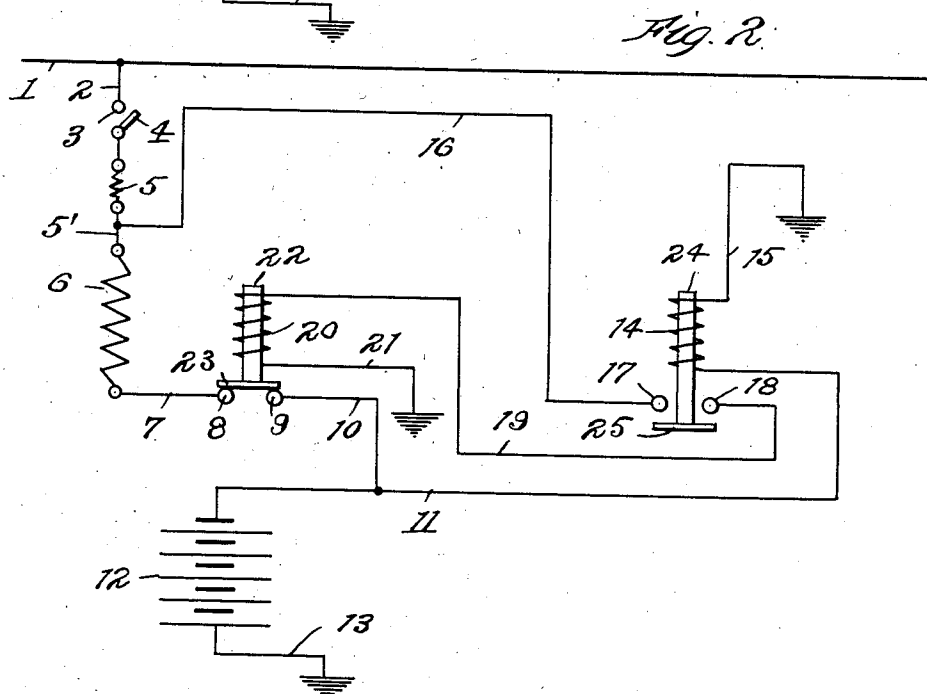
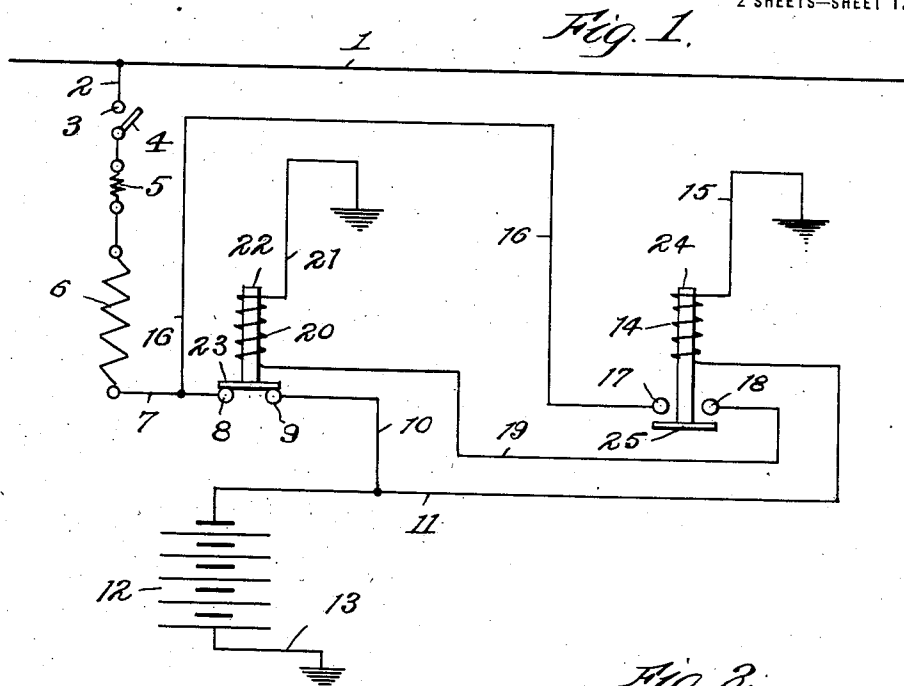


J. J. SINCLAIR.
VOLTAGE REGULATING MEANS FOR STORAGE BATTERIES.
APPLICATION FILED NOV. 15, 1916.

1,306,315.

Patented June 10, 1919.

2 SHEETS—SHEET 1.



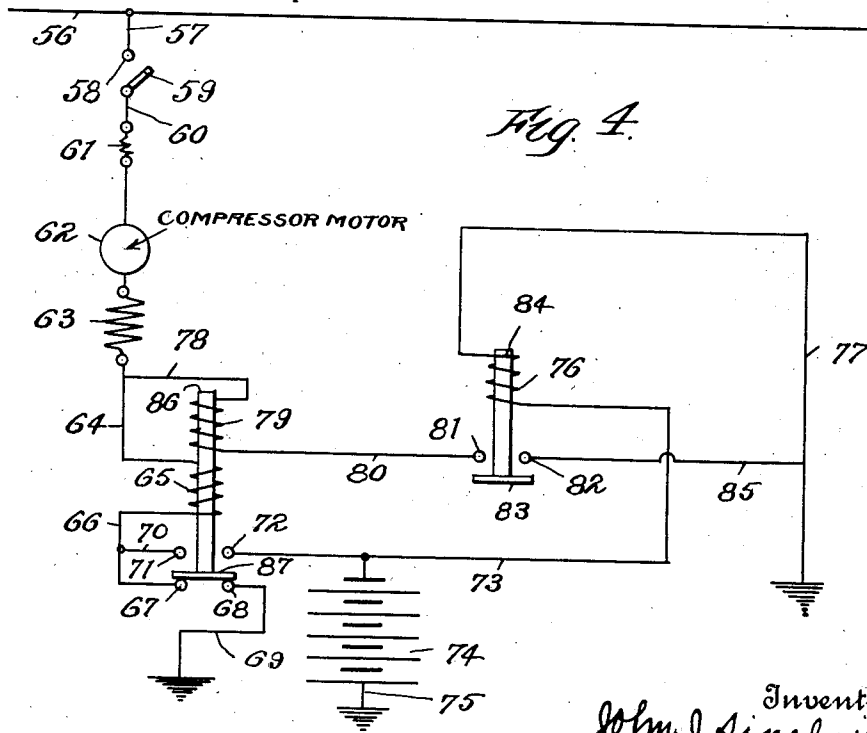
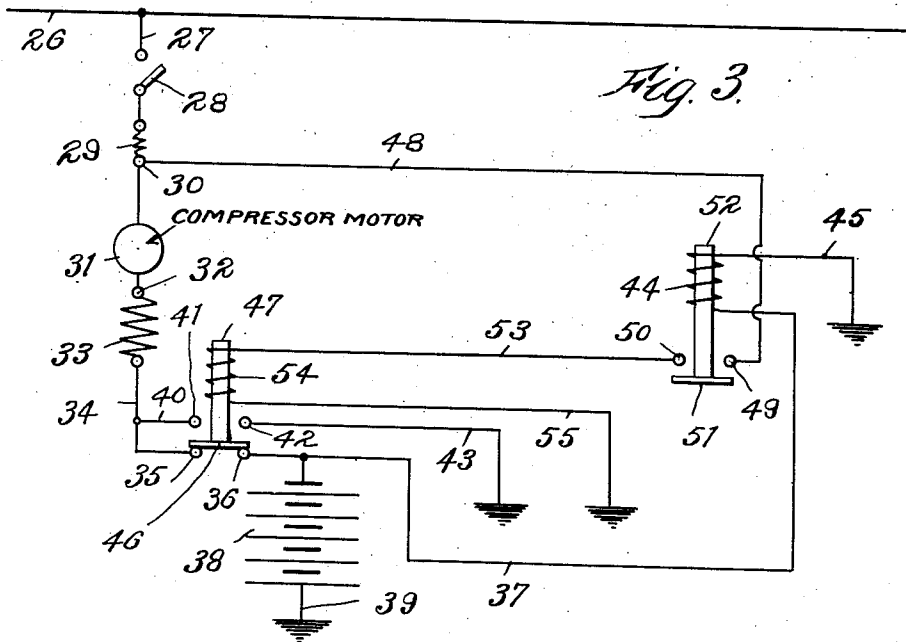
Inventor
John J. Sinclair
By his Attorneys
Knight Bros

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UNITED STATES PATENT OFFICE.

JOHN J. SINCLAIR, OF UPPER MONTCLAIR, NEW JERSEY, ASSIGNOR TO MEGOSIN COMPANY, INC., A CORPORATION OF NEW YORK.

VOLTAGE-REGULATING MEANS FOR STORAGE BATTERIES.

1,306,315.

Specification of Letters Patent. Patented June 10, 1919.

Application filed November 15, 1916. Serial No. 131,467.

To all whom it may concern:

Be it known that I, JOHN J. SINCLAIR, a citizen of the United States, residing at Upper Montclair, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Voltage-Regulating Means for Storage Batteries, of which the following is a full and clear specification.

This invention relates to storage batteries for use on rapid transit cars and the like for operating various service devices in connection with a line source of power. The primary object of my invention is to provide improved means for regulating the voltage of a storage battery to provide certain predetermined limits to the voltage under which the battery may be economically operated. By means of suitable regulation of this nature, the life of the storage battery is greatly prolonged. Other and further objects will appear in the specification and be pointed out in the appended claims, reference being had to the accompanying drawings which exemplify my invention in several desirable embodiments.

In the drawings,

Figure 1 is a diagrammatic view of one embodiment of my invention;

Fig. 2 is a diagram of a modification of the same;

Fig. 3 is a diagrammatic view of another embodiment;

Fig. 4 is a diagrammatic view of another embodiment.

Referring more particularly to the drawings, in the embodiment shown in Fig. 1, a line wire or source 1 is connected by a wire 2 to a fixed contact 3 with which coöperates a movable contact 4 which is connected through a fuse 5 to one end of a charging resistance 6. The other end of resistance coil 6 is connected by a wire 7 to one of a pair of spaced contacts 8 and 9, suitably disposed to be bridged by a relay hereinafter referred to. Contact 9 is connected by a wire 10 to a wire 11 which leads at one end to a storage battery 12 grounded through a wire 13. The other end of wire 11 leads to one end of a solenoid 14, the other end of said solenoid being grounded through a wire 15. A wire 16 leads from the wire 7 and is connected to one of a pair of spaced contacts 17 and 18. Contact 18 is connected by a wire 19 to a solenoid 20, which is grounded

through a wire 21. Solenoid 20 is provided with a plunger 22 which carries a bridge contact 23 which moves into and out of position to bridge the gap between contacts 8 and 9. Within the solenoid 14 is a plunger 24 which carries a contact 25 which is thereby moved into and out of position to bridge the gap between contacts 17 and 18. The construction of solenoid 14 is such that a predetermined maximum voltage acts upon the plunger 24 in such a manner as to bring the contact 25 against the spaced contacts 17 and 18, said solenoid 14 being adapted to retain the plunger 24 in elevated position until the voltage has fallen to a predetermined minimum when it releases the plunger and the connection is broken. As long as the bridge contact 25 is in raised position, a circuit is completed from line source 1, through wire 2, contact 3, switch 4, fuse 5, resistance 6, wire 7, wire 16, contacts 17, 25 and 18, wire 19, solenoid 20 and ground wire 21. This circuit energizes solenoid 20 and holds the movable contact 23 away from spaced contacts 8 and 9 and hence prevents a charging current reaching storage battery 12. As the voltage of storage battery 12 drops however, the solenoid 14 becomes weaker until at a predetermined minimum the movable contact 25 is released to break the circuit which includes solenoid 20. Immediately the movable contact 23 drops to bridge the gap between spaced contacts 8 and 9, thus completing a circuit from line source 1 through elements 2, 3, 4, 5, 6, 7, 8, 23, 9, 10, 11 and storage battery 12, which is grounded through 13. A charging current is thus sent into storage battery 12 until its voltage is raised to the predetermined maximum when solenoid 14 is again energized to close the energizing circuit for solenoid 20, which breaks the charging circuit.

Fig. 2 shows a modification of the system shown in Fig. 1, this modification being adapted to send a relatively larger current through the solenoid 20. For this purpose, the wire 16 is connected up to lead from a wire 5' which is interposed between the fuse 5 and charging resistance 6.

In the embodiment of my invention shown in Fig. 3, a line source 26 is provided with a lead 27, a switch 28 being adapted to close the connection between it and a fuse 29, which is connected to one terminal 30 of a compressor motor 31, the other terminal 32

of said compressor motor being connected to a charging resistance 33 which is connected by a wire 34 to one of a pair of spaced contacts 35 and 36. Said compressor 31 is thus
 5 connected to the main line circuit and is capable of taking the full potential of this circuit. Leading from the contact 36 is a wire 37 to which is connected one pole of a storage battery 38 grounded by a wire 39.
 10 A wire 40 which leads from the wire 34 is connected to one of a pair of spaced contacts 41 and 42, the latter contact being grounded by a wire 43. The wire 37 is connected to one terminal of a solenoid 44 which is
 15 grounded by wire 45. A movable contact 46, which is carried by a plunger 47 is adapted to bridge the gap between spaced contacts 35 and 36. In order to provide an energizing circuit for operating the movable
 20 contact 46, a conductor 48 is preferably connected to terminal 30 and leads to one of a pair of spaced contacts 49 and 50 which are suitably disposed to be bridged by a movable contact 51 carried by a plunger 52,
 25 which is actuated by solenoid 44. A wire 53 connects the contact 50 to one terminal of a solenoid 54, the other terminal of said solenoid being grounded through a wire 55. The operation of this embodiment of my invention
 30 is as follows: While the voltage of storage battery 38 remains above a predetermined minimum which is desirable for the economic operation of the battery, solenoid 44 is kept sufficiently energized to hold
 35 the contact 51 in position to bridge the spaced contacts 49 and 50 by a circuit which includes ground wire 39, battery 38, wire 37, solenoid 44 and ground wire 45. This in turn maintains a circuit including line
 40 source 26, wire 27, switch 28, fuse 29, terminal 30, wire 48, contacts 49, 50 and 51, wire 53, solenoid 54, and ground wire 55. The resulting energization of solenoid 54, retains the movable contact 46 in position to
 45 bridge the gap between spaced contacts 41 and 42, thus maintaining an energizing circuit which includes line source 26, wire 27, switch 28, fuse 29, terminal 30, compressor motor 31, coil 33, wire 34, wire
 50 40, contacts 41, 46 and 42, and ground wire 43. It will be understood that by means of these connections, the compressor motor 31 will operate whether the storage battery is being charged or not. At the same time, by
 55 means of the relays described above, an overcharge of the storage battery is prevented at times when the load on the compressor would not be sufficient for that purpose in case the compressor motor 31 and storage battery 38
 60 were continuously connected up in series with each other. When, however, the voltage of battery 38 falls below a predetermined minimum, solenoid 44 releases the plunger 52 with the movable contact 51, thus
 65 breaking the energizing circuit through line

source 26, wire 27, switch 28, fuse 29, compressor motor 31, resistance 33, wire 34, contacts 35, 46 and 36, wire 37, storage battery 38 and ground wire 39. This circuit is maintained until the voltage of battery 38 70 reaches a predetermined maximum.

In the embodiment of my invention shown in Fig. 4, a line source 56 is connected by a wire 57 to a contact 58 which coöperates with a switch 59 connected by a wire 60 to 75 a fuse 61 which is in turn connected to one terminal of a compressor motor 62. The other terminal of said compressor motor is connected to a charging resistance 63 from which leads a wire 64 connected to one ter- 80 minal of a solenoid 65. The other terminal of said solenoid is connected by a wire 66 to one of a pair of spaced contacts 67 and 68, the latter contact being grounded through a wire 69. A wire 70 leads from the wire 85 66 to one of a pair of spaced contacts 71 and 72. Leading from contact 72 is a wire 73 to which is connected one pole of a storage battery 74 which is grounded through a wire 75. Wire 73 is connected to one terminal 90 of a solenoid 76, the other terminal of said solenoid being grounded through a wire 77. A wire 78 leads from wire 64 to one terminal of a solenoid 79, the other terminal of said solenoid 79 being connected by a wire 95 80 to one of a pair of spaced contacts 81 and 82, the gap between which may be closed by a movable contact 83 carried by a plunger 84 which reciprocates within the sole- 100 noid 76. Contact 82 is connected by a wire 85 to ground wire 77. Solenoids 65 and 79 are oppositely wound and suitably constructed to neutralize each other when energized. Arranged within these solenoids is a plunger 86 which carries a movable contact 87 105 which is adapted in one position to close the gap between spaced contacts 67 and 68 while in its other position it closes the gap between contacts 71 and 72. The operation of this embodiment of my invention is as follows: 110
 Solenoid 76 is suitably constructed so that when once energized sufficiently to move the contact 83 into position to bridge the gap between contacts 81 and 82, it will be held in such position until the voltage of battery 115 74 falls below a predetermined minimum. The energizing circuit for solenoid 76 is then ground wire 75, battery 74, wire 73, solenoid 76 and ground wire 77. This results in closing the circuit including line source 120 56, wire 57, switch 59 (normally closed) compressor motor 62, charging resistance 63, wire 78, solenoid 79, wire 80, contacts 81, 83 and 82, wire 85, and ground wire 77. This energizes solenoid 79 which neutralizes 125 the effects of solenoid 65 on plunger 86 which falls, carrying with it the movable contact 87 which formerly bridged the gap between contacts 71 and 72 and closed the battery charging circuit including line 130

source 56, switch 59, compressor motor 62, resistance 63, wire 64, solenoid 65, wire 66, contacts 71, 87, and 72, wire 73, battery 74 and ground wire 75. As the contact 87 drops away from the contacts 71 and 72, this charging circuit is broken, the energizing circuit for solenoid 65 being immediately reestablished by the contact 87 falling into position to bridge the gap between spaced contacts 67 and 68 through ground wires 69. As soon as the voltage of storage battery 74 again falls below a predetermined minimum, the energization of solenoid 76 falls off to such an extent as to release the plunger 84, thus breaking the energizing circuit of solenoid 79 and thus permitting solenoid 65 to elevate the plunger 86 to reestablish the battery-charging circuit hereinbefore pointed out.

20 I claim:—

1. In mechanism of the character described, a storage battery, means including a movable contact, normally tending to complete an energizing circuit through said battery, and means for holding said contact in circuit-breaking position, including a solenoid connected to said energizing circuit, and a relay connected to said storage battery and controlling the energization of said solenoid.

2. In apparatus of the character described, a storage battery, a relay coil, a conductor connecting said relay coil in circuit with said storage battery, a supply line leading to said conductor, said supply line including a relay switch, a ground wire leading from said supply line and excluding said storage battery and first-mentioned relay, said ground wire including said relay switch, a relay coil for operating said switch, said switch being adapted to alternately close the supply line circuit through said storage battery and said ground line, an energizing circuit for the second mentioned relay coil including a relay switch operated by the first-mentioned relay coil, and a compressor motor included in said supply and ground line.

3. In a system of the character described, a storage battery, a charging circuit therefor, a relay for controlling said charging circuit, an energizing circuit for said relay, including a switch, and electroresponsive means in circuit with said storage battery for operating said switch, said energizing circuit receiving its energy from a source independent of said storage battery.

4. In mechanism of the character described, a storage battery, and means for charging the same including a source of current supply, a relay adapted to be energized by said source and which makes and breaks the circuit connections between said source and said storage battery, and a second relay which makes and breaks the circuit connections between said source and the first mentioned relay, the second mentioned relay being connected up with said storage battery.

5. In apparatus of the character described, a storage battery, a compressor motor, a two-way switch, a supply line provided with branches controlled by said two-way switch in different positions respectively, one of said branches being thereby adapted to connect said compressor motor and storage battery in series and the other of said branches being adapted to connect said compressor motor to ground exclusively of said storage battery, and means depending on current from said storage battery for operating said two-way switch.

6. In mechanism of the character described, a storage battery, and means for charging the same including a source of current supply, a relay which makes and breaks the circuit connections between said source and said storage battery, and a second relay which makes and breaks the circuit connections between said source and the first mentioned relay, the second mentioned relay being connected up with said storage battery and with said source by means of said connections made and broken by the first mentioned relay.

JOHN J. SINCLAIR.