H. S. WILLIAMS.

HEATING SYSTEM.

APPLICATION FILED SEPT. 22, 1913.

1,154,587.

Patented Sept. 21, 1915.

2 SHEETS—SHEET 1.

Fig. 1.

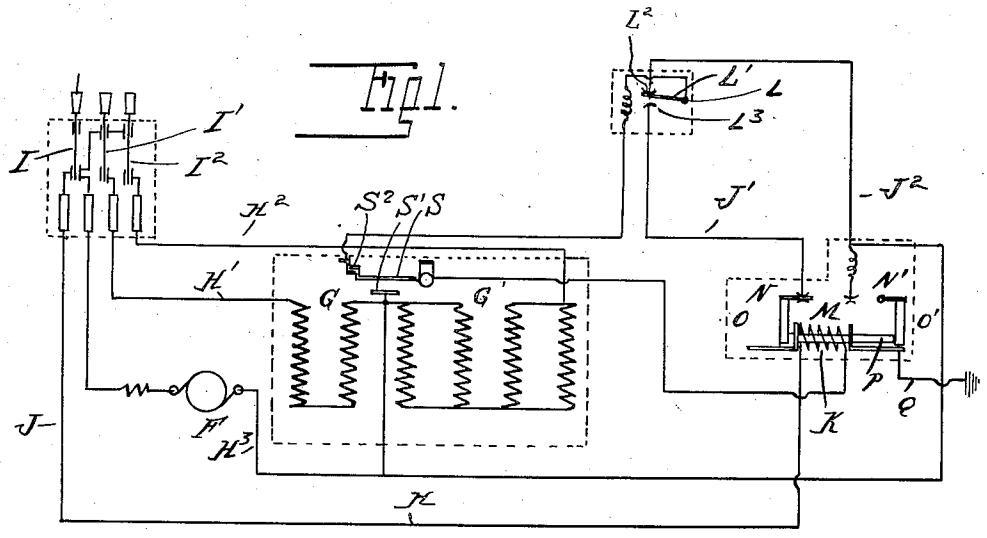
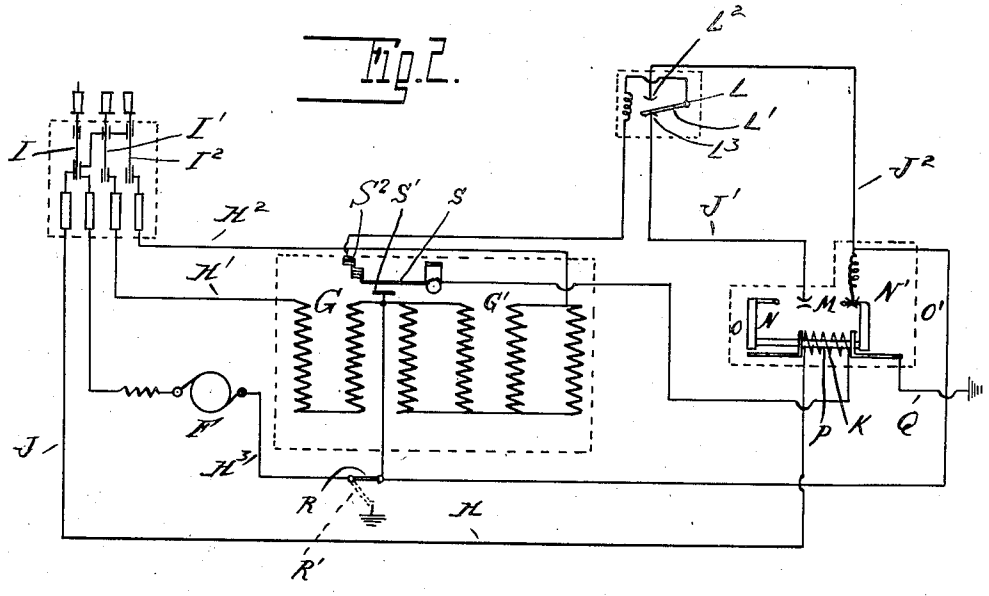


Fig. 2.



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2 SHEETS—SHEET 2.

Fig 4.

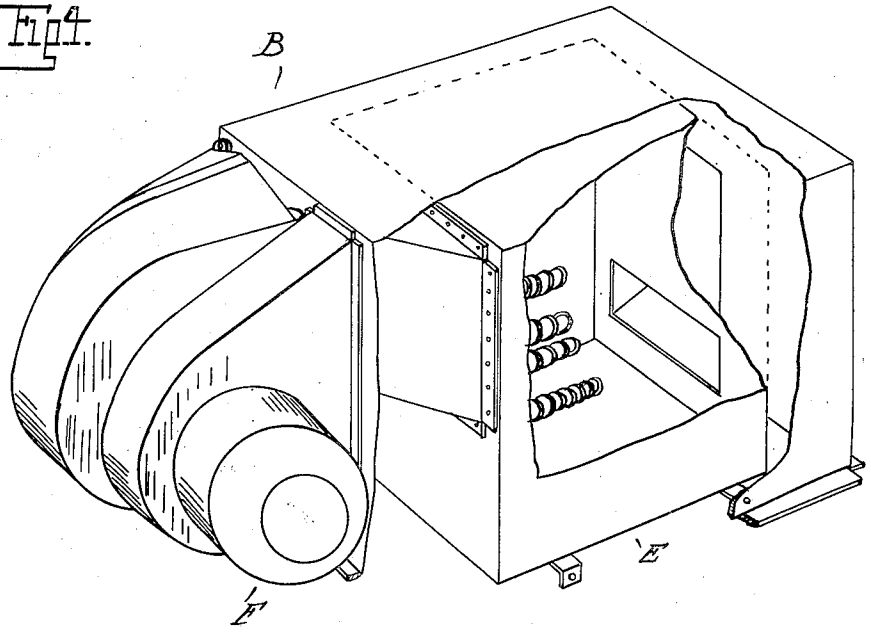
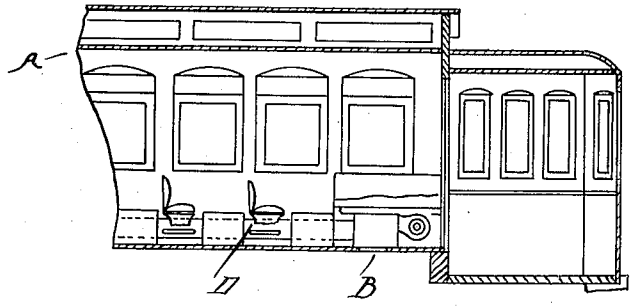


Fig 3.



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UNITED STATES PATENT OFFICE.

HARRY S. WILLIAMS, OF DETROIT, MICHIGAN, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF ONE-HALF TO PETER SMITH HEATER COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN, AND ONE-HALF TO CONSOLIDATED CAR-HEATING COMPANY, OF ALBANY, NEW YORK.

HEATING SYSTEM.

1,154,587. Specification of Letters Patent. Patented Sept. 21, 1915.

Application filed September 22, 1913. Serial No. 790,982.

To all whom it may concern:

Be it known that I, HARRY S. WILLIAMS, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Heating Systems, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to heating systems and more particularly to that type in which the heated air is distributed by a fan or other motor-driven means.

It is the object of the invention to obtain a more perfect control of the heat; first, by providing means for thermostatically controlling the operation of the fan or other means for distributing the heated air; second, by the combination with the automatic controlling means of manually-operable means for varying the heating effect.

More specifically the invention is designed for use in connection with electric heaters and for the heating of cars, and consists in various features as hereinafter set forth.

In the drawings:—Figure 1 is a diagrammatic view illustrating the electric heating and control system; Fig. 2 is a similar view with the parts in different positions of adjustment; Fig. 3 is a longitudinal section, showing the arrangement of the heaters and distributing means within the car, and Fig. 4 is a perspective view of the combined heater and motor-driven fan.

A is the car or other structure to be heated; B is the heater casing, through which the air to be heated is drawn, and C is an associate fan for propelling the air and distributing it through a conduit D to various points within the car. As above stated, I preferably employ electric heaters, which are arranged within the casing B, and preferably within an inner casing E therein, the arrangement being such that the air propelled by the fan is drawn in through the space between the inner and outer casings into the inner casing, and then is expelled into the conduit D.

The distribution of the heated air is dependent upon the operation of the fan which consequently must be operated whenever heat is being generated. On the other hand, if the heat within the car is sufficient and the heaters are cut out, there is no necessity for the operation of the fan. I have therefore, provided automatic controlling means, by which the motor F for the fan C is thrown in or out of action upon variations in temperature, and this controlling means for the fan is associated with controlling means for the electric heaters. In addition to the automatic controlling means I have provided manually-operable and adjustable means for varying the heating effect, this however, being under the control of the automatic means so as to guard against any danger of overheating.

The electric heaters arranged within the casing E may be of any suitable construction and are preferably formed in a plurality of units. As indicated in the diagram G and G′ are heating units which are respectively arranged in branches H′ H^2 of a main heating circuit H. The motor F is also arranged in a branch H^3 of the circuit H, said branches being controlled by separately manually-operable switches I I′ and I^2. The switch I, in addition to controlling the branch H^3 for the motor, also controls both of the branches H′ and H^2—so that the opening of this one switch I will simultaneously break all of the branch circuits. The closing of these switches will not however necessarily close their respective circuits, as these are further controlled by automatically-operating means as follows: J is a circuit which is another branch controlled by the switch I and which includes an electro-magnet K for alternatively opening and closing two branches J′ and J^2 of the circuit J. These two branches are also further controlled and alternatively opened and closed by a thermostat L, the arrangement being such that when the thermostat closes the circuit through one of the branches J′ or J^2, the electro-magnet K will be energized to operate a switch M, opening the branch just closed by the thermostat and closing the other branch of the circuit. In the same manner when the thermostat operates to close the last-mentioned branch the electro-magnet K will operate the switch M to open this branch and to close the first branch.

Thus the closing of the circuit J under any condition is nearly instantaneous, but during the interval in which it is closed will energize the magnet K to reverse the switch M.

The switch M and its operating magnet K may be of any suitable construction, but as shown N and N′ are two pairs of contacts and O and O′ coöperating bridge contact members for alternatively closing said contacts N and N′. The bridge contacts O and O′ are carried by a reciprocatory member P, which is actuated by the magnet K (preferably a solenoid) alternately in opposite directions. Thus when the magnet K is energized it will cause the movement of the member P from one side of the magnetic field; and upon the breaking of the magnetic circuit, the inertia of the moving member P will carry it to the opposite side of the magnetic field—or in a position where a succeeding operation of the magnet will actuate it in the reverse direction. The thermostat L may also be of any suitable construction, and as diagrammatically represented in the drawings, is adapted to move a contact member L′ alternatively into contact with the coöperating contact members L^2 and L^3. The contact L^2 is closed when the thermostat is at the high limit of heat, at which it is desired to cut out the heaters and the fan; while the contact L^3 is closed when the thermostat is at the low limit or the point at which the heaters and fan are to be thrown into operation. These two positions of the thermostat respectively close the branch circuits J^2 and J′, as previously described.

In operation, as shown in Fig. 1, the thermostat is in its high heat position, and in Fig. 2 in its low heat position. In either position the manually-operable switches I′ and I^2 may be closed, but with the thermostat in the position as shown in Fig. 1 this closing of the switches will not establish either the heating or motor circuits. If, however, the thermostat is in the position shown in Fig. 2, the switch M being in the position shown in Fig. 1, the closing of the switch I will establish the circuit J, which includes the magnet K, the closed contacts L′ and L^3, the branch J′, contacts N, and ground connection Q. This will energize the magnet K, moving the member P to open the contacts N and close the contacts N′, thereby adjusting the switch M into the position shown in Fig. 2. This will break the circuit J and deënergize the magnet K, but the closing of the contacts N′ will establish a main circuit H. Thus the motor F will be set in operation, and if the switches I′ and I^2 are closed the heaters G and G′ will be operated.

When the main circuit is once established as above described, the switches I′ and I^2 may be operated to cut in or cut out the heaters without effecting the operation of the motor and thus the heating effect may be varied as desired. If, however, an overheating effect is produced the thermostat L will be moved to open the contacts L′ and L^3 and close the contacts L′ and L^2. The opening of the contacts L′ and L^2 will not produce any result, as the circuit J is already dead through the breaking of the contacts N and therefore, there will be no arcing at the thermostat. On the other hand, the closing of the contacts L′ and L^2 will again establish the circuit J through the branch J^2, which will again energize the magnet K, actuating the member P in the opposite direction to break the contacts N′ and closing the contacts N. This cuts out the circuit J, deënergizing the magnet K, and also breaks the main circuit by the opening of the contacts N′. In this manner the operation may continue as long as the switch I is closed, the thermostat operating to automatically regulate the heat by cutting in and cutting out the heating and motor circuits. At any time when it is desired to throw the system out of operation the switch I is opened, which will break all of the circuits without the necessity of operating either of the manually-operable switches I′ and I^2.

My system has various advantages, among which is; first, that the control circuit is only established momentarily and therefore, no energy is consumed in maintaining the main circuit in operative condition; second, a single control circuit and a single switch is used for both cutting in and cutting out the main circuit; and third, the thermostatic switch operates only to close the circuit and never to break it, which avoids arcing between the contacts.

Another advantage of the system is that the motor and fan, as well as the electric heaters, are controlled by the thermostat, which avoids the unnecessary operation thereof. There are, however, occasions when it is desirable to operate the motor and fan when the heaters are not in operation, as, for instance, in the summer time when used for cooling. I therefore, preferably place a switch R in the motor circuit H^3, which in one position couples the same to the circuit H, while in another position this connection is broken, and the motor circuit is grounded as indicated at R′ in dotted lines, Fig. 2. When thus adjusted the motor is beyond the control of the switch K and may be operated by the closing of the switch I.

As an additional safety measure, I preferably place a thermically operated cut-out so as to control the circuit J. This device, which is preferably located adjacent to the heaters G G′ etc., is shown as consisting of

a switch S having its movable member normally soldered to a coöperating contact member, and in this position closes the circuit J. Whenever the temperature rises sufficiently to melt the soldered connection of the contacts, the member S will drop away, opening the circuit J which leads to the thermostat, and closing a branch S′ which leads to the contact N′ of the switch K. Thus if the parts are in the position shown in Fig. 2 and the switch S is then operated by the rise in temperature so as to open the circuit J and close connection between the same and the contact S^2, this will complete a circuit, which will energize the solenoid of the switch K, thereby reversing said switch and cutting out both the motor and heating circuits and also the control branch circuit just established. By means of this device any overheating effect due by possible failure in the operation of the thermostatic switch will result in operating the automatic cut-out, which will break the heating circuit as has been described.

What I claim as my invention is:

1. In a heating system, the combination with air heating means, of power-driven means for propelling and distributing the heated air, an electric control circuit for starting and stopping said power-driven, air-propelling means, said circuit having two branches, and a thermostat for alternatively closing said branches to respectively start and stop said power-driven means.

2. In a heating system, the combination with air heating means, of an electric motor fan for propelling and distributing the heated air, a circuit for said motor having a manually-operable switch, a control circuit having two branches, a thermostat for alternatively closing the branches of said control circuit respectively in the high and low limits of its adjustment, and means operated by the closing of the respective branches for starting and stopping said motor.

3. In a heating system, the combination with air heating means, of an electric motor fan for propelling and distributing the heated air, a circuit for said motor having a manually-operable switch, a control circuit having two branches, a thermostat for alternatively closing the branches of said control circuit respectively in the high and low limits of its adjustment, and means operated by the closing of the respective branches for starting and stopping said motor, said means including spaced contacts connected with the said branches, and a solenoid having a core carrying circuit controlling devices and adapted to move the same alternately into and out of operative engagement with the said contacts.

4. In a heating system, the combination with air heating means, of power-driven means for propelling and distributing the heated air, an electric control circuit for starting and stopping said power-driven air-propelling means, said circuit having two branches, and a thermostat for alternatively closing said branches to respectively start and stop said power-driven means, and means for cutting out the air heating and the electric control circuit to enable the apparatus to be operated without heating the air.

5. A heating system including a heater circuit, electric air heater means in said circuit, an electric motor fan also in said circuit for propelling and distributing the heated air, a control circuit for the said heater circuit, said control circuit having branches, a thermostat for closing said branches respectively in the high and low limits of its adjustment, and means operable on the closing of either of said branches for opening or closing the heater circuit.

6. A heating system including a heater circuit, electric air heating means in said circuit, an electric motor fan also in said circuit for propelling and distributing the heated air, a control circuit for the said heater circuit, said control circuit having branches, a thermostat for closing said branches respectively in the high and low limits of its adjustment, and means operable on the closing of either of said branches for opening or closing the heater circuit, said means including spaced contacts connected with the said branches, and a solenoid having a core carrying contacts and adapted to move the contacts alternately into operative engagement with the first mentioned contacts.

7. A heating system including a heater circuit, electric air heater means in said circuit, an electric motor fan also in said circuit for propelling and distributing the heated air, a control circuit for the said heater circuit, said control circuit having branches, a thermostat for closing said branches respectively in the high and low limits of its adjustment, and means operable on the closing of either of said branches for opening or closing the heater circuit, and simultaneously opening the branch, serving to effect the opening or closing of the heater circuit whereby the thermostat is prevented from breaking the control circuit.

8. A heating system including a heater circuit, electric air heating means in said circuit, an electric motor fan in said circuit for propelling and distributing the heated air, a control circuit for the said heater circuit, a switch operated by said control circuit adapted to establish and break said heating circuit upon alternate operations and to simultaneously break the control circuit, a thermostatic switch for alternately closing said control circuit to establish or break said heating cir-

cuit, and a thermically operated cut-out for establishing said control circuit to break said heating circuit.

9. In an indirect heating system, the combination with heating coils in sections of a casing containing said coils, a fan motor for driving air over said coils, a thermostat subjected to the temperature of the apartment to be heated, a switch for said coils controlled by said thermostat, and a second thermostat subjected to the temperature in said casing and also controlling said coils.

10. In an indirect heating system, the combination with heating coils in sections, of a casing containing said coils, a fan motor for driving air over said coils, a thermostat subjected to the temperature of the apartment to be heated, a switch for said coils, magnetic operating devices for said switch having the circuit thereof controlled by said thermostat, and a second thermostat subjected to the temperature in said casing and also controlling the circuit of said magnetic operating devices.

11. In an indirect heating system, the combination with heating coils in sections, of a casing containing said coils, a controlling switch for said coils, an operating magnet for said switch, a thermostat controlling the circuit of said magnet and subjected to the temperature of the apartment to be heated, and a fan motor for driving air over said coils having a circuit which is independent of said controlling switch.

12. In an indirect heating system, the combination with heater coils and a casing therefor, of a fan motor and fan for driving air over said coils, a room-thermostat of the reacting type responding to the temperature of the apartment to be heated and controlling said heater coils, and a fan thermostat of the non-reacting type responding to the temperature caused by a failure of the air blast and also controlling said heater coils.

13. In an indirect heating system, the combination with heater coils and a casing therefor, of a fan motor and fan for driving an air blast over said coils, a room-thermostat responding to the temperature of the apartment to be heated and controlling said heater coils, and a fan thermostat responding to the temperature caused by a failure of the air blast and also controlling said heater coils.

In testimony whereof I affix my signature in presence of two witnesses.

HARRY S. WILLIAMS.

Witnesses:

WM. J. BELKNAP,

JAMES P. BARRY.