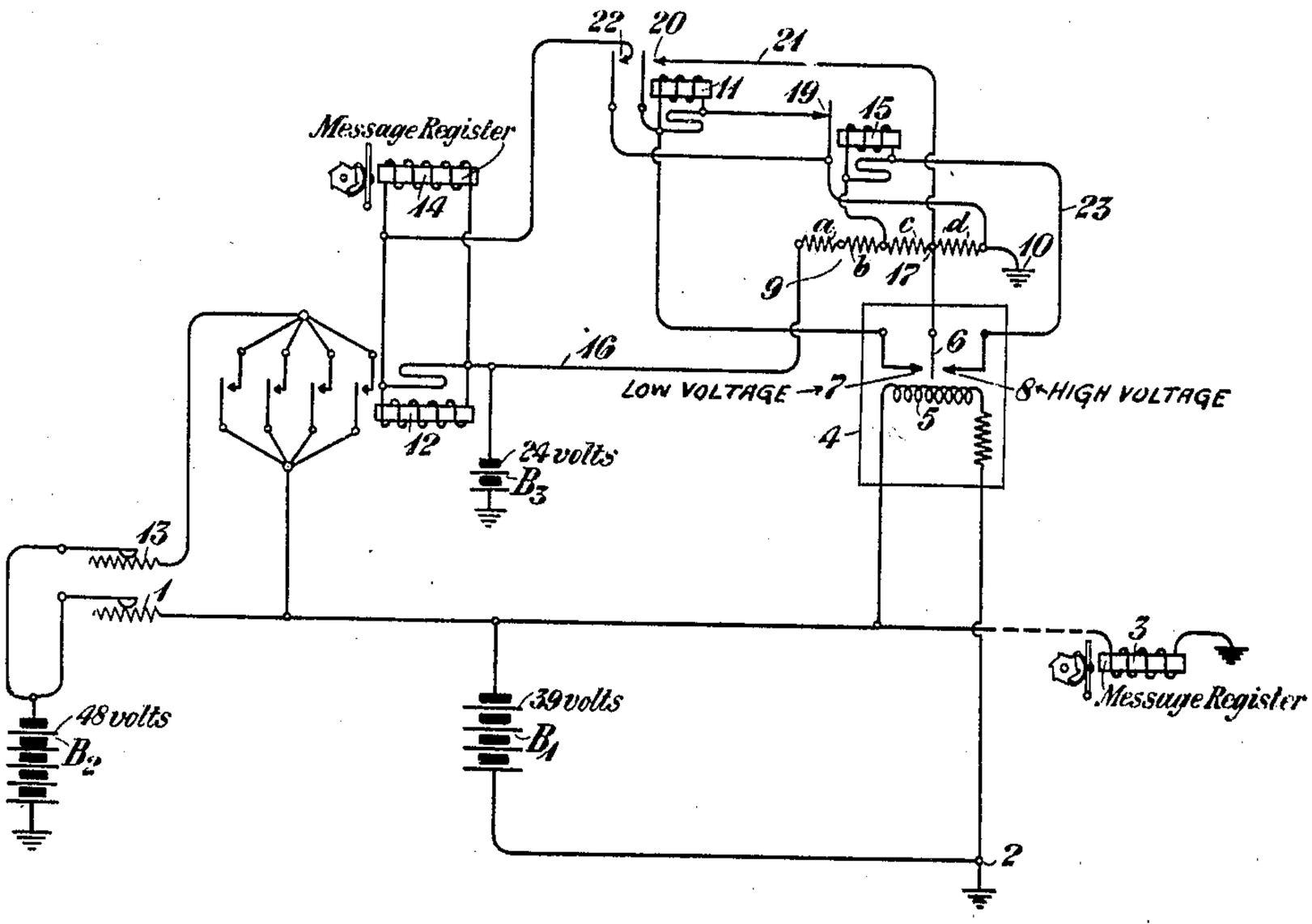
Dec. 30, 1924. 1,520,793

R. L. YOUNG

CURRENT REGULATING DEVICE

Filed May 26, 1921



INVENTOR

R. L. Young

BY

ATTORNEY

Patented Dec. 30, 1924. 1,520,793

UNITED STATES PATENT OFFICE.

ROWLAND L. YOUNG, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

CURRENT-REGULATING DEVICE.

Application filed May 26, 1921. Serial No. 472,798.

To all whom it may concern:

Be it known that I, ROWLAND L. YOUNG, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain Improvements in Current-Regulating Devices, of which the following is a specification.

This invention relates to current regulating devices, and particularly to an arrangement for controlling the charging current of an electrical storage battery system.

It has been customary heretofore in the operation of certain apparatus connected with a telephone system to use generators which were designed to give the required voltage for operating each particular type of apparatus. Apparatus of the type requiring close voltage regulation, of which message registers are an example, could not be operated from the central office battery, since the wide fluctuation in voltage from such source would seriously affect the operation of the registers. Furthermore, the use of motor generator sets for this purpose is undesirable in view of the high initial cost and maintenance charges upon such sets.

It is the object of this invention to provide a storage battery system which is adapted for the operation of message registers and similar apparatus, the voltage of which may be maintained within very close limits by means of a novel circuit for controlling automatically the charging current of the storage battery of the said system.

The invention will be clearly understood from the following description when read in connection with the attached drawing, showing one form of embodiment of the invention.

In the drawing, B_1 indicates a storage battery, having a normal potential of 39 volts, which is designed to furnish energy for the proper operation of the message register 3, which operation is dependent upon close voltage regulation. Although the term "message register" is applied to the apparatus connected with the output circuit of the source B_1, it is to be understood that the invention is not limited to any particular type of load, but may be used in connection with any type of load that requires close voltage regulation. B_2 represents the source of charging current as, for example, the central office battery having a potential of 48 volts that furnishes the talking energy of the system. This battery is normally connected with the battery B_1 through the rheostat 1 which permits a small predetermined amount of current to flow continuously into the battery B_1. Connected across the output side of the battery B_1 is a voltmeter-relay 4 having a winding 5 and armature 6 adapted to swing between its contacts 7 and 8. The armature 6 is connected to a point 17 of the potentiometer 9, comprising a plurality of resistance elements *a*, *b*, *c* and *d* which are connected in series between the 24 volt battery B_3 and the ground 10. A relay 11, which operates when the armature 6 completes a circuit through contact 7, is designed to control the operation of the switching relay 12, whereby a second path for current flow is provided from battery B_2 through rheostat 13 and the contacts of relay 12 for the purpose of increasing the charging current through battery B_1. A message register 14 is connected in parallel with relay 12 to indicate and record the number of times the said relay has operated. A relay 15, which operates when the armature 6 completes a circuit through contact 8, is designed to release the control relay 11 when the potential of battery B_1 reaches its predetermined upper limit as the result of the flow of charging current from the battery B_2 through rheostat 13. Although in the description of the system definite voltages have been assigned to the various batteries associated with the system, it is to be understood that these values are purely illustrative, and that the invention is not limited to the use of these voltages but that other and different voltages may be used without changing the scope of the invention.

Having in mind the foregoing description of the various devices shown in the drawing, the invention will be apparent from the following description of the circuit in which this apparatus is embodied. Let it be assumed that the battery B_1 is receiving current from the battery B_2 through the rheostat 1, which is sufficient in magnitude to maintain the charge of the battery B_1 so that its voltage will not drop below a certain predetermined value for a light load. As the load increases, the current drain upon the battery B_1 will consequently increase and its voltage will drop. This drop

in potential will permit the armature 6 of the voltmeter-relay 4 to close the circuit through contact 7, which will cause the operation of relay 11. It will be seen that when contact 7 is closed, the winding of relay 11 is bridged across the resistance element *d*, which comprises one of the units of potentiometer 9, and the current for the operation of relay 11 results from the drop in potential through the element *d* of the current that flows from battery B_3 to the ground at 10. Relay 11 will be locked up over a circuit extending from the ground 10, contact 19 of relay 15, winding of relay 11, contact 20 of relay 11 and conductor 21 to point 17 of potentiometer 9. By the closing of contact 22 of relay 11, current will flow from battery B_3 through the windings of relay 12 and message register 14 to ground 10 thereby operating the said relay and message register. The operation of relay 12 will permit the flow of current from battery B_2 through rheostat 13 and the multiple contacts of relay 12 to the battery B_1, which will increase in magnitude the charging current applied to the latter battery.

When the battery B_1 has been charged so that its voltage reaches a predetermined upper limit, the armature 6 of relay 4 will close a circuit through its contact 8. When contact 8 is closed winding 15 is bridged across the resistance elements *c* of the potentiometer 9, and, consequently, current will flow through the winding of the said relay over conductor 23 and through contact 8, thereby energizing relay 15. Contact 19, which is in the holding circuit of relay 11, will be opened, and, consequently, relay 11 will be deenergized. The opening of contact 22 of relay 11 will release relay 12, which, by the opening of its contacts, prevents the further flow of current from the battery B_2 through rheostat 13 to the battery B_1. When the voltage across the output circuit of the battery B_1 drops below its upper predetermined limit, the armature 6 will move away from its contact 8 in the direction of contact 7 and will make connection with contact 7 when the voltage reaches the predetermined lower limit of the output voltage of the battery B_1.

It will be seen that the invention disclosed in the foregoing description and in the drawing comprises a battery charging system characterized by automatically controlled switching means wherein the charging rate is governed by the limiting voltages of the battery to be charged. The invention is also characterized by the inclusion of positive means for controlling the switches that connect the charging source with the battery to be charged and is further characterized by the inclusion of positive means for effecting the release of the said controlling means when the battery has been charged to its upper limit.

Although this invention has been disclosed in a definite form and arrangement of parts, it is apparent that it is not so limited, but is capable of embodiment in other forms and arrangements without departing from the spirit and scope of the appended claims.

What is claimed is:

1. In a battery charging system, the combination with a battery of a source of charging current having a plurality of output circuits, one of which is normally effectively connected with said battery, switching means adapted to connect other of said output circuits to said battery, a control relay adapted to govern the operation of said switching means, voltage responsive means connected with the output circuit of said battery adapted to operate and lock up the said control relay and a release relay also controlled by the said voltage responsive means to effect the deenergization of the said control relay.

2. In a battery charging system, the combination with a battery of a source of charging current normally connected with the said battery through a path of predetermined resistance, a voltage responsive device connected with the output circuit of the said battery, a switching relay to connect the said source with the said battery through a second path of different resistance from the said first path, a control relay controlled by the said voltage responsive device to operate and lock up the said switching relay, and a release relay controlled by the said voltage responsive device to release the switching relay when the output voltage of the said battery reaches a predetermined value.

3. In a battery charging system, the combination with a battery of a load requiring close voltage regulation, a source of charging current having a plurality of output circuits one of which is normally effectively connected with the said battery, switching means adapted to connect the other of said output circuits to the said battery, a control relay adapted to govern the operation of the said switching means, voltage responsive means connected with the output circuit of the said battery adapted to operate and lock up the said control relay, and a release relay also controlled by the said voltage responsive means to effect the deenergization of the said control relay.

In testimony whereof, I have signed my name to this specification this twenty-fourth day of May, 1921.

ROWLAND L. YOUNG.