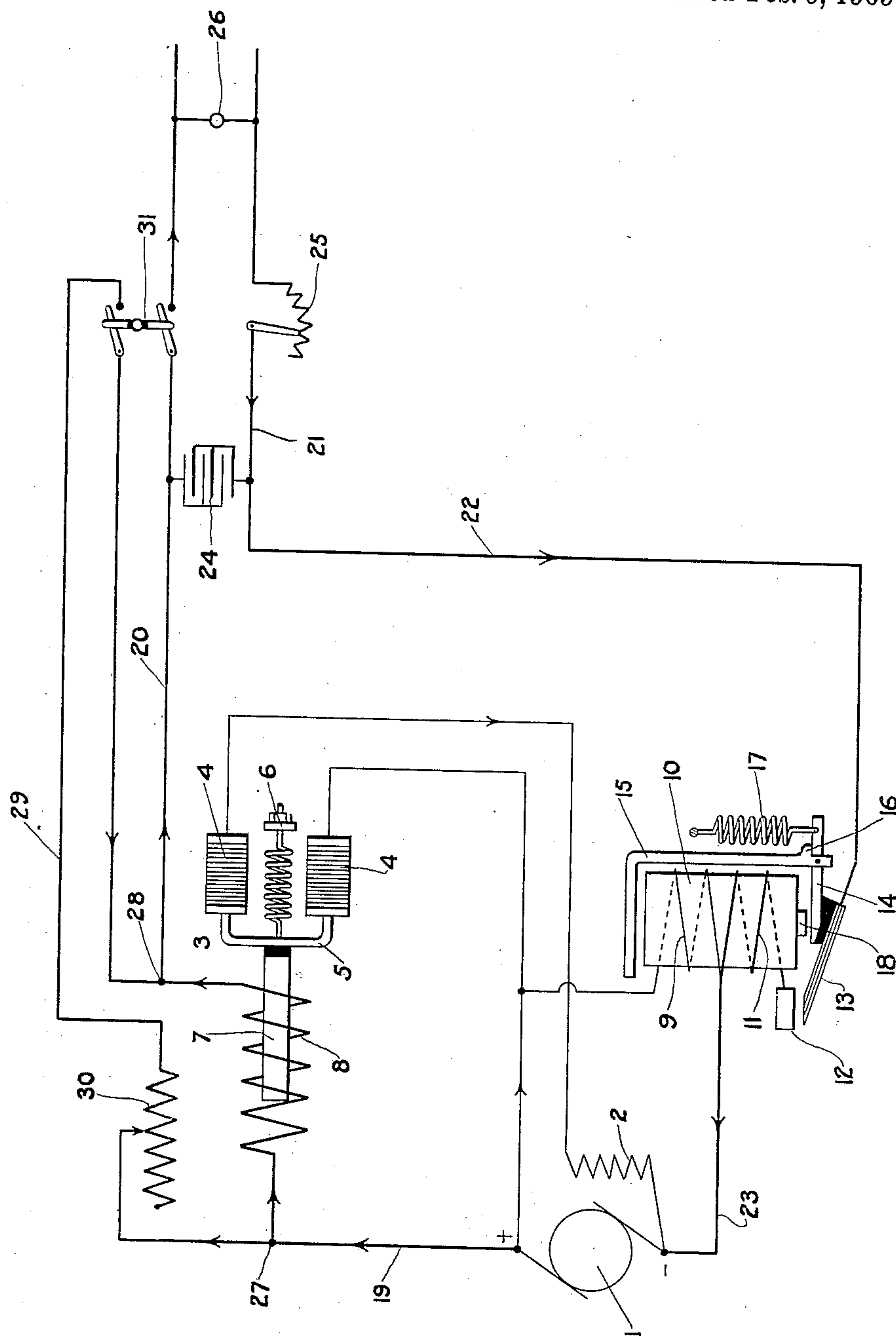


W. I. THOMSON.
BATTERY CHARGING SYSTEM.
APPLICATION FILED AUG. 29, 1905.

911,850.

Patented Feb. 9, 1909.



WITNESSES:

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BATTERY-CHARGING SYSTEM.

No. 911,850.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM I. THOMSON, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Battery-Charging Systems, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to battery charging systems.

One of the objects thereof is to provide practical and efficient means for charging storage or secondary batteries.

Another object is to provide means of the above type adapted to operate efficiently under varying conditions of load in the system in which it is placed.

Another object is to provide simple and practical automatically-acting means of the above type whereby upon a load being cut in in parallel with the battery, the current through the latter remains free from undesirable change.

Another object is to provide means in connection with the type last mentioned whereby upon a given load being cut in as above set forth, any desired predetermined effect upon the battery current is attained.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements and arrangement of parts which will be exemplified in the apparatus hereinafter described, and the scope of the application of which will be indicated in the following claims.

The accompanying drawing which shows one of various possible embodiments of my invention is a diagrammatic plan of the same.

As tending to render clearer certain features of my invention, it may here be noted that in connection with systems of the general nature of those with which this invention deals, I have found it in general desirable to avoid a marked drop in the battery charging current upon the load being increased. I have found, moreover, that it is desirable to provide means for adjusting the effect of the load compensating means so as

more readily and accurately to achieve the desired result.

The above and other advantages are attained in constructions of the nature of that hereinafter described.

Referring now to the accompanying drawing, there is shown at 1 a generator having within its shunt field 2 a variable resistance device 3 comprising sets of contacting electrodes 4, preferably of carbon, which are serially connected, as by a yoke 5. The aggregate resistance of these electrodes varies manifestly with the pressure with which they contact, and this factor is controlled by the opposing forces exerted upon the yoke 5 by an adjustable spring 6 and the core 7 of a solenoid 8, hereinafter referred to. Likewise shunted about the terminals of the generator 1, is the winding 9 of a differentially wound magnet 10, the remaining winding 11 of which terminates in a contact 12. Circuit through winding 11 may be completed by a swinging contact piece 13 upon an armature 14 pivoted to the frame 15 of the magnet. The contact 13 is normally held in a retracted position, determined by a shoulder 16, by means of a spring 17 and the circuit therethrough is closed only upon the current through winding 9 attaining such proportions as to cause the field strength of the magnet to overcome the tension of the spring and draw the pivoted armature 14 into engagement with the core 18 thereof. A circuit is thus completed from generator 1 through lead 19 and solenoid 8 to one of the mains 20, thence from the other main 21 through conductor 22, contacts 13 and 12 and lead 23 to the remaining terminal of the generator.

Between mains 20 and 21 is bridged a storage or secondary battery 24 adapted to receive a charging current from the generator 1, and, on account of the differential type of winding of the magnet 10, it will be seen that if the voltage of the generator fall below that of the battery, no wasteful discharge through the armature of the former is permitted, as the weakening of the resultant field of the magnet will permit the spring 17 instantly to retract armature 14 and break the circuit between contacts 12 and 13. It will thus be seen that on account of the automatic action of this switch and

certain other features of this invention, this system is peculiarly adapted for use in connection with a generator driven at a variable rate of speed, as for example, from a car axle.

Within the main 21 may be positioned any desired form of resistance varying device 25 adapted to maintain constant the voltage across the terminals of current utilizing devices 26 which may be bridged across the mains in parallel with the secondary battery 24. It may here be noted that the terms "secondary" and "storage" are used interchangeably throughout this specification and the following claims in their ordinarily accepted sense as descriptive of a type of battery which is adapted, upon being subjected to the action of an electric current subsequently to discharge an electric current without the aid of an external source of energy.

Bridged about the terminals 27 and 28 of the solenoid 8 is a shunt 29 having in circuit therewith a variable resistance device 30 and one member of a double pole switch 31, the other part thereof being serially connected within the main 20.

The operation of the above described embodiment of my invention is as follows: Assuming the circuit broken at contacts 12 and 13, no current flows through the battery until the circuit is closed as above described when the voltage of the generator is greater than that of the battery. Current then passes through solenoid 8 and battery 24, a substantially constant flow of current being guaranteed by the action of the regulating device comprising solenoid 8 and parts associated therewith. These parts are so arranged and adjusted that upon the current flowing through the solenoid exceeding a certain predetermined value, the abnormal strength of the field thereof causes the core 7 to be slightly retracted, with a consequent increase of the aggregate resistance of the sets of electrodes 4 and a corresponding decrease of the field strength of the generator. The current flowing through the solenoid is thus brought down to the desired value. Upon the switch 31 now being closed and the current utilizing device 26, which may be of any desired type, being thrown into circuit in parallel with the battery, the total resistance of the external circuit of the generator is diminished, with a consequent tendency to increase of current. This tendency, however, were it not for shunt 29, would be checked by the regulating solenoid 8 and the current brought to its normal value, whereupon, by reason of this resultant current being shared between the battery and the current utilizing device, the former would receive a smaller amount than before the load was thrown on. As it is in general desirable that the charging current

be maintained at a substantially constant value, or at least that the change brought about by the throwing on of the load be predetermined and controlled, the above described shunt 29 is provided, and the switch 31 therein so arranged that upon the load being thrown on, the circuit through this shunt is closed. Thus, simultaneously with the cutting in of the load upon the generator with a tendency to increase of current output, a path is provided about the solenoid 8 whereby the accession of current is permitted to flow without acting upon the regulating device as above described. In this manner, by suitable adjustment of the resistance 30, the current through the battery 24 is maintained constant or slightly increased or diminished to a predetermined desired extent upon the load 26 being thrown into circuit. The adjustability, moreover, of the relative resistances of the shunt and the conductor about which it is shunted, is a feature of this invention of considerable practical value and results in an adaptability for use under widely varying conditions.

As many changes could be made in the above construction and many apparently widely different embodiments of my invention could be made without departing from the scope thereof, I intend that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense. I desire it also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In apparatus of the class described, in combination, a source of current, a secondary battery in circuit therewith, a current utilizing device adapted to be put in circuit therewith, means adapted to regulate the output of said source of current, said means comprising a solenoid, a shunt about said solenoid and a single means adapted substantially simultaneously to close the circuit of said shunt and throw said current utilizing device into circuit.

2. In apparatus of the class described, a source of current, a secondary battery in circuit therewith, a current utilizing device adapted to be put in circuit therewith, means adapted to regulate the output of said source of current said means comprising a solenoid, a shunt about said solenoid, a single means adapted substantially simultaneously to close the circuit of said shunt and throw said cur-

rent utilizing device into circuit, and means adapted to vary the relative resistances of said shunt and the conductor about which it is shunted.

5 3. In apparatus of the class described, in combination, a generator, a regulating device adapted to regulate the output of said generator, said device comprising a solenoid in circuit therewith, and a variable resistance
10 controlled by said solenoid and connected in the field circuit of said generator, a secondary battery in circuit with said generator, a current utilizing device adapted to be connected in circuit therewith in parallel with
15 said battery, a shunt about said solenoid and means adapted to close the circuit through said shunt and through said current utilizing device.

4. In apparatus of the class described, in
20 combination, a generator, a regulating device adapted to regulate the output of said generator, said device comprising a solenoid in circuit therewith, and a variable resistance controlled by said solenoid and connected in
25 the field circuit of said generator, a secondary battery in circuit with said generator, a current utilizing device adapted to be connected in circuit therewith in parallel with said battery, a shunt about said solenoid,
30 means adapted to close the circuit through said shunt and through said current utilizing device, and means adapted to adjust the relative resistances of said shunt and the conductor about which it is shunted.

35 5. In apparatus of the class described, in

combination, a shunt wound generator having a variable resistance in circuit with the field winding thereof, a solenoid in circuit with said generator, means controlled by said solenoid adapted to control said variable resistance, a secondary battery in series with
40 said generator, a current utilizing device adapted to be connected in series therewith in parallel with said battery, a shunt about said solenoid, and means adapted substantially simultaneously to close the circuit
45 through said shunt and through said current utilizing device.

6. In apparatus of the class described, in
50 combination, a shunt wound generator having a variable resistance in circuit with the field winding thereof, a solenoid in circuit with said generator, means controlled by said solenoid adapted to control said variable resistance, a secondary battery in series with
55 said generator, a current utilizing device adapted to be connected in series therewith in parallel with said battery, a shunt about said solenoid, a single means adapted to close the circuit through said shunt and through
60 said current utilizing device, and means adapted to adjust the relative resistances of said shunt and the conductor about which it is shunted.

In testimony whereof I affix my signature, 65
in the presence of two witnesses.

WILLIAM I. THOMSON.

Witnesses:

A. C. MOORE,
E. E. ALLBEE.