

Oct. 12, 1926.

W. A. STRAWMYER

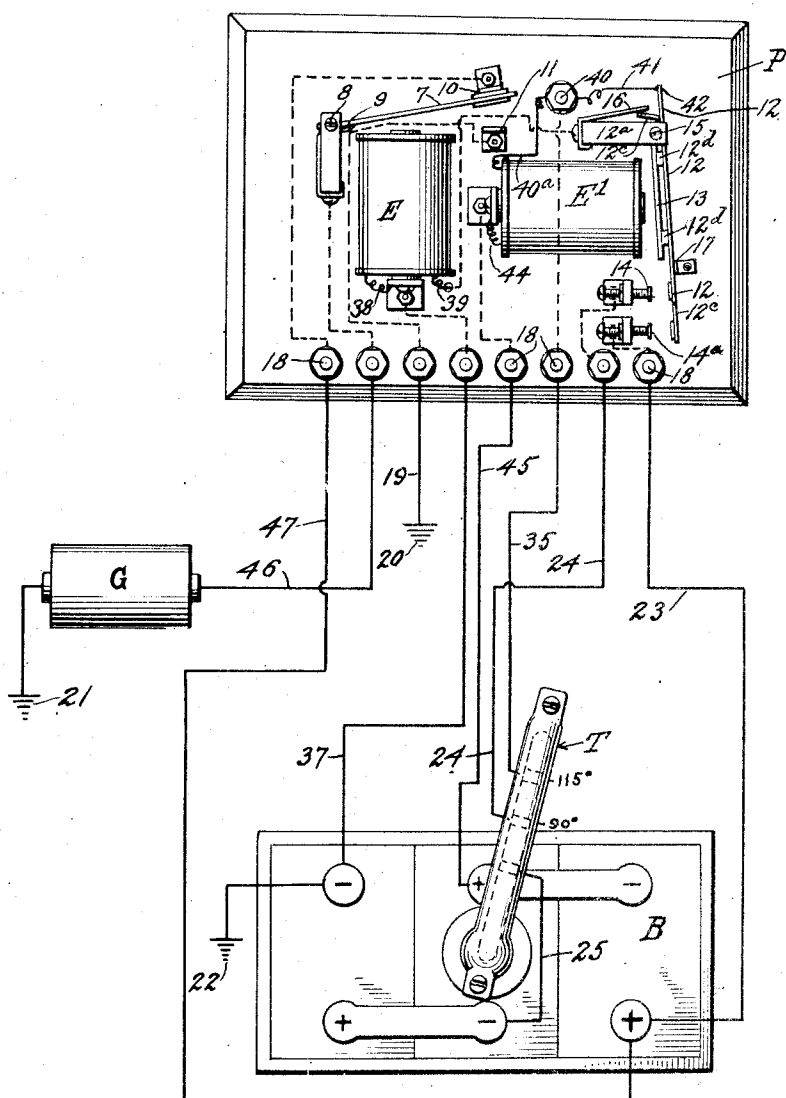
1,602,559

DEVICE FOR CONTROLLING THE TEMPERATURE OF STORAGE BATTERIES

Filed April 18, 1922

2 Sheets-Sheet 1

Fig. 1.



Inventor

William A. Strawmyer

Attorney

By

Attorney

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W. A. STRAWMYER

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2 Sheets-Sheet 2

Fig. 2.

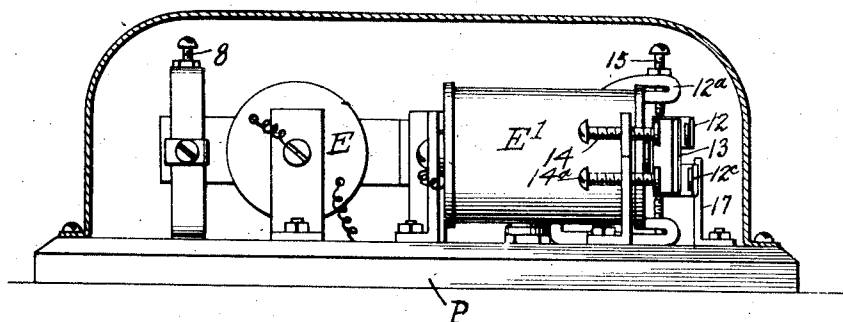
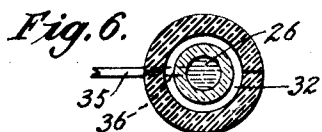
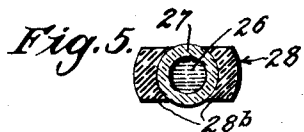
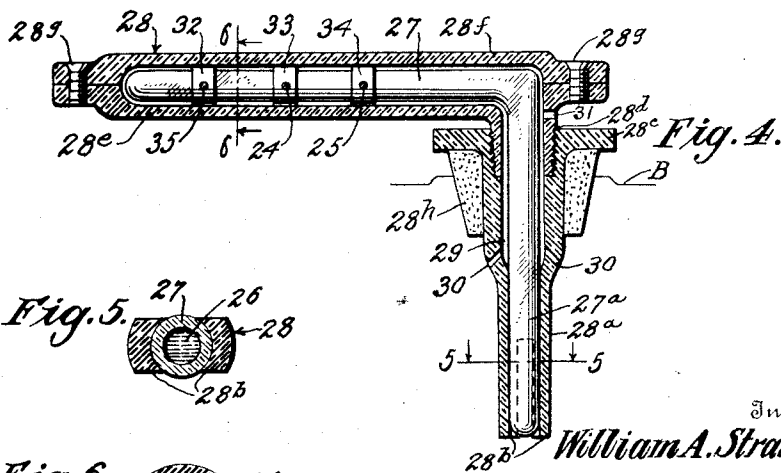
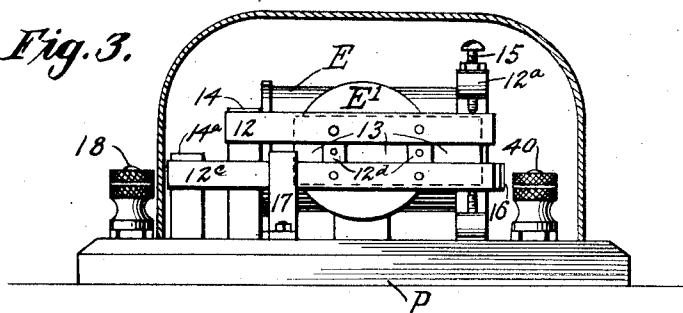


Fig. 3.



By

William A. Strawmyer

Attorney

UNITED STATES PATENT OFFICE.

WILLIAM A. STRAWMYER, OF OMAHA, NEBRASKA.

DEVICE FOR CONTROLLING THE TEMPERATURE OF STORAGE BATTERIES.

Application filed April 18, 1922. Serial No. 555,016.

This invention relates to thermal controlling devices, and more specifically to an improved device for controlling the temperature of a storage battery.

5 This invention has certain features in common with that of the co-pending application No. 421,800 filed by myself and Vane Bearman on November 4, 1920, and patented June 5, 1923, No. 1,457,863.

10 One object of this invention is to generally improve upon devices of this character, and especially upon the device described and claimed in the above mentioned application.

15 Another object is to provide an improved form of thermostat and an improved housing and connecting means for the thermostat.

20 Other objects and advantages will be pointed out or implied in the following details of description, in connection with the accompanying drawings in which:

Fig. 1 is a diagrammatic view illustrating the preferred form of my invention.

25 Fig. 2 is a side elevation of a circuit-breaking mechanism which constitutes a part of the present invention, the cover being shown in vertical section, certain of the binding posts being omitted.

30 Fig. 3 is an end elevation of the structure shown in Fig. 2, the cover being shown in section.

Fig. 4 is a vertical longitudinal sectional view through my improved thermostat-housing, the thermostat being shown in the housing in side elevation.

Fig. 5 is a horizontal sectional view on the line 5-5 of Fig. 4.

40 Fig. 6 is a vertical sectional view on the line 6-6 of Fig. 4.

Referring to these drawings in detail, in which similar reference characters correspond with similar parts throughout the several views, and in which the generator "G" and storage battery "B" may be of any previously known or preferred form, the invention consists in the construction and arrangement or combination of elements which will now be fully described as follows:

50 For convenience in assembling the parts of my improved circuit-breaking device, and for presenting them in a unitary structure, I preferably employ an insulating base or plate "P", and upon this plate I secure,

by any appropriate means, two electro-magnets "E" and "E¹". In connection with the magnet "E" I provide an armature or switch-arm 7 which may hereinafter be referred to as a generator circuit breaker. This member 7 is pivotally mounted at 8 and normally held in the position shown in Fig. 1 by a spring 9. In this position it is in electrical connection with the stationary contact 10. A second stationary contact is shown at 11, and the member 7 touches this contact when the magnet "E" is energized so as to draw the armature or member 7 away from the contact 10.

Two switch arms 12 and 12^c are secured together by insulating bars 12^d and pivoted to an insulating support 12^a. These switch arms are provided with an armature 13 which coacts with the relay electro-magnet "E¹" for moving these switch arms into contact with a pair of stationary contacts 14 and 14^a. The switch arms 12 and 12^c are pivoted at 15 and normally held by a spring 16 away from the contacts 14 and 14^a, and a stop 17 limits the outward or opening movement of the switches 12 and 12^c.

The base or plate "P" is provided with a series of eight binding posts 18 for convenience in connecting the generator "G," battery "B" and thermostat "T" to the several elements which are mounted on the base or plate "P." One of the binding posts 18 is connected with a ground wire 19, the latter being connected at 20 to a ground which may be considered as the indirect generator ground, the generator "G" being directly grounded at 21, and it should be understood that electric current can pass from the ground 20 to the ground 21, and vice versa. The positive terminal of the battery "B" is connected to the contact 14^a through the medium of one of the binding posts 18 and a conductor 23, and the contact 14 is connected to the thermostat "T" through the medium of another binding post 18 and a conducting-wire 24. The conductor 24 may be considered as the low-temperature conductor, because the conductor 24 is connected to the low-temperature or ninety degree point of the thermostat "T" in a manner and for a purpose which will presently appear. A battery-thermostat conductor 25 is in constant electrical connection with the conducting element 26 of the thermostat (see Figs.

5 and 6). This conducting element 26 is mercury or other appropriate liquid conducting material which has a high coefficient of expansion, this liquid being confined within a non-conducting tube 27, preferably glass, and this tube is preferably housed in and protected by a casing or housing 28 which is preferably of the form shown in Figs. 4, 5, and 6, being of non-conducting material such as porcelain, hard rubber or the equivalent. The member 27 is preferably L shaped, as shown, and its vertical portion 27^a is snugly fitted in a tubular portion 28^a of the housing 28, this portion 28^a being preferably bifurcated at its lower end, as indicated at 28^b, the furcations 28^b having the tendency to spring inward and clamp the lower end of the tubular member 27. The upper portion of the element 28^a has a preferably greater internal diameter than the adjacent part of the element 27^a, so that a clearance or passage 29 is provided between these elements 27^a and 28^a, and this passage is in open connection with lower vents 30 and one or more upper vents 31, the purpose of these vents being to permit the free passage of air and gas from the battery cell into which the thermostat extends through a stopper or closer 28^b which is preferably of soft rubber. This element 28^a is preferably provided with a peripheral flange 28^c and with an internal thread 28^d, the latter receiving an external threaded boss or element 28^e which forms the lower section or divisions of the horizontal part of the casing 28, the upper section 28^f of this casing being fitted on and secured to the lower section by any appropriate means, screws 28^g being here shown for securing the upper and lower sections together.

Three metal bands or collars 32, 33 and 34 are secured around the horizontal section of the member 27 and fitted snugly and immovably in the casing 28. Incidentally these bands or collars secure the member 27 against movement in its casing, but the main object of these metal bands are to provide an appropriate and practical electric conducting means between the liquid conducting medium 26 and the conducting wires 24, 25 and 35. The collars 32, 33 and 34 are apertured to receive the respective conducting wires, and the tubular members 27 and 28 are also apertured to receive these wires, so that the conducting wires 24, 25 and 35 extend from the exterior of the housing 28 to the interior of the tubular member 27 through registering apertures in these members and in the lead collars, as indicated at 36 in Fig. 6. It will also be seen, therefore, that when the liquid conducting material 26 is contracted so that it extends to a point between the collars 32 and 33 this liquid is in electrical connection with the conductors 24 and 25. On the other hand, when the liquid expands,

it first electrically connects with the conductor 24 and thereafter connects with the conductor 35.

Referring again to Fig. 1, it will be seen that the negative terminal of the battery "B" connects with the electro-magnet "E" through the medium of conductors 37 and 38, and one of the binding posts 18. The other terminal 39 of this magnet connects with the switch-arm 12^c through the medium of the spring 16.

The conductor 35 extends from one of the binding posts 18 to a binding post 40 to which a conductor 41 is connected, this conductor also being connected to the switch-arm 12 at 42. The binding post 40 is also connected to a terminal 40^a of the electro-magnet "E¹," and the other terminal 44 of this magnet is connected to one of the connecting bars of the battery "B" through the medium of a conducting wire 45 and one of the posts 18.

The automatic operation of the device is as follows:

Assuming that the battery "B" is being charged by current from the generator "G", this current passes through the generator circuit which consists of conducting wires 46 and 47, the arm 7, contact 10 and grounds 21 and 22: The battery temperature increases until finally the liquid element 26 expands into contact with the conductor 35, at the point indicating 115 degrees. The current now passes through the conductor 25, through the mercury or element 26, the conductor 35 and its binding post 18, thence to binding post 40, through the conductor 40^a to the magnet "E¹", through this magnet to the conductor 44, thence through one of the binding posts 18 to the conductor 45, and thence through the central battery-cell to the conductor 25, thus completing the circuit through the electro-magnet "E¹" which energizes this magnet and causes it to draw the armature 13 to its core. The armature 13 draws the switch-arm 12 against the contact 14, and at the same time draws the switch-arm 12^c against the contact 14^a. This closes a circuit through the magnet "E" so that the current now flows as follows: From the positive binding post or terminal of the battery "B", a current now flows through the conductor 23 and its binding post 18 to the contact 14^a, thence through the switch-arm 12^c, the spring 16, conductor 39, magnet "E", conductor 38 and its binding post 18, thence through conductor 37 to the negative terminal of the battery "B", and thence through the battery to the positive terminal thereof. By thus completing the circuit through the magnet "E", this magnet is energized and draws the armature 7 away from the contact 10, thus breaking the charging circuit between the battery and generator. Normally and before the armature 7 is

drawn away from the contact 10, the charging circuit from the generator to the battery is as follows: From the generator "G" through the conductor 46, the current flows to one of the binding posts 18, thence to the armature 7, through the medium of the spring 9, thence through contact 10, the conductor 47 (through the medium of its binding posts 18) to the positive terminal of the battery "B", thence through the battery, the ground 22, and thence through the ground 21 back to the generator, thus completing the normal battery-charging circuit.

When the armature 7 is drawn away from the contact 10, as previously described, the armature or switch-arm 7 is held against the contact 11 by the magnet "E", so that the current now goes through the armature 7, the contact 11 and the ground 20 (through the medium of the conductor 19 and its binding post 18), and from the ground 20 to the ground 21. While the current is thus flowing, as just previously described, the mercury or fluid element 26 is at the band or collar 32, that is, the 115 degree point. When the mercury recedes below the 115 degree point, a closed circuit is still maintained, through the magnet "E", this circuit having been completed at contact 12 when the magnet "E" drew the armature 13 to it. This closed circuit is maintained until the mercury recedes below the 90 degree point, and then each movable part returns to its normal position. Tracing the current through this last mentioned closed circuit, we see that it passes from the battery "B" through the conductor 25, through the mercury 26 to the 90 degree point, thence through the conductor 24 and its binding post 18, thence through the contact 14, the switch-arm 12, the conducting wire 41, binding post 40, conductor 40^a, thence through the magnet "E", its terminal 44, the conductor 45 and its terminal 18, thence back to the battery "B" and through the central cell of the latter to the conductor 25.

So long as the mercury 26 extends to a point between the 90 degree and 115 degree points, this latter circuit remains closed and does not permit the magnet "E" to become deenergized; but when the mercury or element 26 recedes to a point below the 90 degree point, this latter circuit is broken, so that the magnet "E" is de-energized, and the spring 16 forces the spring arms 12 and 12^a away from the contacts 14 and 14^a. Moreover, when the switch-arm 12^a moves away from the contact 14^a this breaks the circuit through the magnet "E", so that the armature 7 is now moved by its spring 9 against the contact 10, thus reestablishing the circuit between the generator and the battery, so that the latter is again recharged by the generator-current.

It is not intended to limit this invention

to the exact details of construction and arrangement here shown and described, but changes may be made within the scope of the inventive ideas as implied and claimed.

What I claim as my invention is:

1. In a battery controlling system, the combination with a generator and a battery to be charged thereby of a unitary structure, including a base plate, two electro-magnets mounted on the base plate, a combined armature and circuit closer pivotally mounted on the base plate in operative relation to one of said magnets, two electric contacts on opposite sides of the combined armature and circuit closer, a spring for normally holding the combined armature and circuit closer against one of said electric contacts, for closing the charging circuit between the generator and the battery, a thermostat for controlling the other of said electro-magnets, a circuit closer including a switch arm operable by said last mentioned magnet for completing an electric circuit between the battery and a low temperature point of the thermostat, and a second switch arm secured to said last mentioned switch arm and adapted to complete an electrical circuit between the battery and a terminal of the magnet which actuates said combined armature and circuit closer, whereby the latter is caused to contact with the other of said first mentioned electric contacts to ground the generator circuit.

2. In a battery controlling system, the combination of a battery controlling device, comprising a unitary structure including a base plate, two electromagnets mounted on the base plate, a combined armature and circuit closer pivotally mounted on the base plate in operative relation to one of said magnets, two electric contacts on opposite sides of the combined armature and circuit closer, a spring for normally holding the combined armature and circuit closer against one of said electric contacts, a thermostat for controlling the other of said electromagnets, a circuit closer including a switch-arm operable by said last mentioned magnet for completing an electric circuit between the battery and a low temperature point of the thermostat, a second switch-arm rigid with said last mentioned switch-arm and an electric conductor connecting said second switch arm with a terminal of the magnet which actuates said combined armature and circuit closer, a generator electrically connected to said combined armature and circuit closer, a storage battery electrically connected with said first magnet, an electric conductor connecting said storage battery with one of the two above mentioned electric contacts, whereby the storage battery is electrically connected with the generator when the combined armature and circuit breaker is in contact with the said electric

contact, the other of said electric contacts being grounded whereby the generator circuit is grounded when the combined armature and circuit breaker contacts the second electric contact; said thermostat including an expansible conducting element, three contacts being provided for electrical connection with this expansible element, one of said contacts being connected to said second magnet, another being connected to and controlled by said first mentioned switch arm, and the other being electrically connected to said storage battery, and a magnet battery connector electrically connected to said battery and to a terminal of the electromagnet which actuates said switch arm. 10 15

In testimony whereof I affix my signature.

WILLIAM A. STRAWMYER.