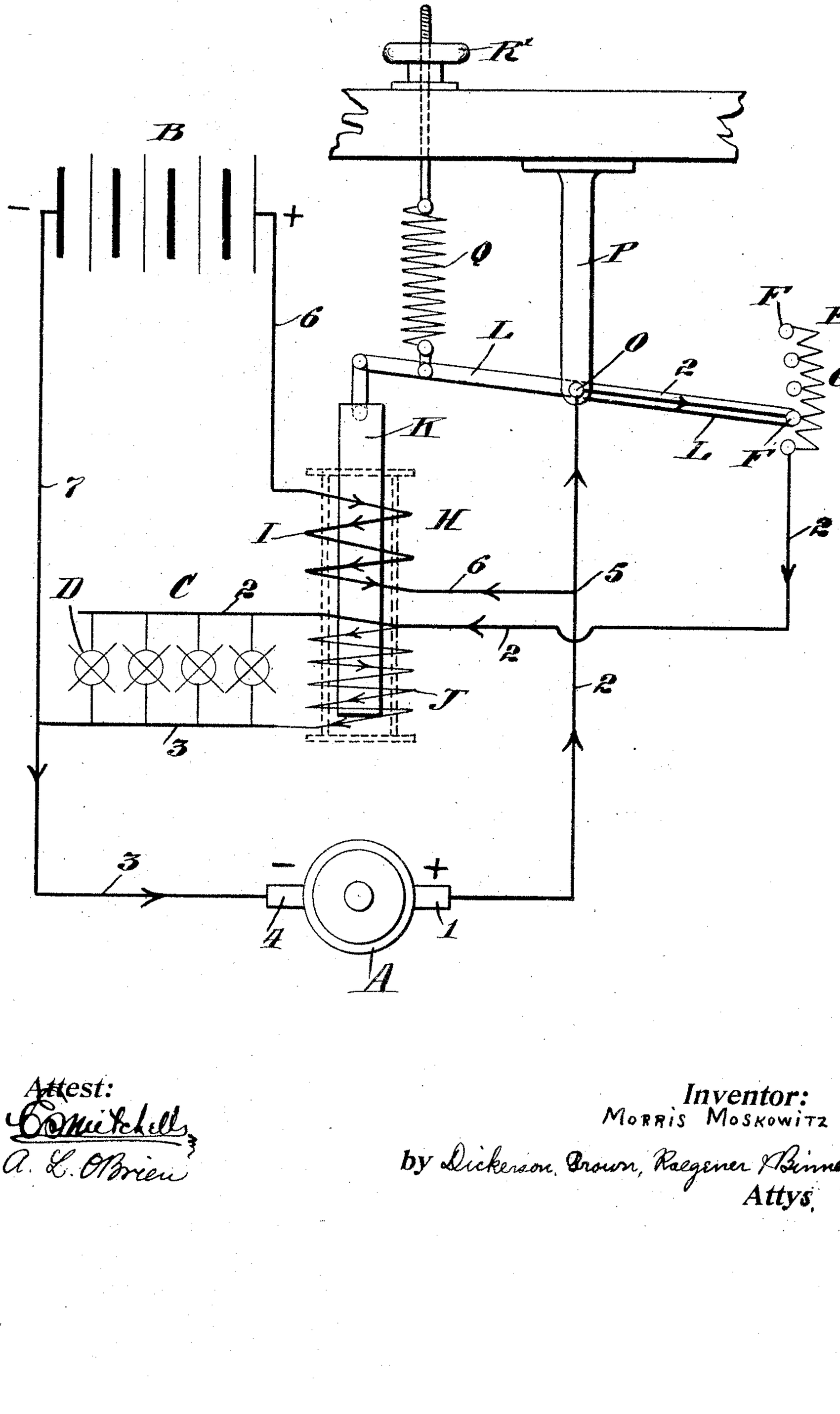
M. MOSKOWITZ.

ELECTRIC REGULATION.

APPLICATION FILED JAN. 6, 1906.

2 SHEETS—SHEET 1.

Fig. 1.



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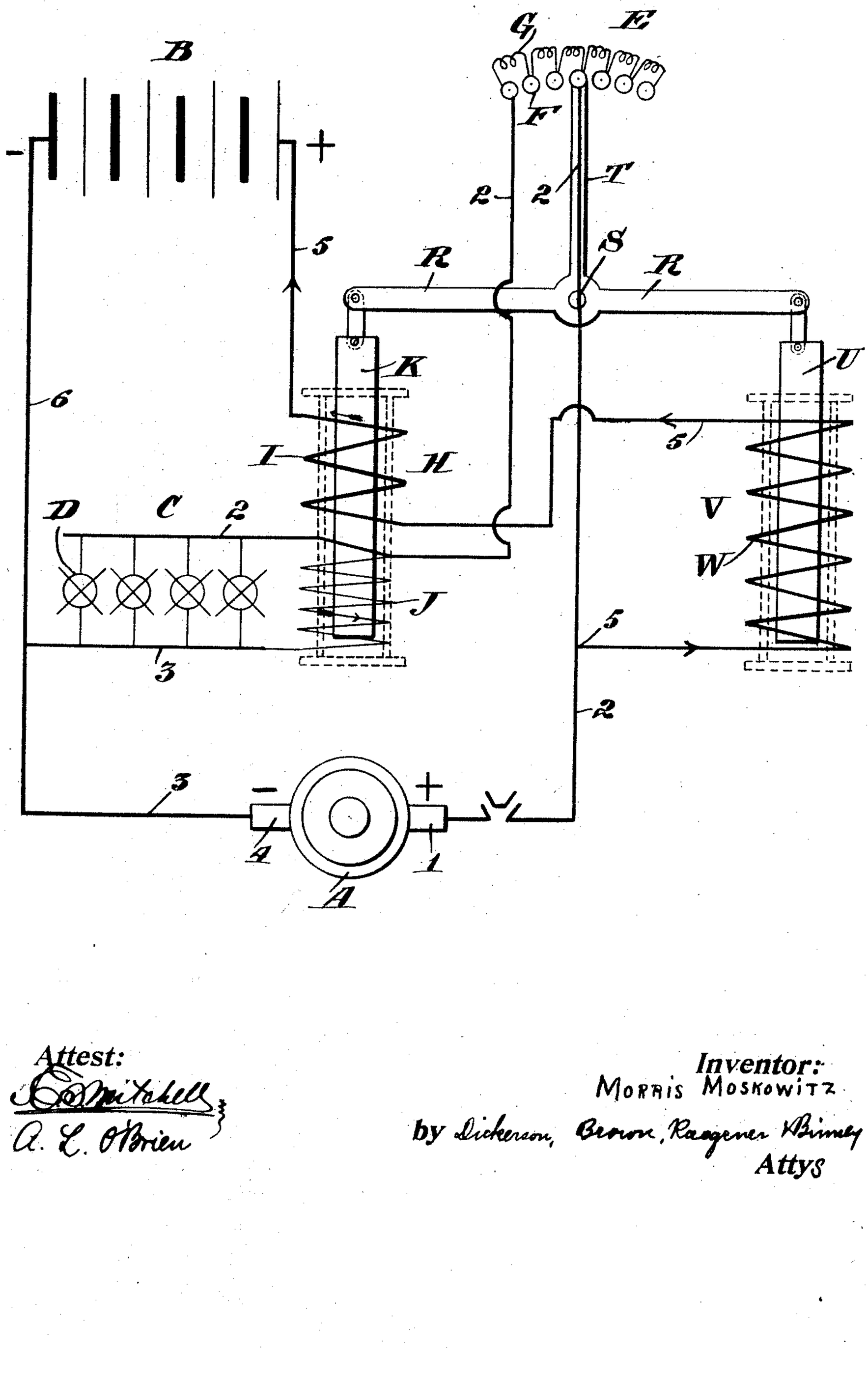
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

MORRIS MOSKOWITZ, OF NEW YORK, N. Y., ASSIGNOR TO THE UNITED STATES LIGHT & HEATING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

ELECTRIC REGULATION.

No. 875,205. Specification of Letters Patent. Patented Dec. 31, 1907.

Application filed January 5, 1906. Serial No. 294,717.

To all whom it may concern:

Be it known that I, MORRIS MOSKOWITZ, a citizen of the United States, and resident of the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful Improvements in Electric Regulation, of which the following is a specification accompanied by drawings.

This invention relates to means for regulating electric circuits, more particularly electric lamp circuits when using a constant current machine and a storage battery in multiple.

When a constant current generator is used to charge a secondary battery with a given amperage, and lamps are fed from the machine at the same time, there is a variation in voltage due to the counter electro-motive force of the storage battery. If the lamps draw the full amount of current supplied by the generator, and the battery is only floating on the line, the lamps will receive a voltage equal to that of the battery only. If the lamps are all turned off but one, and all the current less that to supply the one lamp is forced through the battery, the voltage across the brushes of the generator will rise enormously, which means destruction to the lamp. If only half of the lamps are turned off the difference in voltage will not be so great, but will still be too high for the lamps. Since the commercial incandescent lamp is burning just below the point of destruction, it is evident that an increase of voltage will materially shorten the life of the lamp.

One of the objects of the present invention is to automatically compensate for any rise in voltage across the brushes of the machine, so that the lamps will receive approximately the same voltage when all the lamps are used or if only one lamp remains burning and all the others are turned off, with the battery receiving the bulk of the current.

Another object of the invention is to improve upon the construction and operation of means for regulating circuits of the character described and increase their efficiency and certainty of operation.

Further objects of the invention will hereinafter appear and to these ends the invention consists of apparatus for carrying out the above objects embodying the features of construction, combinations of elements and arrangement of parts having the general mode of operation substantially as hereinafter fully described and claimed in this specification and shown in the accompanying drawings, in which,—

Figure 1 is a diagrammatic view of circuits and apparatus for carrying out the invention; and Fig. 2 is another diagram of circuits and apparatus for carrying out the invention.

Referring to the drawings A represents a suitable constant current generator which may be driven from any suitable source of power, as for instance, an engine, or from the axle of a car if the apparatus is to be used for car lighting.

B represents a storage battery connected in parallel with the generator A, and C represents the work circuit in which the load consists of the lamps D although other translating devices may be inserted in the work circuit.

E represents a suitable rheostat comprising the contacts F and resistance G inserted in series with the work circuit C.

In Fig. 1, H represents a compound wound magnet having a coil I in series with the storage battery B and the coil J connected in shunt across the work circuit C. The magnet H is provided with a core K pivotally carried on one end of the rheostat lever L pivoted at O to the bracket P. The other end of said lever L is adapted to sweep over the rheostat contacts F. A suitable retracting spring Q is connected to the end of the lever L adjacent the core K and a thumb screw R′ is provided for adjusting the tension of the spring Q.

It will be observed that the series winding I on the solenoid H is connected in that branch of the circuit through which only the current that charges the battery B passes and the current for supplying the lamp circuit C flows in a branch which includes the rheostat E, and thence through the lamps back to the generator.

In the operation of the apparatus, let it be assumed that the lamps D are using all of the current supplied by the generator A, in which case no current will pass to the battery B from the generator A, and therefore no current will be passing through the series winding I. Under these conditions the core K of magnet H will be normally retracted by the spring Q and all of the resistance G will be cut out of the work circuit C. Current will pass from the positive brush 1 of gener-

ator A by wire 2 to the point O, thence, still by wire 2, along the lever L to one of the contacts F, thence, still by wire 2, to the work circuit C, through the lamps D and out by wire 3 and back to the negative brush 4 of the generator A. A portion of the current is shunted through the shunt winding J on the core K, but this winding is not powerful enough to overcome the retractive force of the spring Q, and therefore the core K is maintained in its uppermost position and the resistance G is cut out of the circuit. The normal voltage which corresponds to the voltage of the storage battery in its normal condition when not under charge will be impressed across the lamp circuit C.

If all the lamps were turned off but one and assuming that the lamps draw one ampere each, then one and a fraction of amperes would pass through the lamp which remains burning, and the remainder of the current would be forced through the battery. The maximum current now passing through the battery energizes the series winding I on magnet H because some of the current flows from the positive brush 1 of generator A, through wire 2 to the point 5, thence, by wire 6, through winding I and by wire 6 to and through the storage battery B, and back by wires 7 and 3 to the negative brush 4 of the generator A. The series winding I thus energized acts cumulatively with the shunt winding J upon the core K of magnet H, and said core is drawn into the magnet against the force of the spring Q, thereby introducing resistance G into the work circuit C, and thus maintaining the proper voltage at the terminal of the last remaining lamp. If only half of the lamps were turned off, only a portion of the resistance G would be cut into circuit in accordance with the requirements of the remaining lamps. It is understood that the core K may operate against the tension of the spring Q or against a predetermined weight to bring the lever L back to normal position.

The function of the shunt winding J on the magnet H is to neutralize the effect of the series winding I on the magnet H when the lamps are being fed from the storage battery B instead of from the generator A. If the generator A is at rest, as for instance, in railway car lighting from the axle when the car is stopped, the battery will discharge through the lamp circuit C and the current in the series winding I will be in an opposite direction to that in which it flowed when current was passing to the battery. Under these circumstances the coils I and J act differentially because the current is always in the same direction through the shunt coil J when the source of current is the generator A or the storage battery B. The differential action of the coils I and J prevents the plunger or core K from being attracted and therefore the resistance G is not cut into the circuit as would otherwise happen if it were not for the provision of the shunt winding J. It is to be understood that the shunt winding J may be connected directly across the battery circuit if desired.

In Fig. 2 the lever R is pivoted at S and provided with a rheostat arm T which sweeps over the contacts F. The plunger K of magnet H is pivoted at one end of lever R, while the plunger or core U of magnet V is pivoted at the other end of the lever, magnet V is provided with a winding W in series with the series winding I on magnet H.

In the operation of the apparatus when the generator A supplies the amount of current necessary to feed the lamps, no current passes through the battery and therefore no current passes through the series coils W and I on the magnets V and H. Current passes to the lamps from the positive brush 1 of generator A, through wire 2 to the point S, from thence, still by wire 2, through one of the contacts F, thence, still by wire 2, to the work circuit C, through the lamps D and out by wire 3 to the negative brush 4 of the generator A. A portion of this current is shunted through the shunt winding J on magnet H, which is thereby energized and attracts the core K, thereby cutting the resistance G out of circuit and permitting the full current to pass to the lamps D. When the machine A generates more current than the lamps consume, or when a large number of lamps are turned off, the additional current passing through the battery raises the voltage at the battery terminals and consequently on the lamp circuit, in which case the apparatus protects the lamps. The current passing to the battery must first pass through the windings W and I on the magnets V and H. Under these circumstances the magnets J and H act differentialiy and resistance is cut into the circuit. Current passes from the point 5 on wire 2, through winding W of magnet V, thence, by wire 5, through winding I of magnet H, thence through the battery and back by wire 6 and wire 3 to the generator. Under these circumstances the coils I and J on magnet H act differentially, thereby weakening magnet H and the stronger magnet V thereby attracts its plunger U, thus rocking the lever R in a direction to cut resistance G into the circuit C. When the current from the generator A falls there will be less current passing through the series coils I on magnet H, thus permitting the attractive force of said magnet to become stronger and resistance is cut out of the circuit C.

When the generator is not running and the battery B feeds the lamps direct, the regulator is constructed to keep all of the resistance G out of the circuit C with the normal number of lamps. When the battery supplies current

the direction of current in the coils I and W is reversed from that already described, and under these circumstances the coils I and J on magnet H act cumulatively instead of differentially, therefore magnet H is stronger than magnet V and the rheostat arm T is maintained in a position to cut resistance G out of the circuit.

Obviously some features of this invention may be used without others and the invention may be embodied in widely varying forms, therefore, without limiting the invention to the devices shown and described, and without enumerating equivalents, I claim and desire to obtain by Letters Patent the following:

1. The combination of a generator, a storage battery in multiple therewith, a work circuit, means for varying the voltage of the work circuit, and opposing electro-responsive devices controlling said voltage varying means, one of said devices being compound wound and each having a coil in the battery circuit.

2. The combination of a generator, a storage battery in multiple therewith, a work circuit, means for varying the voltage of the work circuit, and opposing electro-responsive devices controlling said voltage varying means, one of said devices being compound wound and each having a coil in the battery circuit, the coils of the compound wound device acting cumulatively or differentially according to the direction of current in the series coil.

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

MORRIS MOSKOWITZ.

Witnesses:
E. VAN ZANDT,
A. L. O'BRIEN.