

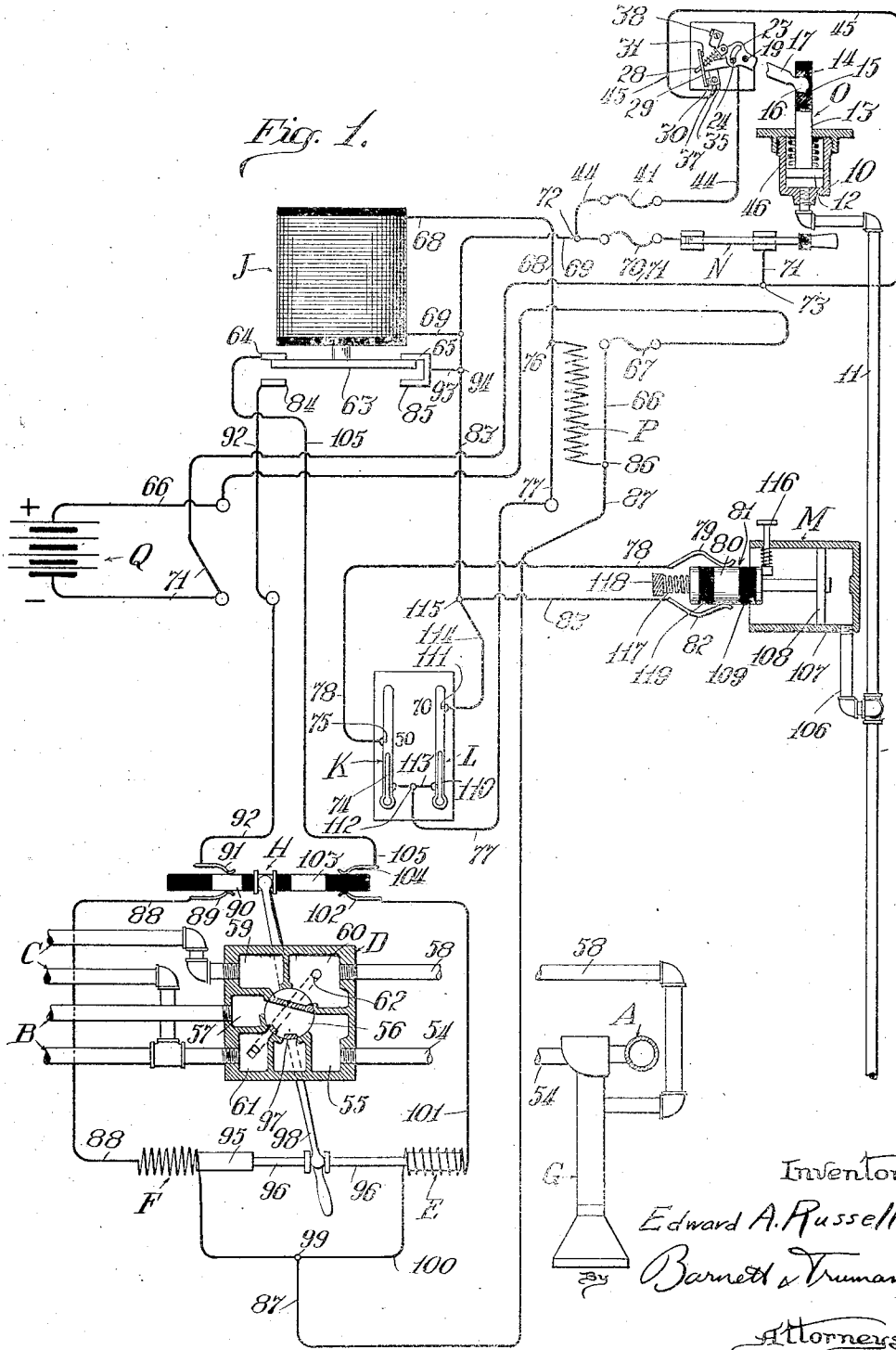
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AUTOMATIC REGULATING APPARATUS FOR CAR HEATING SYSTEMS

Original Filed July 6, 1925 2 Sheets-Sheet 1



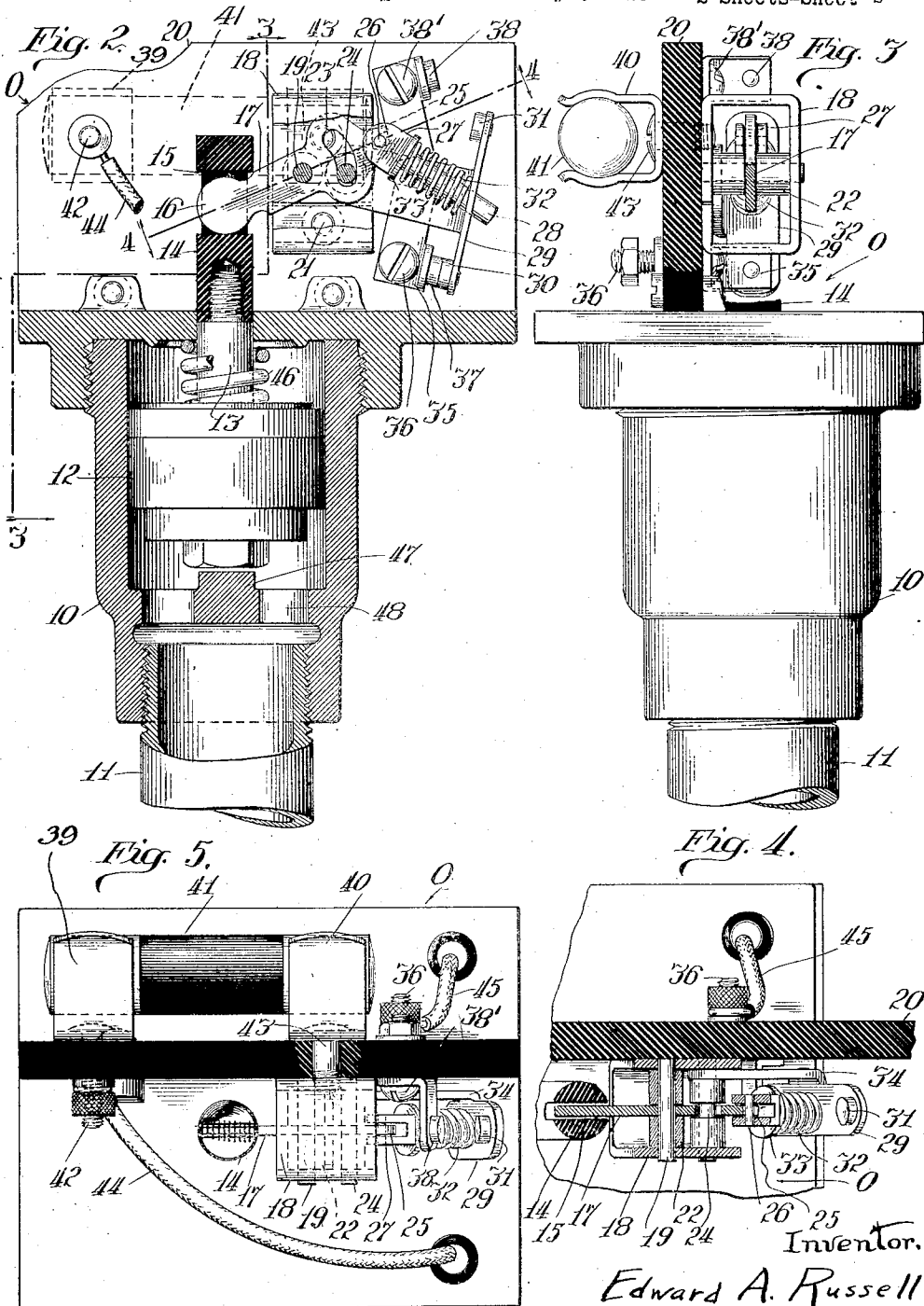
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UNITED STATES PATENT OFFICE.

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AUTOMATIC REGULATING APPARATUS FOR CAR-HEATING SYSTEMS.

Application filed July 6, 1925, Serial No. 41,779. Renewed July 17, 1926.

My invention relates to a car heating system provided with two controls, one becoming effective automatically when the car is put into service to maintain a relatively high temperature, 70° Fahrenheit, for example, and the other made effective when the car is cut off from the locomotive and supplied with heating medium from a yard or terminal steam line for maintaining the car atmosphere at a lower temperature, 50° Fahrenheit, for example. A car heating system operating in this manner is shown, for example, in United States patent to Edward A. Russell No. 1,440,701, January 2, 1923, the apparatus disclosed comprising two control thermostats functioning at respectively high and low temperatures which are put into control of the system in response to the appearance and disappearance of air pressure in one of the air train pipes of the car. When the car is operatively connected up with the locomotive the air train line is under pressure and through operation of a selecting device the controlling mechanism maintains the car atmosphere at the higher temperature. When the car is cut off from the locomotive and sent to the train yard the pressure in the air train line disappears and the selecting device throws the control over upon the low temperature thermostat so that the car temperature is maintained at a lower point. Fuel economy is the motive for this dual control.

The temperature regulating system referred to is ordinarily provided with a circuit breaker or master switch by opening which the controlling mechanism may be disabled to permit the manual operation of the radiator valves. Such capacity for manual control is desirable in view of the possible failure of the automatic controlling apparatus to function properly under certain extreme and unusual conditions. But the provision of the apparatus with the master switch operable at will by the train crew has the disadvantage that the car may be sent to the yard with the controlling mechanism disabled so that when the car is connected up with the yard steam line it may be overheated or deprived of heat entirely according to the positions in which the radiator valves have been left by the train crew.

My invention provides a remedy for such mishandling of the system by furnishing the apparatus with means, whereby when the car is cut off from the locomotive, the heating system is automatically placed under the low temperature control regardless of whether the master switch governing the controlling mechanism during periods of service is open or closed.

It is sometimes desirable to put the system under the high temperature control when the car is not connected with the locomotive, for example, when the cars of the train are brought to the starting terminal station. Heretofore this has been accomplished by manipulation of the air actuated selector switch, but only if the master switch of the electrical apparatus was closed. The arrangement of my present invention makes it possible to put the high temperature thermostat into control, when the air train line is not under pressure, even if the master switch has been left open, that is, by merely tripping the selector switch.

The invention is disclosed in a preferred embodiment in the accompanying drawings wherein—

Fig. 1 is a diagram illustrating the controlling mechanism as applied to a steam heating system for railway cars.

Fig. 2 is a sectional view of the automatic electric switch, air actuated, for making the low temperature automatic control effective regardless of the position of the master switch.

Fig. 3 is a sectional view on line 3—3 of Fig. 2.

Fig. 4 is a sectional view on line 4—4 of Fig. 2, and

Fig. 5 is a plan view of the automatic switch.

Referring first to Fig. 1, A designates the steam train line of the car; B, C the radiating coils of the heating system; D the radiator valve which is opened and closed by solenoids E and F; G the vapor regulator (the system shown being a system of the atmospheric type); H a limit switch for cutting off the current to solenoids E or F at the end of the valve movement; J a relay for directing the flow of current either to solenoid E or solenoid F; K the low tem-

perature thermostat, that is, the thermostat which is in control when the car is disconnected from the locomotive; L the high temperature thermostat; M the selecting device
 5 subject to pressure changes in one of the air train lines of the car for determining whether the system shall be under the high temperature or low temperature control; N
 10 a master switch for making the controlling mechanism effective or ineffective while the car is in service, and O a switch subject to pressures in the air train line arranged in shunt with switch N and functioning so that
 15 it will be subject to the automatic control regardless of the position of master switch N. P indicates a resistance to cut down the current flow through relay J and thermostats K and L. The supply of electric current is
 20 indicated at Q.

The switch O is preferably constructed as follows: 10 is a cylinder connected by pipe 11 to one of the air train pipes of the car, for example, to the signal train pipe although
 25 it might be connected to the brake line. In cylinder 10 is a piston 12, the stem 13 of which is provided with a stud 14 of insulating material slotted at 15 for the rounded end 16 of a lever 17 which is pivoted to a
 30 frame 18 by pin 19. The frame 18 is composed of a sheet metal strip secured to an insulating plate 20 by screw 21. Spacing sleeves 22 are arranged on pin 19 on opposite sides of lever 17. The latter is formed with
 35 an arcuate slot 23 through which projects a pin 24, the ends of which are secured in opposite sides of frame 18. The extremity of the lever 17 beyond slot 23 is in the form of a fork 25 which engages a stud 26 arranged in a clevis 27 on the end of a rod 28
 40 which extends through an opening in a bridging member 29 provided at opposite ends with contacts 30, 31, a coiled spring 32 being interposed between a collar 33 on rod 28 and the bridging member 29. The bridging member is formed with an arm 34 pivoted on pin 24. 35 is a contact plate secured to insulating plate 20 by binding post 36
 45 having a contact 37 engageable by contact 30 on the bridging member. 38 is a similar contact plate secured to plate 20 by screw 38', but with no electrical function. It acts merely as a stop for the other end of the bridging member. When the piston 12 is
 50 raised lever 17 is rocked and with it rod 28. The contacts 30, 37 are not disturbed until the parts pass center. Then the bridging member is moved by snap action away from contact 37 and against the stop member 38.
 60 On the opposite side of the insulating plate 20 are a pair of clips 39, 40 for a fuse 41, clip 39 being secured to plate 20 by binding post 42 and clip 40 by a screw 43 making an electrical connection between the fuse
 65 and frame 18.

Current enters the mechanism by wire 44. Wire 45 is connected with a binding post 36 of contact plate 35.

The piston 12 in air cylinder 10 is held in its lower position, when there is no pressure in the air train line, by a coiled spring 46 and rests on a stud 47 projecting upwardly from a cross web 48 in the bottom of the cylinder.

The other wiring of the apparatus, together with certain structural details not already mentioned, will be described in connection with the description of the operation of the controlling mechanism which is as follows:

The parts are in the positions shown in Fig. 1 when the car is cut off from the locomotive and is being supplied with steam from a yard or terminal steam line. The temperature of the car is supposed to be below that
 85 at which the low temperature thermostat K functions, that is, below 50° Fahrenheit, so that radiator valve D is open and the heating coils receiving steam. Steam passes from train line A through the vapor regulator G, thence through pipe 54 to chamber 55 of valve D, through the central space 56 of the valve, valve chamber 57 and then through the radiating coils B and C. Water of condensation (and steam when the coils
 90 are filled with steam) passes by way of pipe 58 to the thermostat chamber of the vapor regulator through valve chambers 59 and 60, in case of the discharge from coil C, and through valve chamber 61, port 62 and valve chamber 60, in case of the discharge from coil B.

The steam heating apparatus shown is a vapor or atmospheric heating system. When the radiator is filled with steam the excess
 105 passing through pipe 58 to the thermostat chamber throttles inflow of steam to the coils.

So long as the conditions as above set forth prevail, the relay J will be energized so that its bridging member 63 is held against the upper pair of contacts 64, 65, the circuit
 110 through the relay being as follows:

Circuit No. 1.—Battery Q, wire 66 (in which is arranged fuse 67) resistance P, wire 68, coil of relay J, wire 69, fuse 70, master
 115 switch N, wire 71 to the battery.

If, however, the master switch N has been open during the period in which the car was in service, to disable the automatic controlling mechanism and permit the manual operation of radiator valve D, and, through inattention, has been left open, as may well happen, when the car was cut off from the train and sent to the yard, the circuit as
 120 above described will be completed as follows:

Circuit No. 1^a.—Circuit 1 to binding post 72 on wire 69; wire 44 including fuse 41, electrical connection 40, 43, 18 (represented for simplification as a wire in Fig. 1), lever 17, rod 28 and contact 30 on bridging member
 125 130

29 of the switch O, fixed contact 37, 35, 36 and wire 45 to binding post 73 on the wire 71, thence to the battery.

The switch O will necessarily be closed since, the car being cut off from the locomotive, there will be no pressure in the air train line with which pipe 11 is connected.

As soon as the mercury column 74 of the low temperature thermostat K reaches contact 75 (temperature of 50°) a circuit will be closed through the low temperature thermostat which circuit is a shunt from circuit No. 1, and, when closed, deprives relay J of current sufficiently to deenergize the same. The circuit through the low temperature thermostat is as follows:

Circuit No. 2.—Circuit No. 1 to binding post 76 at the upper end of resistance P, wire 77, mercury column 74, contact 75, wire 78, spring contact 79, of the selector switch M, conducting block 80 of the movable switch member 81 of the selector switch, spring contact 82, wire 83, thence to the battery either through the master switch N or the switch O as described in circuits No. 1 and No. 1^a.

The relay J, deprived of current, drops the bridging member 63 on contacts 84, 85 closing a circuit through the coil of solenoid F as follows:

Circuit No. 3.—Circuit No. 1 to binding post 86 on wire 66, wire 87, solenoid F, wire 88, spring contact 89, conducting block 90 of limit switch H, spring contact 91, wire 92, contact 84, bridging member 63, contact 85, wire 93 to binding post 94 on wire 69, and thence to the battery either through master switch N or switch O.

Solenoid F attracts its armature 95 moving rod 96 to the left and turning the revolvable member 97, connected with rod 96 by lever 98, to a position which shuts off steam from the radiator and allows the coils to drain.

As soon as the temperature in the car falls below 50° Fahrenheit, the thermostat circuit—circuit No. 2—is broken, relay J is energized by current flowing over circuit No. 1, and the bridging member 63 is raised against the upper pair of contacts 64, 65 closing a circuit through coil E as follows:

Circuit No. 4.—Circuit No. 3 to binding post 99 on wire 87, wire 100, solenoid E, wire 101, spring contact 102, conducting block 103 of the limit switch (which is now in its right hand position so that contact 102 bears on block 103) spring contact 104, wire 105, relay contact 64, bridging member 63, contact 65 and thence through the master switch N or through the switch O to the battery.

The radiator valve is now shifted back to its open position. As each movement of the valve has been completed the limit switch is operated to break the circuit to the then

energized solenoid, F or E, as the case may be. When the car is put into service air from the air train pipe passes by pipe 106 to the cylinder 107 of the selector switch and moves piston 108 to the left so as to bring the insulating block 109 of movable switch member 81 between the spring contacts 79 and 82. This opens the low temperature thermostat circuit (circuit No. 2) so that this thermostat will not function at the 50° temperature, the control of the heating system being thereby thrown upon the high temperature thermostat L. In other words, the relay J will be deenergized and energized to bring about reverse movements of the radiator valve at a car temperature of 70° (assuming the high temperature thermostat is set to function at this temperature) instead of at a car temperature of 50° for which the low temperature thermostat is assumed to be set.

With the car temperature below 70° the parts of the apparatus will remain as shown in Fig. 1. As soon as the mercury column 110 of high temperature thermostat L reaches the contact point 111 of this thermostat, a circuit will be closed through the high temperature thermostat as follows:

Circuit No. 5.—Circuit No. 2 to binding post 112 on wire 77, wire 113, mercury column 110, contact 111, and wire 114 to binding post 115 on wire 83, thence to the battery through the master switch N provided the same is closed.

When the train is connected up with the locomotive and pressure is created in the air train line, with which pipe 11 is connected, piston 12 of the automatic switch O is raised and lever 17 is rocked so as to throw the bridging member 30 away from contact 37 against the dead contact or stop 38. This breaks the shunt circuit around the master switch N so that the heating system may be either subjected to the automatic control, by closing master switch N, or may be subject to hand control, through manipulation of radiator valve D, if the master switch N is open.

The operation of the apparatus under the high temperature control is the same, and the controlling circuit is the same as described in connection with the low temperature control except in the respects already noted.

Selector switch M is capable of manual operation with no pressure in the air line (at a terminal station for example, before the locomotive has been attached to the cars) regardless of whether the master switch N is open or closed. If the switch had been left open by the train crew when the car was put out of service it may remain open while the car was in the yard and when the car was brought to the terminal. The man at the terminal after con-

necting the steam train pipe of the rear car to the terminal steam supply line merely trips the selector switch, as will be described, for the purpose of throwing the control on the high temperature thermostat. He is likely to pay no attention to the position of master switch N. With the apparatus as herein disclosed, high temperature control is obtained in this way even if the master switch be open.

The movable member 81 of selector switch M is normally stopped in the low temperature control position by a trip 116, which can be pulled out to allow spring 117 on fixed abutment 118 to force the movable member 81 toward the inner end of cylinder 107, whereby insulation 119 is interposed between springs 79, 82, the trip riding over the top of member 81 ready to drop behind said member when piston 108 is moved outwardly by air pressure. The electrical connections are the same whether the circuit is broken by insulation 109 or 119. That is, the low temperature thermostat is cut out and the high temperature thermostat put in control. Now since with the car cut off from the locomotive switch O is closed, the system will operate under the high temperature control (assuming that the selector switch has been tripped as described) even if the master switch N is open because circuit No. 1^a under these conditions is a closed circuit.

As soon as the car is connected to the locomotive member 81 of the selector switch is moved outwardly under air pressure so that insulation 109 is between spring contacts 79, 82. The system remains under high temperature control but the apparatus is ready now to be thrown to the low temperature control as soon as the car is cut off from the locomotive and the pressure in the air train line reduced to atmospheric pressure.

While the invention has been described in a preferred embodiment and as forming an improvement upon a specific type of control apparatus, to wit, that shown in the patent to Russell referred to, it will be understood that all modifications, adaptations and uses of the device are intended to be covered within the scope of the appended claims.

I claim:

1. In combination with electrically operated mechanism for automatically maintaining the car at a lower temperature when out of service than when in service, a circuit breaker whereby said controlling mechanism may be rendered operative or inoperative at will while the car is in service without affecting the automatic operation of said mechanism when the car is put out of service.

2. In combination with electrically operated mechanism for automatically maintaining the car at a lower temperature when

out of service than when in service, a circuit breaker for putting said controlling mechanism out of operation, and a switch shunted around said circuit breaker which is open when the car is in service and closed when the car is put out of service.

3. In combination with a heating apparatus, mechanism for controlling said apparatus to maintain a higher or lower temperature in the space heated, an automatically operated selective device which determines whether the apparatus shall be subject to the high or low temperature control, and means whereby the controlling mechanism may be made ineffective when the selective device is in the high temperature control position without affecting its operativeness when the selective device is in the low temperature control position.

4. In combination with a heating apparatus, mechanism for controlling said apparatus to maintain a higher or lower temperature in the space heated, a selective device which determines whether the apparatus shall be subject to the high or low temperature control, and means whereby the controlling mechanism may be made ineffective when the selective device is in the high temperature control position without affecting its operativeness when the selective device is in the low temperature control position.

5. In combination with a heating apparatus, mechanism for controlling said apparatus to maintain an automatically operated higher or lower temperature in the space heated, a selective device which determines whether the apparatus shall be subject to the high or low temperature control, and means whereby said controlling mechanism may be made inoperative when the selective device is in one position without affecting the operativeness of said mechanism when the selective device is in its other position.

6. In combination with a heating apparatus, mechanism for controlling said apparatus to maintain a higher or lower temperature in the space heated, a fluid pressure actuated selective device which determines whether the apparatus shall be subject to the high or low temperature control, and means whereby the controlling mechanism may be made ineffective when the selective device is in the high temperature control position without affecting its operativeness when the selective device is in the low temperature control position.

7. In combination with a heating apparatus, mechanism for controlling said apparatus to maintain a high or lower temperature in the space heated, a fluid pressure actuated selective device which determines whether the apparatus shall be subject to the high or low temperature control, and

means whereby said controlling mechanism may be made inoperative when the selective device is in one position without affecting the operativeness of said mechanism when the selective device is in its other position.

8. In combination with a heating apparatus, an electrically operated mechanism for controlling said apparatus to maintain a higher or lower temperature in the space heated, an automatically operating selective device which determines whether the apparatus shall be subject to the high or low temperature control, a circuit breaker to disable said controlling mechanism when the selective device is in one position, and a switch shunted around said circuit breaker which is opened when the selective device is moved to the aforesaid position and closed when moved to its other position.

9. In combination with a heating system, an electrically operated mechanism for controlling said apparatus to maintain a higher or lower temperature in the space heated, an automatically operated selective device which determines whether the apparatus shall be subject to the high or low temperature control, a circuit breaker to disable said controlling mechanism when the selective device is in the high temperature control position, and a switch shunted around said circuit breaker which is opened when said selective device is moved to the aforesaid position and closed when said selective device is moved to the low temperature control position.

10. In combination with a heating apparatus, an electrically operated mechanism for controlling said apparatus to maintain a higher or lower temperature in the space heated, a fluid pressure actuated selective device moved to one position to subject the apparatus to the high temperature control and to another position to subject it to low temperature control, a circuit breaker to disable said controlling mechanism when the selective device is in one position, and a switch shunted around said circuit breaker which is opened when the selective device is moved to the aforesaid position and closed when moved to its other position.

11. In combination with a heating system, an electrically operated mechanism for controlling said apparatus to maintain a higher or lower temperature in the space heated, a fluid pressure actuated selective device moved to one position to subject the apparatus to the high temperature control and to another position to subject it to low temperature control, a circuit breaker to disable said controlling mechanism when the selective device is in the high temperature control position, and a switch shunted around said circuit breaker which is opened when said selective device is moved to the aforesaid position and closed when said selective device is moved to the low temperature control position.

12. In combination with a railway car, an air train line, a heating apparatus, electrically operated mechanism for controlling the heating apparatus to produce either a high or a low temperature in the car, a selective device actuated by pressure changes in the air train line for determining whether the heating apparatus shall be operated under the high or low temperature control, a circuit breaker to disable the controlling mechanism, a switch shunted around said circuit breaker, and an air motor actuated by changes of pressure in said air line for opening and closing said switch.

13. In combination with a railway car, an air train line, a heating apparatus, electrically operated mechanism for controlling the heating apparatus to produce either a high or low temperature in the car, a selective device actuated with pressure in the air train line to bring about the high temperature control and on disappearance of pressure from the air line the low temperature control, a circuit breaker to disable said controlling mechanism, a switch shunted around said circuit breaker, and means actuated with air pressure in the train line for opening said switch and on disappearance of pressure in said pipe for closing said switch.

14. In combination with a railway car, a steam heating apparatus comprising a radiator valve, electrically operated controlling mechanism for said valve comprising high and low temperature thermostats, a selective device for determining which of said thermostats shall control said mechanism, a circuit breaker to govern the supply of current to the controlling mechanism, a switch shunted around said circuit breaker, an air train line, and means actuated by pressure changes in said air train line for operating said selective device and opening and closing said switch.

15. In combination with a railway car, a steam heating apparatus comprising a radiator valve, electrically operated controlling mechanism for said valve comprising high and low temperature thermostats, a selective device for determining which of said thermostats shall control said mechanism, a circuit breaker to govern the supply of current to the controlling mechanism, a switch shunted around said circuit breaker, an air train line, and means actuated by pressure changes in said air train line for operating said selective device and opening and closing said switch so that the opening of the circuit breaker disables the controlling mechanism at the high temperature control, without affecting the operation of the controlling mechanism during the low temperature control.

16. An electrical switch mechanism comprising a fluid pressure cylinder, a piston therein having a stem, a lever oscillated by

said stem, formed with an arcuate slot and a fork, a pin extending through said arcuate slot, a rocking member pivoted to said pin and having a bridging piece provided with a contact, a fixed contact engageable by said last named contact, a rod engaged by the fork of said lever and loosely engaged with the bridging piece and formed with a spring abutment, and a coiled spring between said abutment and bridging piece.

17. In a car heating apparatus, mechanism automatically actuated when the car is connected with and disconnected from a locomotive for controlling the heating apparatus to maintain the car at determinate high and low temperatures, respectively, which mechanism can be set when the car is disconnected from the locomotive for high temperature control, and means for making said controlling mechanism ineffective when the car is connected with the locomotive without affecting its operation either for the high or low temperature control when the car is disconnected from the locomotive.

18. In a car heating apparatus, mechanism automatically actuated when the car is connected with and disconnected from a locomotive for controlling the heating apparatus to maintain the car atmosphere at a determinate high temperature when the car is connected to the locomotive and at said high temperature or at a determinate low temperature at will when the car is disconnected from the locomotive, and means for making said controlling mechanism ineffective when the car is connected with the locomotive without affecting its operation when the car is disconnected from the locomotive.

19. In combination with mechanism for controlling a car heating system to maintain the car at a determinate low temperature when out of service and at a determinate high temperature when in service, which mechanism may be set to maintain the car at the high temperature when out of service, and means whereby said controlling mechanism may be rendered operative or inoperative at will while the car is in service without affecting its automatic operation for either the high or low temperature control when the car is put out of service.

20. In combination with electrically operated mechanism for automatically maintaining the car at a determinate low temperature when out of service and at a determinate high temperature when in service, which mechanism may be set to maintain the high temperature when the car is out of service, and a circuit breaker whereby said controlling mechanism may be rendered operative or inoperative at will while the car is in service without affecting the automatic operation of said mechanism for either the high or low temperature control when the car is put out of service.

21. In combination with electrically operated mechanism for automatically maintaining the car at a lower temperature when out of service than when in service, which mechanism may be set for maintaining the higher temperature when the car is out of service, a circuit breaker for putting said controlling mechanism out of operation, and a switch shunted around said circuit breaker which is open when the car is in service and closed when the car is put out of service.

22. In combination with a heating apparatus, mechanism for controlling said apparatus to maintain determinate high or low temperatures in the space heated, an automatically operated selective device which determines whether the apparatus shall be subject to the high or low temperature control which device when in the low temperature control position may be set manually to a third position to bring about the high temperature control, and means whereby the controlling mechanism may be made ineffective when the selective device has been moved automatically to the high temperature control position without affecting its operativeness when the selective device is in the low temperature control position or in said third position.

23. In combination with a heating apparatus, mechanism for controlling said apparatus to maintain determinate high or low temperatures in the space heated, a fluid pressure actuated selective device which determines whether the apparatus shall be subject to the high or low temperature control which device may be set manually from the low temperature control position to a third position bringing about high temperature control, and means whereby the controlling mechanism may be made ineffective when the selective device has been moved automatically to its high temperature control position without affecting its operativeness when the selective device is in the low temperature control position or said third position.

24. In combination with a railway car, an air train line, a heating apparatus, electrically operated mechanism for controlling the heating apparatus to produce either a high or a low temperature in the car, a selective device actuated by pressure changes in said air train line for determining whether the heating apparatus shall be operated under the high or low temperature control which device may be manually set from the low temperature control position to a third position subjecting the apparatus to high temperature control, a circuit breaker to disable the controlling mechanism, a switch shunted around said circuit breaker, and an air motor actuated by changes of pressure in said air line for opening and closing said switch.

25. In combination with a railway car, a steam heating apparatus comprising a radiator valve, electrically operated controlling mechanism for said valve comprising
5 high and low temperature thermostats, a selective device for determining which of said thermostats shall control said mechanism which device may be set from its low temperature control position to a third position subjecting the apparatus to high temperature control, a switch shunted around
10 said circuit breaker, an air train line, and means actuated by pressure changes in said air train line for operating said selective device and opening and closing said switch.

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