

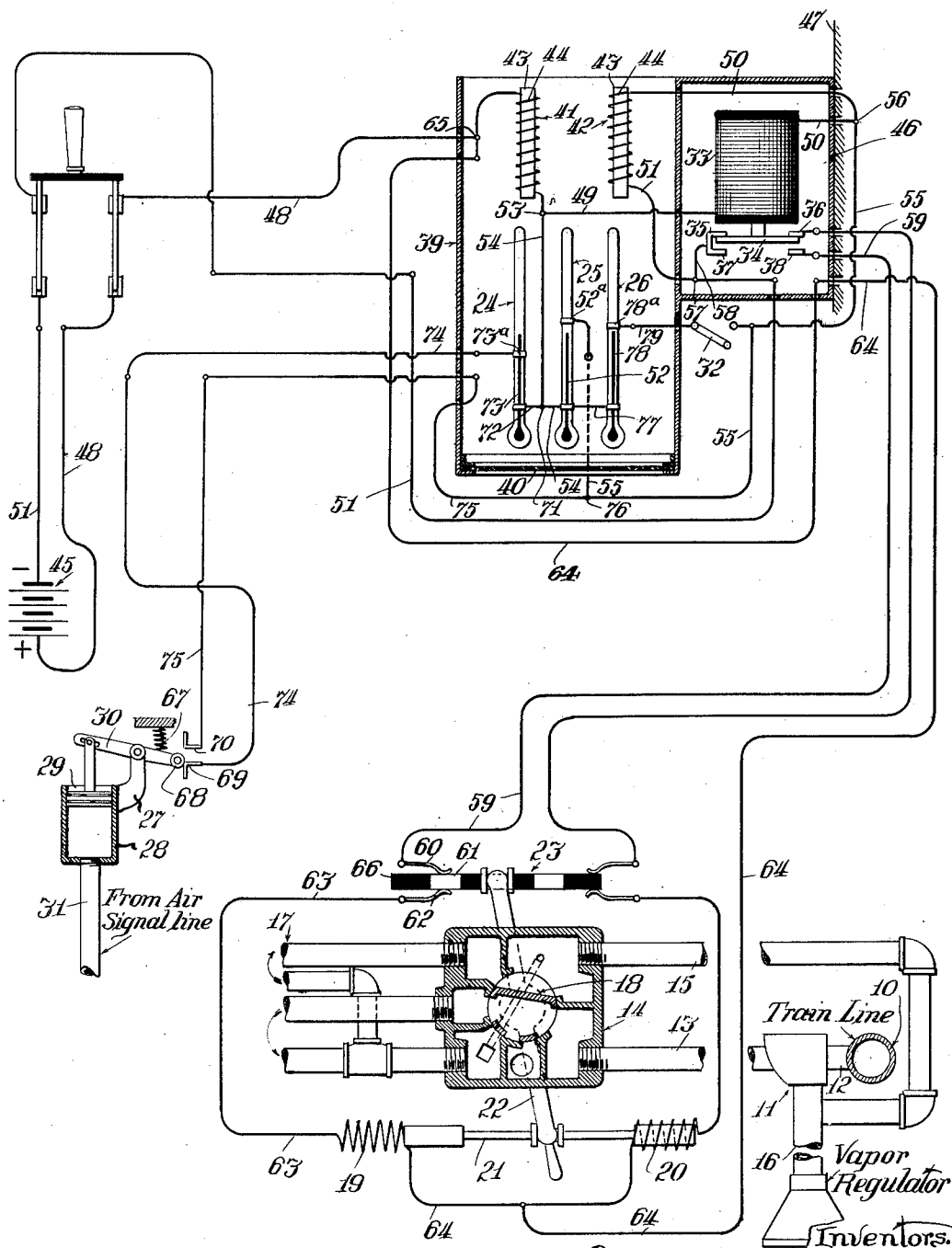
Jan. 24, 1928.

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1,656,949

CONTROL MECHANISM FOR CAR HEATING SYSTEMS

Original Filed March 2, 1925



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UNITED STATES PATENT OFFICE.

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CONTROL MECHANISM FOR CAR-HEATING SYSTEMS.

Application filed March 2, 1925, Serial No. 12,730. Renewed December 1, 1927.

Our invention relates to mechanism for automatically controlling the operation of heating systems, particularly steam heating systems installed in railway cars and governed by fluctuations in the car temperature. A system of this general type is shown in the patent to Edward A. Russell No. 1,440,701 granted January 2, 1923.

In installing in a railway car a heating system controlled by a thermostat located in the car so as to be responsive to changes of temperature in the car atmosphere, it has been found desirable, in order to get reasonably prompt response on the part of the thermostat to such temperature changes, to locate the thermostat where it will be subject directly to the natural draft or rising current of warm air from the radiator coils, these being usually located along the side of the car. But it is not always convenient to so locate the thermostat, or at least to locate it in a position, relative to the radiators, which will be most favorable to quick response and reliable functioning of the instrument; and, under the best of circumstances, it does not seem practical to find a location for the thermostat which will give it as quick a response as is desirable when the instrument is subject merely to the natural draft.

The primary object of our present invention is to provide new and improved means for insuring a constant movement of air past the thermostat whereby the instrument may be located, if this is more convenient, elsewhere than in the natural draft from the radiator pipes, whereby the thermostat will function more uniformly than heretofore and whereby its response to temperature changes will be quicker.

The invention has for further objects such other new and improved constructions, arrangements and devices relating to controlling mechanism for heating systems as will be referred to in the following description of the preferred embodiment of our invention shown in the accompanying drawing.

The drawing is a diagrammatic repre-

sentation of a heating system such as shown in the Russell patent above referred to but with the improved thermostatic device of our present invention.

Referring to the drawing, 10 designates the steam train pipe of a railway car, 11 the vapor regulator, which is of well known construction and will not require detailed description, 12 a pipe leading from the train pipe to the high pressure chamber of the vapor regulator, 13 a pipe leading from the low pressure chamber of the vapor regulator to the radiator control valve 14, and 15 a pipe for conducting medium, water of condensation or steam, or both mixed, from the radiator valve 14 to the thermostat chamber 16 of the vapor regulator. 17 indicates the radiator which is shown as consisting of certain pipe coils as described in the patent above referred to. Radiator valve 14 comprises a revoluble valve body 18 which is moved in opposite directions through the alternate actuation of a pair of solenoid coils 19 and 20 operating on a common core member 21 connected by lever 22 to the valve body 18. 23 is a limit switch for cutting off current from coils 19 or 20 as soon as the valve has completed its rotary movement in one direction or the other, as the case may be.

The energization of solenoid coils 19 and 20 is controlled by means of one or more thermally actuated elements which are referred to herein, collectively, as a thermostatic device or thermostatic mechanism, the separate elements being referred to as thermostats. This thermostatic mechanism, in the form of the apparatus shown, comprises three mercury tube circuit breakers or thermostats, a low temperature thermostat designated 24 and adapted to open and close its circuit at a relatively low temperature, say 50° Fahrenheit, so that when in control it maintains the car atmosphere at substantially this temperature; a high temperature thermostat 25 which closes its circuit at preferably 71° Fahrenheit; and a third or intermediate temperature thermostat 26 which may be designed or set to oper-

ate at, say, 69° Fahrenheit. The system is put under the control either of the low temperature thermostat or the high temperature thermostat, automatically dependent upon whether the car is connected up with or cut off from the locomotive. This automatic selection of control is accomplished by means of a selector switch 27 comprising a cylinder 28, piston 29 and pivoted switch arm 30, the cylinder being connected by pipe 31 to one of the air train pipes of the car which is opened and its pressure reduced to atmospheric pressure when the car is disconnected from the locomotive. The intermediate thermostat 26 may be put into or out of control by a hand operated switch 32. 33 is a relay having an armature 34, the position of which controls the circuits through the valve operating solenoids 19 and 20 conditioned upon the position of limit switch 23 which determines whether the current is directed through one or the other of said solenoids. When the circuit through the thermostat in control is open the relay 33 is energized so as to raise armature 34 against the upper pair of contacts 35, 36. When the thermostat circuit is closed its resistance is so much less than the resistance of the relay that the relay drops its armature 34 on the lower pair of contacts 37, 38.

In order to accomplish the more accurate, reliable and responsive functioning of the thermostatic mechanism, set forth above as the primary object of our invention, the thermostats 24, 25 and 26 are located in a casing 39 and means provided for bringing about a continuous passage of air at relatively uniform rate through this casing. Preferably the casing is open at the top and bottom, with a screen 40 arranged across the bottom of the opening, and the means employed for promoting passage of air through the casing consists of one or more resistance coils, preferably two such coils, 41, 42, which are located in the upper part of the casing above the thermostats and serve the double purpose of putting resistance into the relay and thermostat circuits and of generating heat so as to bring about the upward circulation of air through the thermostat casing, as above referred to. These resistance coils may be constructed in any desired manner. For example, they may consist of porcelain cores 43 wound with resistance wire 44 which becomes heated with the passage of electric current. These two coils are preferably arranged in the two leads from the source of current supply 45 to the controlling mechanism so that the danger of injury to the controlling mechanism through grounding is eliminated. The relay 33 may be located in a cabinet 46 secured to the wall 47 of the car. The thermostat casing 39 may be fastened to the

front side of cabinet 46 so as to project from the car wall.

The electric circuits will be described in connection with the operation of the mechanism which is as follows:

The drawing shows the parts of the apparatus in the positions which they assume when the car is attached to the locomotive and the car temperature is below that which it is ordinarily desirable to maintain at such time. That is, the high temperature thermostat 25 is in control but the mercury is below the point at which this thermostat closes its circuit. The mercury column of the low temperature thermostat 24 may or may not be in circuit closing position. This is immaterial since the circuit of the low temperature thermostat is open at the selector switch 27. Steam flows into the radiator 17 from pipe 13 and water of condensation is discharged to the vapor regulator through pipe 15. A circuit is closed through the relay 33 as follows:

Circuit No. 1.—Battery 45, wire 48, resistance coil 41, wire 49, relay 33, wire 50, resistance coil 42, wire 51 to the battery. The relay is consequently energized, raising its armature 34.

The heat developed by resistance coils 41, 42 induces a constant upward current of air through the car thermostat casing 39, increasing the susceptibility of the thermostat to temperature changes and insuring accurate response of the thermostat to such changes.

As soon as the mercury column 52 of thermostat 25 reaches contact 52^a a circuit is closed which, in effect, short circuits the relay 33 since the new circuit is of much less resistance than the circuit through the relay. This new circuit is as follows:

Circuit No. 2.—Circuit No. 1 to binding post 53, wire 54, mercury column 52, wire 55 to binding post 56 on wire 50, and then to the battery over circuit No. 1.

Relay 33 drops its armature on the lower contacts 37, 38 closing a circuit through the valve moving solenoid 19 as follows:

Circuit No. 3.—Circuit No. 1 to binding post 65, wire 64, solenoid 19, wire 63, spring contact 62 of the limit switch, contact plate 61 on the movable element 23 of the limit switch, spring contact 60, wire 59, contact 38, armature 34, contact 37, wire 58, binding post 57, and thence over circuit No. 1 to the battery.

Solenoid 19 is energized attracting the core and moving the revoluble element 18 of valve 14 to a position which shuts off the radiator 17 from the supply and return pipes 13 and 15 which are connected so that steam is short circuited through the low pressure chamber of the vapor regulator to the thermostat chamber thereof. The completion of this rotary movement of valve

member 18 cuts off the current from solenoid 19 through the movement of the limit switch 23 to a position in which spring contacts 60, 62 are separated by an insulating block 66.

When the train is cut off from the locomotive pressure in air pipe 31 disappears and spring 67 of the selector switch moves switch arm 30 so that its contact 68 bridges the gap between a pair of contacts 69 and 70. This closes a circuit through the low temperature thermostat 24 which, if the mercury column of the low temperature thermostat is in circuit closing position, brings about a short circuiting of the relay 33 in the same way as the relay is short circuited by closing of the circuit through the high temperature thermostat 25. The circuit through the low temperature thermostat is as follows:

Circuit No. 4.—Circuit No. 2 (high temperature thermostat circuit) to binding post 71, wire 72, mercury column 73 of low temperature thermostat 24, contact 73^a of low temperature thermostat 24, wire 74, fixed contact 69 of the selector switch, movable contact 68, fixed contact 70, wire 75 to binding post 76 and then, as in circuits No. 1 and No. 2, to the battery.

It will be understood that the opening and closing of the circuit last traced through the low temperature thermostat brings about the opening and closing of the radiator valve 14 through the alternate deenergization and energization of the relay 33, exactly as described in connection with the operation of the high temperature thermostat 25.

If desired, a third thermostat 26 may be put in control of the system. For example, if the high temperature thermostat is set to function at 71° Fahrenheit and the low temperature thermostat at 50, thermostat 26 may be set to maintain some intermediate temperature, for example 69° Fahrenheit. This thermostat is connected by wire 77 with wire 54 and its upper contact 78^a by wire 79 with wire 55, 79 containing the switch 32 above referred to. Thermostat 26 is designed to be used in place of thermostat 25, that is, when the car is connected with the locomotive so that the circuit through the low temperature thermostat 24 is open at the selector switch. With switch 32 closed current will pass from wire 54 to wire 77 and then to the mercury column 78 of thermostat 26, and thence over wires 55, 50, etc. to the battery. As the mercury column 78 of thermostat 26 will reach its contact 78^a before mercury column 52 of the high temperature thermostat reaches its contact 52^a, the intermediate thermostat will necessarily control the system so long as switch 32 remains closed. The circuit through thermostat 26 is as follows:

Circuit No. 5.—Circuit No. 2 to wire 54, wire 77, mercury column 78 of the intermediate thermostat, contact 78^a, wire 79 (circuit breaker 32 being by supposition closed), wire 55 and then as in circuits No. 1 and No. 2 to the battery.

The intermediate thermostat 26 controls the system in the same way as the other two thermostats, that is, through the alternate energization and deenergization of relay 33.

The resistance coils 41, 42 are arranged in the circuits above described so that they receive current whenever the system is in operation. These coils are always effective, therefore, to maintain a relatively uniform flow of air through the thermostat casing and in contact with the thermostats.

We claim:

1. In a controlling mechanism for a heating system, a thermostat responsive to atmospheric temperature changes, means for positioning the thermostat in a chamber in which the temperature of the air is to be regulated, and means associated with the thermostat for causing air from the chamber, at the temperature and pressure existing in the chamber, to flow past and in contact with the thermostat at a substantially uniform rate.

2. In a controlling mechanism for a heating system, a thermostat responsive to atmospheric temperature changes, an inclosing casing for said thermostat having an air inlet and an air outlet, and means associated therewith for causing air to pass through said casing at a relatively uniform rate said means being so positioned as not to affect the temperature or pressure of the air prior to its contact with the thermostat.

3. In a controlling mechanism for a heating system, a thermostat responsive to atmospheric temperature changes, an inclosing casing for said thermostat which is open at the top and bottom, providing an air inlet and an air outlet, and means associated with the air outlet for causing air to pass through said casing at a relatively uniform rate.

4. In a controlling mechanism for a heating system, a thermostat responsive to atmospheric temperature changes, and a heating device, independent of the radiator elements of the system and associated with the thermostat for producing a flow of air past the thermostat.

5. In a controlling mechanism for a heating system, a thermostat responsive to atmospheric temperature changes, an inclosing casing for the same, and a heating device independent of the radiator elements of the system and associated with the thermostat for producing a flow of air past the thermostat.

6. In a controlling mechanism for a heating system, a thermostat responsive to at-

mospheric temperature changes, an inclosing casing for the same open at the top and bottom, and a heating device independent of the radiator elements of the system and
 5 associated with the thermostat for producing a flow of air past the thermostat.

7. In a controlling mechanism for a heating system, a thermostat responsive to atmospheric temperature changes, an inclosing casing for the same open at the top and bot-
 10 tom, a heating device in the casing above the thermostat, producing a flow of air past the thermostat.

8. In a controlling mechanism for a heating system, a thermostat responsive to atmospheric temperature changes, and an electric resistance element to produce heat and so positioned as to cause movement of air past the thermostat toward the resistance
 20 element.

9. In a controlling mechanism for a heating system, a thermostat responsive to atmospheric temperature changes, an inclosing casing for the same having air inlet and
 25 outlet openings, and an electric resistance element in said casing to produce heat and thereby cause movement of air through said casing.

10. In a heating system, the combination of a radiator, a valve for governing the supply of medium to the radiator, electrically actuated mechanism for controlling the movement of said valve, a circuit making and breaking thermostat controlling said
 35 electrically actuated mechanism, and an electric heating device adjacent to the thermostat to insure movement of air past the same.

11. In a heating system, the combination of a radiator, a valve for governing the supply of medium to the radiator, electrically actuated mechanism for controlling the movement of said valve, a circuit making and breaking thermostat controlling said
 45 electrically actuated mechanism, a casing having an air inlet and an air outlet for inclosing said thermostat, and an electric heating device in said casing to produce a movement of air through the same.

12. In a heating system, the combination of a radiator, a valve for governing the supply of medium to the radiator, electrically actuated mechanism for controlling the movement of the valve, a circuit making and breaking thermostat controlling said electrically actuated mechanism, and an electric heating device positioned adjacent the thermostat to produce a movement of air past the thermostat and connected with the
 60 electrically actuated controlling mechanism so as to receive current at all times that said mechanism is operated.

13. In combination with a railway car, a radiator in the car, a valve to control the
 65 supply of heating medium through the radi-

ator, an electric motor for giving the valve movement in opposite directions, a relay for controlling the current supply to said motor, a circuit making and breaking thermostat for controlling the energization of said
 70 relay, and an electric heater arranged adjacent said thermostat to produce a movement of air past the thermostat.

14. A circuit making and breaking thermostat in combination with a casing for the
 75 same and a heating device in said casing to produce a movement of air through the casing.

15. In combination a mercury tube thermostat, a casing inclosing the same and a
 80 heater arranged in said casing to produce a movement of air through the casing.

16. In combination a mercury tube thermostat, a casing inclosing the same and a heater arranged in said casing, above said
 85 thermostat to produce a movement of air through the casing.

17. In combination a tubular casing open at the top and bottom, a thermostat arranged in said casing and a heater arranged in the casing above the thermostat to produce an upward movement of air through the casing.

18. In combination with a railway car and air train pipe, a heating system for the car comprising two thermostats adapted to function at different temperatures in controlling the heating system, means whereby either one or the other of said thermostats may be put into control at will, and means actuated
 100 by changes in pressure in said air train pipe, whereby the control of the heating system by either of said thermostats is conditioned upon the existence of super-atmospheric pressure in the train pipe.

19. In combination with a railway car and air train pipe, a heating system comprising high and low temperature thermostats adapted to control the heating system dependent upon the presence or absence of super-atmospheric pressure in said air train pipe, a third thermostat to function at an intermediate temperature and means whereby the high temperature thermostat or the intermediate temperature thermostat may be
 115 put into control of the system, at will, but subject to the presence of air pressure in said train pipe.

20. In a heating system, the combination of a radiating element for heating the atmosphere in an enclosed space, a thermostat in said space for controlling the operation of said radiating element and means independent of said radiating element associated with said thermostat for creating a current
 120 of air in said space and causing the same to flow past and in contact with the thermostat at a relatively constant rate whenever said heating system is in operation.

21. In a heating system, the combination
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of a radiating element for heating the atmosphere in an enclosed space, a thermostat in said space for controlling the operation of said apparatus, a housing for the thermostat having an air inlet and air outlet, means independent of said radiating element for creating a current of air in said space and causing the same to pass through said housing in contact with said thermostat at a relatively constant rate whenever said heating system is in operation. 10

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