

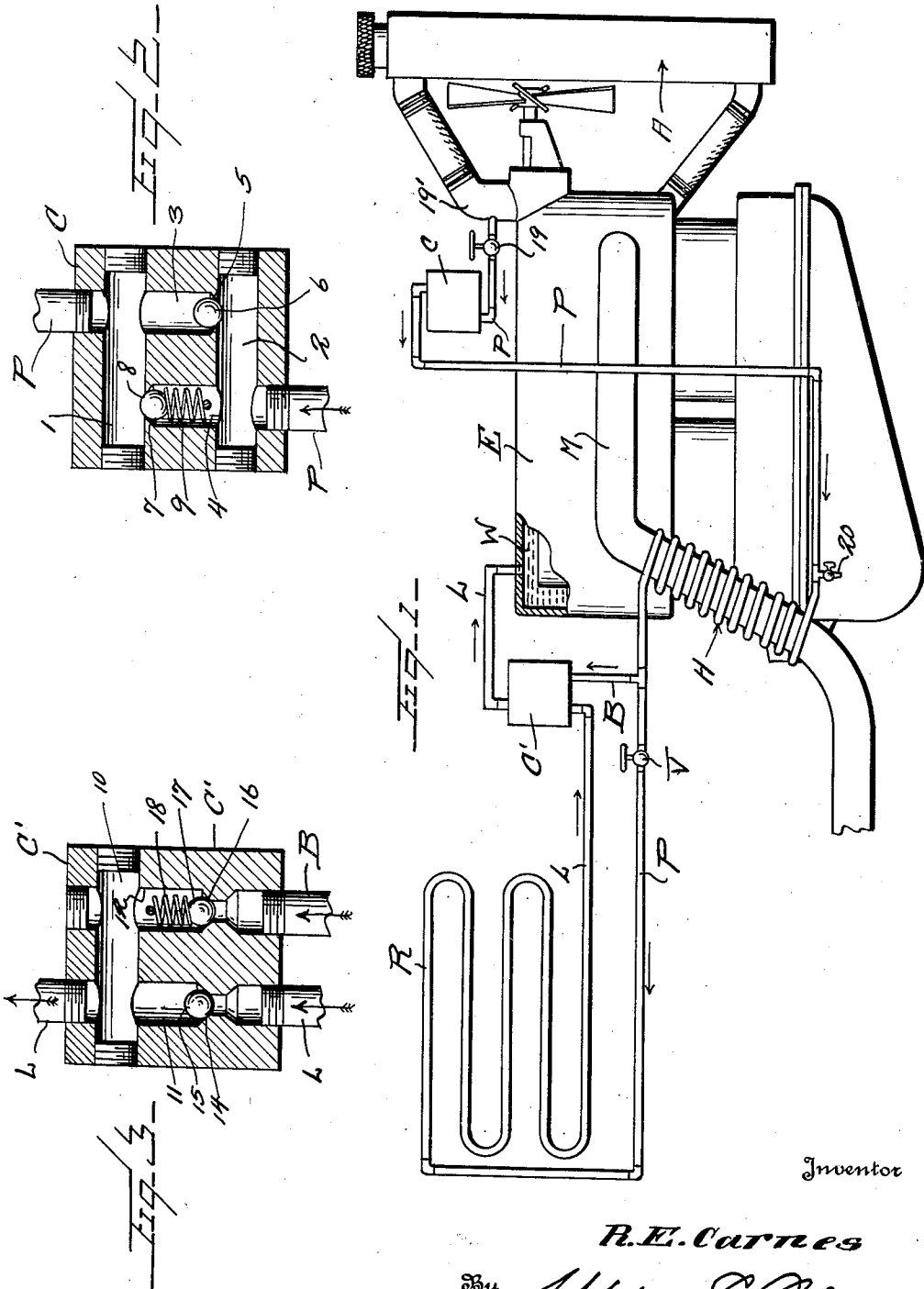
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HEATING SYSTEM

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HEATING SYSTEM

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This invention relates to heating systems, and it is an object of the invention to provide a system of this kind wherein the heat generated by the exhaust from an internal combustion engine is carried off as desired through the medium of a fluid conveyor and wherein means are provided to relieve abnormal pressure within the system.

The invention also has for an object to provide a heating system of this kind especially designed for vehicles employing an internal combustion engine as a power unit and wherein heat generated by such unit is conveyed to a desired location within the vehicle, the transmission of such heat being under ready control.

An additional object of the invention is to provide a system of this kind embodying a radiator interposed within a circulating line leading from and discharging within a source of water supply, together with a heating means coacting with the portion of the line leading from the water supply to the radiator, the remaining portion of the line constituting a return.

Furthermore, it is an object of the invention to provide a system of this kind comprising a circulating line, a portion of said line constituting a lead pipe and a second portion constituting a return, both of said portions being in communication with a source of water supply, together with means interposed in either or both of such portions of the line for relieving abnormal pressure therein.

The invention consists in the details of construction and in the combination and arrangement of the several parts of my improved heating system whereby certain important advantages are attained and the device rendered simpler, less expensive and otherwise more convenient and advantageous for use, as will be hereinafter more fully set forth.

The novel features of my invention will hereinafter be definitely claimed.

In order that my invention may be better understood, I will now proceed to describe the same with reference to the accompanying drawing, wherein:—

Figure 1 is a diagrammatic view illustrating a heating system constructed in accordance with an embodiment of my invention;

Figure 2 is a sectional view illustrating one of the valve casings embodied in the system as herein employed;

Figure 3 is a sectional view illustrating a second valve casing included in the invention.

As disclosed in the accompanying drawing, E denotes an internal combustion engine of a conventional type having associated therewith a water jacket W in communication with a radiator A whereby a well known water circulating cooling system for the engine E is provided.

A radiator R is positioned upon the vehicle as desired and preferably so that said radiator is entirely below the normal water level within the radiator A. In communication with the radiator R at the upper part thereof is a pipe P also in communication at a desired point with the jacket W through the medium of the usual coupling 19'. The water jacket W constitutes a source of water.

Interposed in the line P is a heater H, herein disclosed as a coiled portion of the line P encircling the exhaust manifold M of the engine E, and interposed in said pipe line P at a desired point between the heater H and the radiator R is a regulating valve V of any preferred type. The radiator R also has in communication therewith a return pipe line L also in communication at a desired point with the water jacket W.

At a desired point between the water jacket W and the heater H, the pipe line P has interposed therein a valve casing C. This casing C is provided with two separated chambers 1 and 2 in communication with each other through the medium of the spaced ports 3 and 4. The port 3 is provided with an internal valve seat 5 with which coacts a valve member 6 preferably of a ball type. This valve member 6 coacts with the seat 5 to prevent retrograde flow through that portion of the line P beyond the casing C but readily unseating under normal conditions to permit the desired flow of water from within the jacket W to and through the heater H.

The second port 4 is provided with an internal valve seat 7 with which coacts a valve member 8 preferably of a ball type and which is normally maintained seated by an expansible spring 9 of desired tension. Under normal conditions the valve member or ball 8 is seated but upon abnormal pressure within the line P beyond the casing C of a degree sufficient to overcome the tension of the spring 9, the valve member or ball 8 will be seated and thereby permit retrograde flow through the pipe line P until the pressure within such line has returned substantially to normal.

Interposed in the return line L at a desired point between the radiator R and the point of communication between said line L and the water jacket W is a second valve casing C'. This casing C' is provided with a chamber 10 with which communicates the portion of the line L between the casing C' and the water jacket W. This chamber 10 has in communication therewith the ports 11 and 12 and in direct communication with the port 11 is that portion of the pipe line L in advance of the casing C'. This port 11 is provided with an internal valve seat 14 with which coacts a valve member 15 preferably of a ball type and which serves to prevent retrograde movement through the line L. The second port 12 has in communication therewith a branch line B also in communication with the pipe line P at a desired point between the heater H and the valve V. This port 12 is also provided with an internal valve seat 16 with which coacts a valve member 17 preferably a ball. This valve member or ball 17 is normally maintained seated by the expansible member 18.

With the valve V closed there is a probability of abnormal pressure being created within the pipe line P between the heater H and the valve V and when such abnormal pressure increases beyond the tension of the spring 18, the valve member or ball 17 will open, thus permitting flow through the branch line B and through that portion of the line L between the casing C' and the water jacket W until such pressure has been reduced to normal.

Interposed in the line P at a desired point between the casing C and the communication of said line P with the water jacket W is a cut-off valve 19.

In practice, the radiator R and the water jacket W together with the pipe lines P, L and B are filled with water. As the engine E functions the water within the line P will be heated as it passes through the heater H and within a relatively short period of time such water will be converted into steam. With the valve V closed abnormal pressure within the line P in advance of the valve V will be relieved by the opening of either the valve members or balls 8 or 17 or both, but

with the valve V opened and the pressure normal the steam will pass through the line P forcing the water in the radiator R and line L into the water jacket W until said radiator R and line L are filled with steam. As the steam is returned within the water jacket W it will substantially instantly be condensed. If, during this operation, the pressure within either of the lines P or L should rise beyond normal or in excess of the tension of the members 9 and 18, the valve member or ball 8 or 17 will open under such abnormal pressure permitting flow to the water jacket W until said abnormal pressure is relieved.

The check valve 6 opens at the normal pressure of the water within the cooling system to permit the water to flow into the intake end of the heating circuit, but automatically closes to prevent back flow of water or steam from the intake end of the heating circuit. The check valve 15 will open at about the same pressure that opens the check valve 6, and this check valve 15 is connected in the outlet end of the heating circuit, and opens outwardly with relation thereto. The check valve 15 permits of the discharge of water or steam from the outlet end of the heating circuit but automatically closes to prevent the flow of water or steam into such outlet end. It is essential that an inwardly opening check valve be connected with the inlet end of the heating circuit, upon the intake side of the heating unit and radiator, and an outwardly opening check valve be connected with the outlet end of the heating circuit upon the outlet side of the radiator. The apparatus cannot function without the inlet check valve and outlet check valve, arranged in this manner, as the circulation of water or steam, or a mixture thereof, through the heating circuit, is due to a percolator action, and such circulation is independent of a pump or thermo-siphon. During the operation of the heating circuit, the inwardly opening check valve 6 is unseated by pressure of the water from the coupling 19', and the water passes through the forward portion of the pipe P and enters the heating coil or unit H. Within this coil H, the water is heated and converted in whole, or in part, into steam, creating an increased pressure within the heating coil H. There is a tendency for this pressure to travel forwardly through the forward end of the pipe P, but this cannot occur, since this pressure automatically seats the check valve 6, and, hence, the pressure must travel through the rear portion of the pipe P, forcing the water within the radiator R, outwardly through the pipe L. The water passing outwardly opens check valve 15, and is returned to the water jacket. The pressure upon the water within the radiator R causes the water traveling through the radiator to gain velocity, so that such water, passing the outwardly opening check valve

15, continues to pass such valve after the pressure has been reduced, such travel being caused by the velocity of the traveling water. When check valve 15 again closes, there is a partial vacuum created within the radiator R, the check valve 15 now preventing fluid entering the discharge end of the heating circuit. This partial vacuum or suction within the radiator R is transmitted to the heating coil H, and serves to aid in drawing a fresh charge of water into the heating coil H, which is again converted into steam, in whole, or in part, and forced into the radiator by the expanding action of the same, check valve 6 now being closed.

The steam gains velocity during its travel through and from the radiator, again creating a partial vacuum or suction within the radiator, when the check valve 15 closes, and the cycle of operation is repeated. It is thus seen that when the device is in operation, the steam is caused to circulate within the heating circuit by a percolator action, embodying the rapid travel of the same through the radiator for producing velocity when passing the outwardly opening check valve, so that the discharge continues, after the original propelling pressure is reduced.

In addition to the percolator action, there is a condensation action which aids in the circulation of the fluid through the heating circuit. If the radiator R becomes completely filled with steam, with check valve 15 closed, this steam will condense in the radiator, in whole, or in part, thus producing a partial vacuum or suction within the radiator R, and since check valve 15 is closed, this suction will be transmitted to the heating coil H, which will cause a fresh charge of water to be fed into this heating coil, the cycle of operation being repeated, as is obvious.

With the system in operation, it is to be understood that the valve 19 is opened as desired but, of course, when it is desired to entirely cut out the system this valve 19 is closed. The valve V is operated to cut out the radiator R when desired or to regulate or control the admission of the steam thereto.

When the system is not in use, the lines P and L together with the radiator R may be readily drained through the cock 20 interposed in the line P at the lowermost point of the apparatus and preferably in advance of the heater H.

From the foregoing description it is thought to be obvious that a heating system constructed in accordance with my invention is particularly well adapted for use by reason of the convenience and facility with which it may be assembled and operated, and it will also be obvious that my invention is susceptible of some change and modification without departing from the principles and spirit thereof and for this reason I do not wish to be understood as limiting myself to the pre-

cise arrangement and formation of the several parts herein shown in carrying out my invention in practice except as hereinafter claimed.

I claim:—

1. In a steam heating apparatus for a vehicle driven by an internal combustion engine having an exhaust element and a source of water, a heating circuit including a vehicle-heating radiator, an inlet pipe connected with the radiator and with the source of water, a steam generating element connected in the inlet pipe and receiving heat from the exhaust element, an outlet pipe connected with the radiator and connected with the source of water, a check valve connected with the inlet pipe upon the inlet side of the steam generating element and opening toward the steam generating element for supplying water into the same, and a check valve connected in the outlet pipe upon the outlet side of the radiator, the last-named check valve opening toward the source of water to permit of the discharge of water from the outlet pipe, the arrangement of the two check valves being such that the condensation of steam in the radiator produces a suction therein which draws water into the steam generating element from the source of water.

2. In a steam heating apparatus for a vehicle driven by an internal combustion engine having an exhaust element and a source of water, a heating circuit including a vehicle heating radiator, an inlet pipe connected with one end of the radiator and with the source of water, a steam generating element connected in the inlet pipe and receiving heat from the exhaust element, an outlet pipe connected with the opposite end of the radiator and connected with the source of water, a check valve connected with the inlet pipe upon the inlet side of the steam generating element and opening toward the steam generating element for supplying water into the same, and a check valve connected in the outlet pipe upon the outlet side of the radiator, the last-named check valve opening toward the source of water to permit of the discharge of fluid from the outlet pipe, the two check valves being opened by substantially the same pressure the arrangement being such that the condensation of steam in the radiator produces a suction therein which draws water into the steam generating element from the source of water.

3. In a steam heating apparatus for a vehicle driven by an internal combustion engine having an exhaust element and a source of water, a heating circuit including a vehicle heating radiator, an inlet pipe connected with the radiator and with the source of water, a steam generating element connected in the inlet pipe and receiving heat from the exhaust element, an outlet pipe connected with the radiator and connected with

the source of water, a check valve connected with the inlet pipe upon the inlet side of the steam generating element and opening toward the steam generating element for supplying water into the same, a check valve connected in the outlet pipe upon the outlet side of the radiator, the last-named check valve opening toward the source of water to permit of the discharge of fluid from the outlet pipe, the arrangement of the two check valves being such that the condensation of steam in the radiator produces a suction therein which draws water into the steam generating element from the source of water, a pressure relief valve connected in the inlet pipe and opening outwardly with respect to the same for discharging fluid therefrom under excessive pressure, and a second pressure relief valve connected with the inlet pipe upon the outlet side of the steam generating element and discharging fluid from the same under excessive pressure.

4. In a steam heating apparatus for a vehicle driven by an internal combustion engine having an exhaust element and a source of water, of a heating circuit including a vehicle heating radiator, an inlet pipe connected with the radiator and with the source of water, a steam generating element connected in the inlet pipe and receiving heat from the exhaust element, an outlet pipe connected with the radiator and connected with the source of water, a check valve connected with the inlet pipe upon the inlet side of the steam generating element and opening toward the steam generating element for supplying water into the same, a check valve connected in the outlet pipe upon the outlet side of the radiator, the last-named check valve opening toward the source of water to permit of the discharge of fluid from the outlet pipe, the arrangement of the two check valves being such that the condensation of steam within the radiator causes a suction therein which draws water into the steam generating element from the source of water, and a pressure relief valve connected with the heating circuit.

In testimony whereof I hereunto affix my signature.

ROBERT E. CARNES.

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