

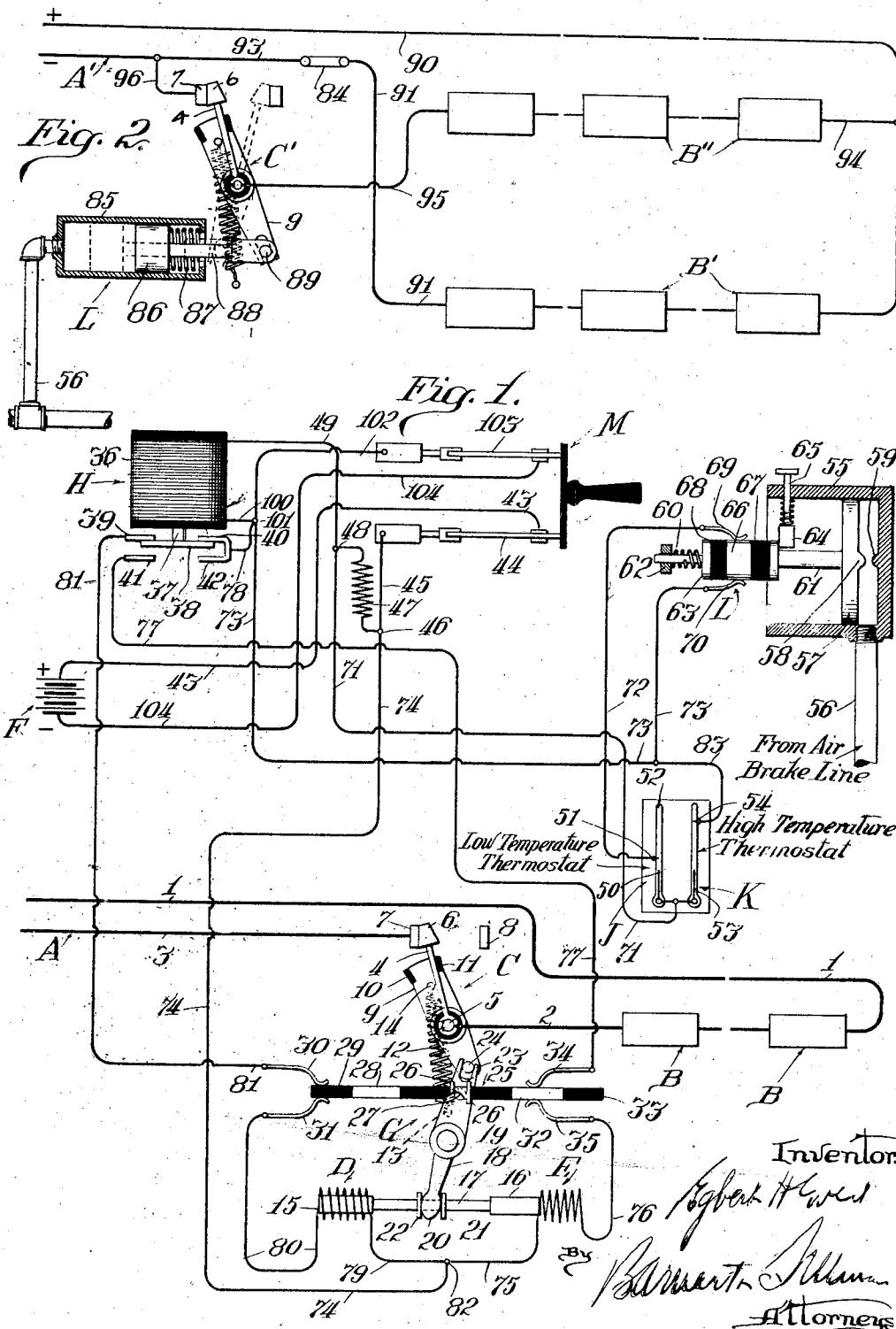
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E. H. GOLD

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CAR HEATING SYSTEM

Filed June 20, 1925



UNITED STATES PATENT OFFICE.

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CAR-HEATING SYSTEM.

Application filed June 20, 1925. Serial No. 38,464.

This invention relates to apparatus for heating railway cars by electricity. The invention provides automatic mechanism for maintaining the car atmosphere at one of two selected temperatures, for example, at a relatively high temperature during periods of occupancy, and at a lower temperature when the car is not in service, for example, when it is standing vacant in the train yard.

When not in use, and unoccupied, it is not essential that the car be heated to the same relatively high temperature that is desirable during occupancy, but the car must at such times be heated sufficiently to avoid the freezing of water pipes, injury to paint and other damage incident to a subnormal temperature. For example, while a temperature of 70° Fahrenheit may be desirable while the car is in service and occupied, a temperature of 50° Fahrenheit may be sufficient while the car is not in service. Since such cars are frequently out of service for a larger part of the time, a considerable saving of electric power is effected by cutting down the heat delivery at such times.

One of the objects of this invention is to provide an automatically operated mechanism for controlling the supply of electrical energy to the heating units so as to maintain the car temperature at either one of two determinate temperatures, according to whether the car is or is not in service.

More specifically it is the object of the invention to provide a regulating mechanism for this purpose which will be governed by the presence or absence of fluid pressure in some conduit or vessel on the car, for example, by the presence or absence of air pressure in some part of the brake system in which pressure is reduced to atmospheric pressure when the car is put out of service.

Another object is to provide an improved form of circuit breaker, for controlling the supply of electricity to the heating units, which is automatically operated in accordance with fluctuations in the car temperatures to maintain the car at approximately the desired temperature, preferably at one or other of the selected temperatures, above mentioned.

Other objects and advantages of the invention will be apparent from the following detailed description of one approved form of installation.

In the accompanying drawings:

Fig. 1 is a diagrammatic view illustrating the controlling system as a whole.

Fig. 2 is a similar view of a modified form of the apparatus.

The car to which this heating system is applied may be of the self-contained, and self-operating type, adapted to be used singly or as one unit of a train, or may be one of a series of cars adapted to be drawn by a locomotive. While the invention is particularly adapted for use with electrically operated cars, wherein the electrical energy for the heating units can be drawn from the same outside source which supplies current to the car moving motors, it could be used to heat cars propelled by other agency such as steam or internal combustion engines, in which case the electrical energy could be obtained from a generator carried by the car.

In any case, the car is usually provided with an air brake system, for operating which a supply of fluid under pressure is maintained while the car is in service. In some cases the cars are supplied with air signal lines. It is to be understood that the regulating device hereinafter described, can be operated from any of these systems, wherein the fluid pressure is normally present when the car is in service, and is cut off when the car is out of service.

Referring first to the form of the invention shown in Fig. 1: A indicates the main electric circuit for supplying energy to the heating units B. A main control switch or circuit breaker is shown at C for making or breaking the circuit to govern the supply of electrical energy to the heating units. An electric motor D is provided to move this switch C to closed position, and a similar motor E moves the switch to break the circuit. The control circuits for energizing the motors D and E include a battery or other source of electrical energy F, (or current might be taken from the heating cir-

cuit), a limit-switch G, a relay H, a low temperature thermostat J, a high temperature thermostat K, and a fluid pressure controlled regulating device L. M is a circuit breaker for disabling the control system when desired. Each of these devices will now be described more in detail.

The circuit A may derive its energy from a rail or trolley wire through the usual plow or trolley. The current will flow from the positive main through wire 1 to the heating units B, thence through wire 2 to the main switch or circuit breaker C, and through wire 3 to the negative main. It will be understood that the heating units B can be arranged in series or in parallel according to their construction and requirements. The main switch C, in the form here shown, comprises a contact arm 4, pivoted at its lower end 5 and having a contact member 6 at its upper end adapted to be oscillated between a fixed contact member 7 and a fixed abutment or stop 8. The wire 2 is connected with the lower end of contact arm 4 at its pivoted end 5, and wire 3 is connected with the fixed contact 7. When arm 4 is in the position shown in the drawings, current will flow through the contact arm 4 and circuit A will be completed. When arm 4 is swung over against the fixed abutment 8, the circuit will be broken, and the supply of electrical energy through the heating units B will be cut off. An oscillatable operating member or lever 9 is pivoted, preferably on the same axis 5 as arm 4, and carries at its upper end a pair of spaced stops 10 and 11 adapted to engage alternately with the opposite sides of arm 4, as the member 9 is swung to one side or the other of its upright position. A spring 12 is anchored at its lower end 13 to a fixed pin in the vertical plane of axis 5, and is connected at its upper end 14 to the upper arm of lever 9. As lever 9 is swung to one side or the other of a vertical position, the spring 12 will tend to draw it down at that side, and the stop 10 or 11, as the case may be, will engage with one side of contact arm 4 and snap the same quickly to its closed or open position, and hold it against the fixed members 7 or 8. The motors D and E are here shown as solenoids whose cores 15 and 16 are connected by a rod 17. An operating lever 18 is centrally pivoted at 19, its lower end 20 being engaged between a pair of collars 21 and 22 on the rod 17, and its upper end being forked at 23 and engaging a pin 24 on the lower end of lever 9. When motor E is energized, as hereinafter described, the lower end of lever 18 will be swung counterclockwise toward the right, thereby swinging the upper end of operating member 9 clockwise toward the right, and as this member passes over its mid-position, the

stop 10 will engage with contact arm 4 and break the circuit by swinging the contact 6 away from contact 7 and over against fixed abutment 8. This movement will be accelerated by the spring 12, which insures the completion of this movement of the contact arm, once it has been moved past vertical position, even though the motor D or E should cease to function. The operating circuit through motors D or E is broken after the operation of the motor is completed, by means of the limit-switch G. This limit-switch is here shown diagrammatically as a rod or plate 25, having a pair of centrally disposed collars 26 engaging a pin 27 on lever 18, whereby the member 25 will be reciprocate from one operating position to another as the lever 18 is oscillated to control the main switch. One end of member 25 has a contact element 28 and an insulating element 29 adapted to engage alternately between the pair of fixed spring contacts 30 and 31. The other end of member 25 is similarly provided with a contact element 32 and an insulating element 33, which are alternately positioned between a pair of fixed spring contacts 34 and 35.

The relay H comprises a solenoid coil 36 and a core 37 carrying at its lower end a contact plate 38 adapted, when the solenoid is energized, to be drawn up against and connect the fixed contact members 39 and 40. When the circuit through the solenoid 36 is deenergized, the plate 38 will drop down upon and connect the contacts 41 and 42. When the heating mechanism is operative, as shown in Fig. 1, a normally closed circuit is maintained through relay H as follows:

Circuit No. 1.—Positive pole on battery F, conductor 43, arm 44 of circuit breaker M, conductor 45, binding post 46, resistance 47, binding post 48, conductor 49, coil 36, conductor 100, binding post 101, conductor 102, arm 103 of circuit breaker M, and wire 104 to negative pole of battery F.

With this circuit completed, the relay H will be energized and the contact plate 38 held up against the contacts 39 and 40.

The thermostats J and K are of the mercurial type. The mercury column 50 in thermostat J is adapted to make contact with a contact point 51 in the tube 52 at a relatively low temperature, for example, 50° Fahrenheit. In a similar manner, the mercury column 53 of thermostat K is adapted to make contact with a fixed contact point 54 at a relatively high temperature, for example 70° Fahrenheit.

The regulating device L comprises a cylinder 55 closed at one end and open at the other, and connected by a pipe or conduit 56 with the air brakes, or signal system on the car, so that under normal operating conditions the conduit 56 will contain fluid under

pressure. The piston 57, operating within cylinder 55, has a stud 58 adapted to engage with a stud 59 in the closed end of the cylinder to limit the inward movement of the piston. A compression spring 60, surrounding the piston rod 61 between a fixed stop 62 and the enlarged head 63 on the piston rod, tends normally to force the piston assembly into the cylinder 55. This inward movement is normally limited by the stop 64 carried at the lower end of a spring-held locking rod 65. Head 63 carries a central annular contact ring 66 between a pair of annular insulating rings 67 and 68. A pair of fixed spring contacts 69 and 70 are adapted to bear interchangeably on the rings 66, 67 and 68, according to the position of adjustment of the piston assembly. When fluid under pressure is present in the conduit 56, piston 57 will be forced outwardly and the insulating ring 67 will separate the spring contacts 69 and 70. When fluid pressure is absent from the conduit 56, spring 60 will force the piston assembly inwardly to the position shown in Fig. 1 and contacts 69 and 70 will be connected by the annular contact member 66. These are the two normal operating positions of the regulating device L. Under certain conditions, as hereinafter specified, the locking member 65 can be withdrawn when pressure is absent from conduit 56, thus permitting the spring 60 to force the piston assembly to its extreme inner position with the studs 58 and 59 in contact with one another. At this time annular insulating ring 68 will be between the spring contacts 69 and 70, thus breaking the circuit that would otherwise exist at this time.

The position of the parts indicated in Fig. 1 is that which will exist when the car is out of service, and fluid pressure is absent from the conduit 56, and the car temperature is somewhat below the desired low temperature to be maintained, so that the heating units B are connected with the heating supply circuit A, and are supplying heat units to the car atmosphere. When the car temperature rises to the desired maximum, say 50° Fahrenheit, mercury column 50 of thermostat J will make contact with the fixed contact point 51. A circuit will now be established as follows:

Circuit No. 2.—Circuit No. 1 to binding post 48, conductor 71 to mercury column 50, contact point 51, wire 72 to spring contact 69, annular contact 66, spring contact 70, conductor 73 to binding post 101, and thence by circuit No. 1 to battery F.

It will be noted that this circuit is in shunt across points 48 and 101 with the coil 36 of solenoid H, so that this coil will be short circuited and insufficient current will flow therethrough to support the core 37 so that plate 38 will fall down and connect the

contacts 42 and 41. A circuit through operating motor E will now be completed as follows:

Circuit No. 3.—Circuit No. 1 to binding post 46, conductor 74 to binding post 82, conductor 75 to coil of motor E, conductor 76, spring contact 35, contact plate 32 of limit-switch G, spring contact 34, conductor 77 to the contact 41, plate 38, contact 42, and conductor 78 to binding post 101, and thence by circuit No. 1 to battery F. Motor E will now be energized and will operate as already described to throw over the main switch C and break the supply circuit to the heating units B. The movement of limit-switch G in unison with the switch C, will immediately shift the insulating member 33 between the spring contacts 34 and 35 and break the circuit through motor E.

As soon as the temperature in the car falls below 50° Fahrenheit, (or the temperature for which thermostat J is set), the circuit through this thermostat J (circuit No. 2), will be broken, and circuit No. 1 will again be active to energize the solenoid 36 of relay H and raise the contact plate 38 until it bridges the contacts 39 and 40. A circuit will now be established through motor D as follows:

Circuit No. 4.—Circuit No. 3 to binding post 82, conductor 79 to coil of motor D, conductor 80 to spring contact 31, contact member 28, spring contact 30, conductor 81, contact 39, plate 38, contact 40, and conductor 78 to binding post 101, and thence by circuit No. 1 to the battery F. Motor D now being active will shift the switch 4 back into circuit closing position, and current will again be supplied through circuit A to the heating units B. Limit-switch G will again be shifted back to the right to break circuit No. 4 by inserting the insulating member 29 between contacts 30 and 31. The parts are now again in the position illustrated in Fig. 1. This cycle of events will be repeated indefinitely, the supply of current being turned on and off alternately to maintain the heating units B at such a temperature as will maintain the car temperature at the point determined by the setting of thermostat J.

When the car is in service, fluid under pressure will be present in pipe 56, and piston 57 will be moved outwardly to bring the annular insulating member 67 between the spring contacts 69 and 70, and thus prevent the completion of circuit No. 2 through the low temperature thermostat J. Consequently this low temperature thermostat will be rendered inoperative for controlling the heating system, and the heating units B will continue to receive electrical energy, and give out heat until the car temperature has risen to such a point, for example, 70° Fahrenheit, that the mercury column 53 of

high temperature thermostat K makes contact with the fixed contact point 54. A circuit is now completed as follows:

Circuit No. 5.—Circuit No. 2 through conductor 71, mercury column 53, contact point 54, and conductor 83 to conductor 73 of circuit No. 2 and then back to battery F. It will be noted that circuit No. 5 for the high temperature thermostat K, is the same as circuit No. 2 for the low temperature thermostat J, with the exception that regulating device L is not included in circuit No. 5.

The completion or breaking of circuit No. 5, will, through relay H, cause the energization of circuits No. 3 or No. 4 for motors E or D, and the main switch C will be operated to cut off or supply electrical energy to the heating units B, so as to maintain the car atmosphere at the temperature for which high temperature thermostat K is set.

When the car is taken out of service, the fluid pressure in conduit 56 will either be cut off or will be lost, so that spring 60 will return the piston assembly to its inner position, as shown in Fig. 1, with contact ring 66 between the spring contacts 69 and 70. Circuit No. 2 will now remain closed even after the temperature has fallen below the high temperature for which thermostat K is set, and the relay H cannot again be energized until the temperature has fallen below the low temperature for which thermostat J is set, so that circuit No. 2 is broken between mercury column 50 and contact 51. The cycle of operation will now take place at the lower temperature, as first described.

It may be desirable under some conditions to bring the car temperature up to normal or to the temperature of occupancy before the car is put in service or before fluid pressure is present in conduit 56. In this event it is only necessary to withdrawn the spring-held plunger 65, carrying stop 64, and permit the spring 60 to push the piston assembly in until the studs 58 and 59 are in contact. Insulating ring 68 will now be placed between the spring contacts 69 and 70, and low temperature thermostat J is thrown out of operation exactly as if fluid pressure were present in the conduit 56. High temperature thermostat K is now in control of the system, the same as when the car is in service.

A simplified heating system embodying some of the principles of this invention is shown in Fig. 2. Here, the main heating circuit is designated A', and the heating units are divided into two separate groups B' and B''. The heating units B' are continuously in circuit, (although they can be thrown out if necessary by manually operated switch 84), and will be assumed under average conditions to be sufficient in heating capacity, to maintain the car at approximately the minimum temperature required when not in service, for example, 50° Fah-

renheit. The additional heating units B'' are designed to be sufficient to raise the heating capacity of the system so that the car temperature will be maintained at the normal temperature of occupancy, say 70° Fahrenheit. The main switch C' is adapted to cut the auxiliary heating units B'' in or out of the circuit, as the car is in or out of service and main switch C' is directly controlled by the regulating device L'.

The regulating device L' comprises a cylinder 85 in which is a movable piston 86 which is held to the right, in the position shown in Fig. 2, when fluid pressure is present in conduit 56. When fluid pressure is absent from the conduit, spring 87 moves piston 86 to the dotted line position at the left. Piston rod 88 is connected by pin and slot connection 89, with the lower end of the lever 9 of main switch C', which otherwise is the same as the switch C already described.

In operation, when the car is in service and fluid under pressure is present in conduit 56, the parts will be in the positions shown in Fig. 2 and heating current will flow from the source of supply through conductor 90, main heating units B', conductor 91, switch 84 and conductor 93, back to the source. At the same time, current will flow through a shunt circuit as follows: Conductor 90, conductor 94, auxiliary heating units B'', conductor 95, switch arm 4, contacts 6 and 7, conductor 96 and thence by conductor 93 back to the source of supply. When the car is taken out of service and fluid pressure ceases to exist in the conduit 56, spring 87 will force piston 86 to the left, and through main switch C' break the circuit through the auxiliary heating units B''. Main heating units B' will remain in service and will maintain the car at the necessary minimum temperature. If it should be desired to cut out the heating units entirely, switch 84 may be opened manually.

I claim:

1. The combination with a railway car, and an electrical heating apparatus thereon, of a controlling mechanism for the heating apparatus which is made effective automatically by disconnecting the car from a train and thus taking it out of service to maintain the car at a determinate temperature below the normal temperature of occupancy when the car is in service.
2. The combination with a railway car, an electrical heating system thereon, and a conduit on the car normally containing fluid under pressure, of a controlling mechanism for the heating apparatus which automatically maintains the car atmosphere at a determinate temperature below the normal temperature of occupancy in the absence of pressure in the conduit.
3. The combination with a railway car,

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an electrical heating system thereon, and a conduit on the car normally containing fluid under pressure, of a controlling mechanism for the heating apparatus which automatically maintains the car atmosphere at a determine temperature below the normal temperature of occupancy in the absence of pressure in the conduit, and at the normal temperature when the fluid in the conduit is under pressure.

4. The combination with a railway car, an electrical heating system thereon, and a conduit on the car normally containing fluid under pressure, of a controlling mechanism for the heating apparatus which automatically maintains the car atmosphere at a relatively low temperature in the absence of pressure in the conduit, and at a higher temperature when the fluid in the conduit is under pressure.

5. The combination with a railway car, and an electrical heating apparatus thereon, of a controlling mechanism for automatically maintaining the heating apparatus at either the desired normal temperature when the car is in service, or at a relatively low temperature when the car is out of service.

6. The combination with a railway car, and an electrical heating apparatus thereon, of a controlling mechanism for automatically maintaining the heating apparatus at either the desired normal temperature when the car is in service, or at a relatively low temperature when the car is out of service, and means whereby said controlling means may be manually set for the higher temperature in the absence of pressure in the conduit.

7. The combination with a railway car, and an electrical heating apparatus thereon, of a controlling mechanism for automatically maintaining the heating apparatus at either the desired normal temperature when the car is in service, or at a relatively low temperature when the car is out of service, and means whereby said controlling means may be manually set for the higher temperature when the car is out of service.

8. In combination with a railway car, an electrical heating apparatus thereon, and a conduit on the car containing fluid under pressure when the car is in service, means to control the heating system to produce either a high or low temperature in the car, and a regulating device actuated in accordance with the presence or absence of fluid pressure in the conduit for determining whether the high or low temperature operation takes place.

9. In combination with a railway car, an electrical heating apparatus thereon, and a conduit on the car containing fluid under pressure when the car is in service, means to control the heating system to produce either a high or low temperature in the car,

a regulating device actuated in accordance with the presence or absence of fluid pressure in the conduit for determining whether the high or low temperature operation takes place, and means for manually setting the regulating device to permit only high temperature operation irrespective of the fluid pressure in the conduit.

10. In an electrical car heating system, heating means, a supply circuit, circuit controlling means for determining the normal degree of heat furnished by the heating means, a conduit on the car normally containing fluid under pressure, and means for actuating the circuit controlling means in accordance with the presence or absence of fluid under pressure in the conduit.

11. In an electrical car heating system, heating means, a supply circuit, a conduit on the car normally containing fluid under pressure, and a regulating device for the supply circuit for decreasing the heat supplied by the heating means when the fluid pressure in the conduit is absent.

12. In an electrical car heating system, heating mechanism, a supply circuit for furnishing current to the heating mechanism, and a means for making and breaking the supply circuit comprising a pivoted contact arm, a pivoted operating member having spaced abutments at one end adapted to engage with the respective sides of the contact arm and swing it to or from closed or open position, motor means to swing the operating member from one position to the other, and a spring mounted to move the operating member to either extremity of its movement and hold it there after this member has been moved by the motor means past a mid-position.

13. In an electrical car heating system, heating mechanism, a supply circuit for furnishing current to the heating mechanism, and a means for making and breaking the supply circuit comprising a pivoted contact arm, an operating member pivoted to swing in unison with the contact arm and having a lost-motion connection with the contact arm whereby the operating arm is permitted a limited initial swinging movement independent of the contact arm, motor means for moving the operating member in either direction, and a spring mounted to move the operating member to either extremity of its movement and hold it there, after this member has been moved past a mid-position by the motor means.

14. In an electrical car heating system, heating means, a supply circuit for the heating means, a control switch for the supply circuit, electric motors for moving the switch to circuit making or breaking positions respectively, a pair of thermostats one of which energizes the motors alternately in accordance with changes in car temperature

to maintain a normal temperature of occupancy within the car, the other thermostat being adapted to similarly control the motors to maintain a determinate lower temperature, the last mentioned thermostat being inoperative when the car is in service, but assuming control of the system when the car is out of service.

15. In an electrical car heating system, heating means, a supply circuit for the heating means, a control switch for the supply circuit, electric motors for moving the switch to circuit making or breaking positions respectively, a pair of thermostats one of which energizes the motors alternately in accordance with changes in car temperature to maintain a normal temperature of occupancy within the car, the other thermostat being adapted to similarly control the motors to maintain a determinate lower temperature, a conduit on the car normally containing fluid under pressure, and a regulating device actuated in accordance with the presence or absence of fluid under pressure in the conduit for determining which of the thermostats shall control the heating system.

16. In combination with a railway car, an electrical heating system thereon, comprising heating units, a supply circuit for the heating units, a main control switch in the supply circuit, motor means for moving the switch to closed position, motor means for moving the switch to open position, control circuits for the motors, a pair of thermostats functioning at different temperatures to make and break the control circuits, and an automatic regulating device for determining which of the thermostats shall control the heating system according to whether the car is or is not in service.

17. In combination with a railway car, an electrical heating system thereon, comprising heating units, a supply circuit for the heating units, a main control switch in the supply circuit, motor means for moving the switch to closed position, motor means for moving the switch to open position, control circuits for the motors, a thermostat functioning to make and break the control circuits so as to maintain the heating system at a certain determinate temperature, a second thermostat functioning when the first thermostat is inoperative to maintain the heating system at a determinate higher temperature, and a regulating device to automatically make the first mentioned thermostat inoperative when the car is in service.

18. In combination with a railway car, an electrical heating system thereon, comprising heating units, a supply circuit for the heating units, a main control switch in the supply circuit, motor means for moving the switch to closed position, motor means for moving the switch to open position, control

circuits for the motors, a thermostat functioning to make and break the control circuits so as to successively energize the motors and maintain the heating system at a certain determinate temperature, a circuit breaker moving in unison with the main control switch to break the circuit to the motor last operated after the switch movement is completed, a second thermostat functioning when the first thermostat is inoperative to similarly control the motors and maintain the heating system at a determinate higher temperature, and a regulating device to automatically make the first mentioned thermostat inoperative when the car is in service.

19. In combination with a railway car, an electrical heating system thereon, comprising heating units, a supply circuit for the heating units, a main control switch in the supply circuit, motor means for moving the switch to circuit closing position, motor means for moving the switch to open position, control circuits for the motors, a pair of thermostats functioning at different temperatures to make and break the control circuits, a conduit on the car normally containing fluid under pressure, and a regulating device governed by the presence or absence of fluid pressure in the conduit for determining which of the thermostats shall control the heating system.

20. In combination with a railway car, an electrical heating system thereon, comprising heating units, a supply circuit for the heating units, a main control switch in the supply circuit, motor means for moving the switch to circuit closing position, motor means for moving the switch to open position, control circuits for the motors, a thermostat functioning to make and break the control circuits so as to maintain the heating system at a certain determinate temperature, a second thermostat functioning when the first thermostat is inoperative to maintain the heating system at a determinate higher temperature, a conduit on the car normally containing fluid under pressure, and a regulating device governed by the presence or absence of fluid pressure in the conduit for rendering the first mentioned thermostat inoperative or operative.

21. In combination with a railway car, an electrical heating system thereon, comprising heating units, a supply circuit for the heating units, a main control switch in the supply circuit, motor means for moving the switch to circuit closing position, motor means for moving the switch to open position, control circuits for the motors, a thermostat functioning to make and break the control circuits so as to successively and alternately energize the motors and maintain the heating system at a certain determinate temperature, a circuit breaker moving in

unison with the main control switch to break the circuit to the motor last operated after the switch movement is completed, a second thermostat functioning when the first thermostat is inoperative to similarly control the motors and maintain the heating system at a determinate higher temperature. a conduit on the car normally containing fluid under pressure, and a device actuated when fluid pressure is absent from the conduit for rendering the first mentioned thermostat operative, and when fluid under pressure is present in the conduit rendering the first mentioned thermostat inoperative.

22. In combination with a railway car, an electrical heating system thereon, comprising heating units, a supply circuit for the heating units, a main control switch in the supply circuit, motor means for moving the switch to circuit closing position, motor means for moving the switch to open position, control circuits for the motors, a thermostat functioning to make and break the control circuits so as to successively and alternately energize the motors and maintain the heating system at a certain determinate temperature, a circuit breaker moving in unison with the main control switch to break the circuit to the motor last operated after the switch movement is completed, a second thermostat functioning when the first thermostat is inoperative to similarly control the motors and maintain the heating system at a determinate higher temperature, a conduit on the car normally containing fluid under pressure, a device actuated when fluid pressure is absent from the conduit for rendering the first mentioned thermostat operative, and when fluid under pressure is present in the conduit rendering the first mentioned thermostat inoperative, and a manually controlled device for making the first thermostat inoperative even when the conduit is not under fluid pressure.

23. The combination with a railway car, of an electrical heating system thereon comprising heating units, a supply circuit for the heating units, a main control switch in the supply circuit, motor means for moving the switch to circuit closing position, motor means for moving the switch to break the supply circuit, control circuits for the motors, a relay, a normally closed circuit for energizing the relay, and a thermostat functioning at a determinate temperature to complete a circuit which deenergizes the relay, the opposite movements of the relay making and breaking the respective control circuits for the motors.

24. The combination with a railway car, of an electrical heating system thereon comprising heating units, a supply circuit for the heating units, a main control switch in the supply circuit, motor means for moving the switch to circuit closing position, motor

means for moving the switch to break the supply circuit, control circuits for the motors, a relay, a normally closed circuit for energizing the relay, a thermostat functioning at a determinate temperature to complete a circuit which deenergizes the relay, the opposite movements of the relay making and breaking the respective control circuits for the motors, a second thermostat functioning when the first thermostat is inoperative, and at a determinate higher temperature, to complete the circuit which deenergizes the relay, and a regulating device operating when the car is in service to render the first mentioned thermostat inoperative.

25. The combination with a railway car of an electrical heating system thereon comprising heating units, a supply circuit for the heating units, a main control switch in the supply circuit, motor means for moving the switch to circuit closing position, motor means for moving the switch to break the supply circuit, control circuits for the motors, a relay, a normally closed circuit for energizing the relay, a thermostat functioning at a determinate temperature to complete a circuit which deenergizes the relay, the opposite movements of the relay making and breaking the respective control circuits for the motors, a second thermostat functioning when the first thermostat is inoperative, and at a determinate higher temperature, to complete the circuit which deenergizes the relay, a conduit on the car containing fluid under pressure only when the car is in service, and a regulating device for rendering the first mentioned thermostat inoperative when fluid pressure is present in the conduit.

26. In combination with means providing a space intermittently under fluid pressure, electric heating apparatus and a circuit breaker for controlling current supply to said apparatus, high and low temperature thermostats for operating said circuit breaker and means for putting one or other of said thermostats in control of the circuit breaker dependant on presence or absence of fluid pressure in said space.

27. In combination with means providing a space intermittently under fluid pressure, electric heating apparatus and a circuit breaker for controlling current supply to said apparatus, a thermostat to operate said switch to maintain a relatively high temperature in the car, a thermostat to operate the circuit breaker to maintain a lower temperature in the car, and means actuated through presence or absence of fluid pressure in said space for determining which of said thermostats shall control said circuit breaker.

28. In combination with means for providing a space intermittently under fluid pressure, electric heating apparatus and a

circuit breaker for controlling current supply to said apparatus, a thermostat to operate said switch to maintain a relatively high temperature in the car, a thermostat to operate the circuit breaker to maintain a low temperature in the car, and means actuated through presence or absence of fluid pressure in said space for determining which of said thermostats shall control said circuit breaker, and manually operated means whereby on the absence of pressure in said space the high temperature thermostat may be put into control of said circuit breaker.

EGBERT H. GOLD.

Certificate of Correction.

Patent No. 1,639,338.

Granted August 16, 1927, to

EGBERT H. GOLD.

It is hereby certified that error appears in the printed specification of the above-numbered patent requiring correction as follows: Page 2, lines 81 and 82, for the word "reciprocate" read *reciprocated*; page 8, line 7, claim 28, for the word "or" read *of*; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 11th day of October, A. D. 1927.

[SEAL.]

M. J. MOORE,
Acting Commissioner of Patents.

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