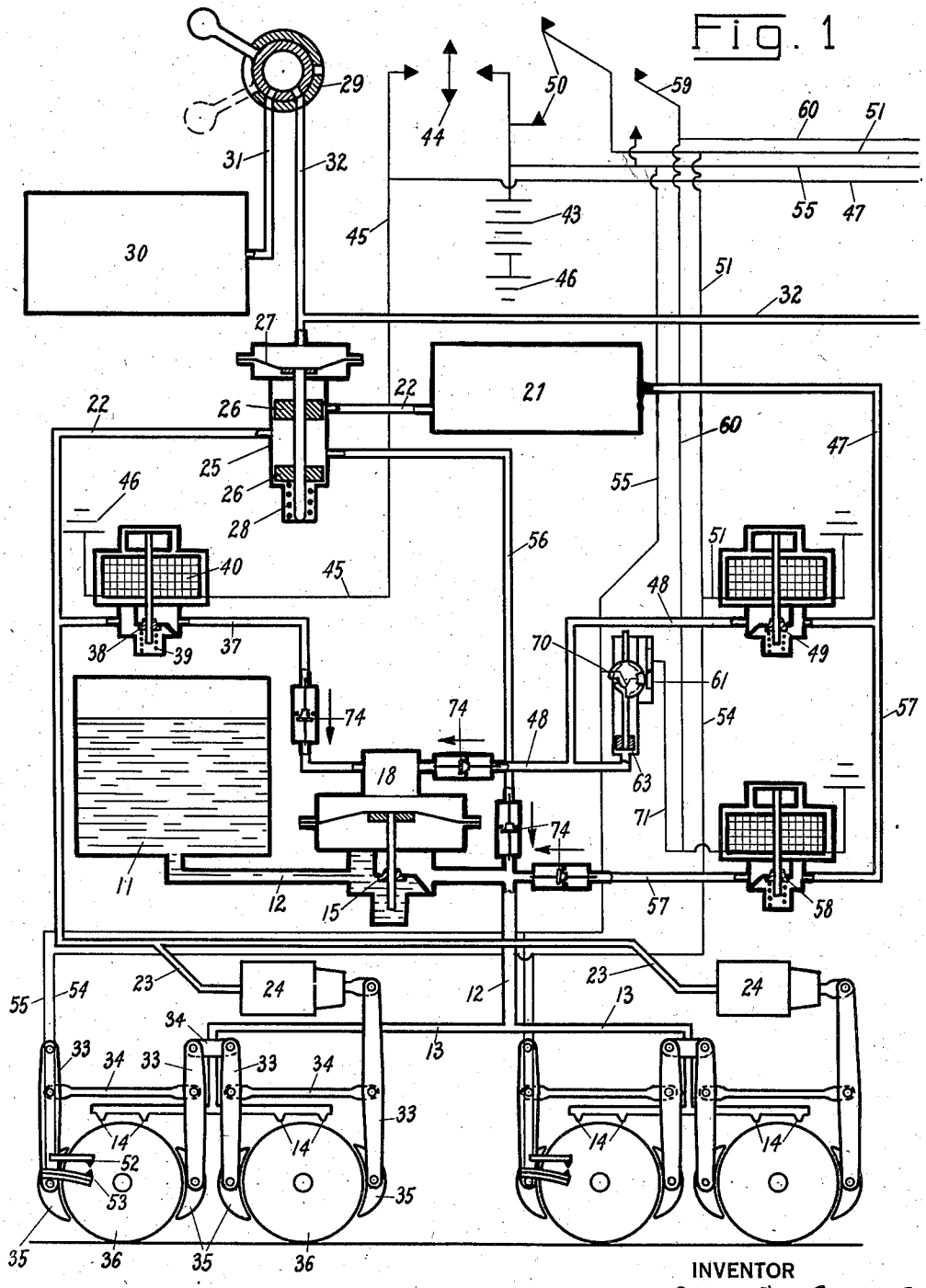
Dec. 14, 1937. G. McCORMICK 2,102,181

WHEEL COOLING APPARATUS

Filed Dec. 14, 1936 2 Sheets-Sheet 1

Fig. 1



INVENTOR

BY George McCormick

Booth & Booth

ATTORNEYS

Dec. 14, 1937. G. McCORMICK 2,102,181

WHEEL COOLING APPARATUS

Filed Dec. 14, 1936 2 Sheets-Sheet 2

Fig. 2

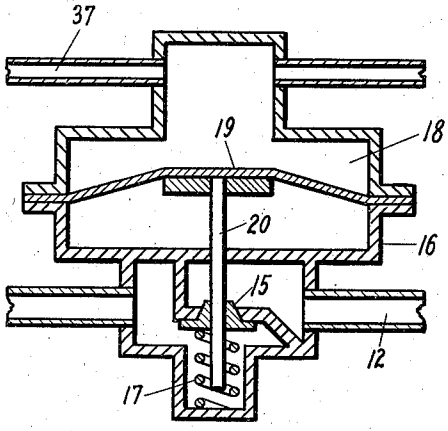


Fig. 3

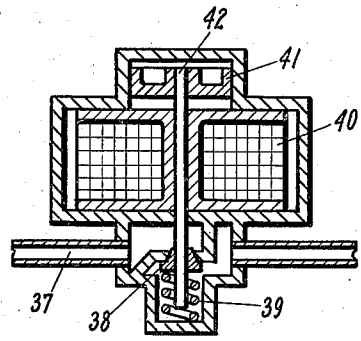
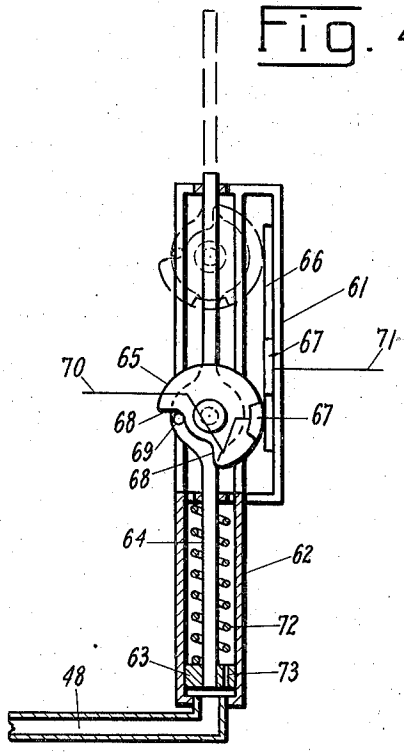


Fig. 4



INVENTOR

BY George McCormick

Booth & Booth

ATTORNEYS

Patented Dec. 14, 1937

2,102,181

UNITED STATES PATENT OFFICE

2,102,181

WHEEL COOLING APPARATUS

George McCormick, Redwood City, Calif.

Application December 14, 1936, Serial No. 115,794

12 Claims. (Cl. 188—264)

The present invention relates to apparatus for cooling the wheels of railway cars and engines, in order to prevent the overheating thereof by prolonged application of the brake shoes.

The principal object of the invention is to provide an apparatus for applying a cooling fluid, preferably water, directly to the tread surfaces of the wheels, and to provide means whereby the application of said cooling fluid can be controlled, either manually by the engineer, or automatically by the application of the brakes or by a rise in temperature of the wheels themselves. Another object of the invention is to provide means, manually or automatically controlled, for discharging the water from those parts of the cooling system which extend into exposed positions in the car trucks, in order to prevent clogging of said parts by freezing of the water therein in cold weather.

A further object of the invention is to provide a system adapted either for operation from each individual car or from the engineer's cab of a train. Still further objects and advantages of the invention will become apparent from the following specification, which should be read with the understanding that the form, construction and arrangement of the several parts may be varied within the limits of the claims hereto appended, without departing from the spirit of the invention.

Reference will be made to the accompanying drawings wherein

Fig. 1 is a diagram, partly in section, of the control apparatus and one unit of the operating apparatus as mounted on one car.

Fig. 2 is a section, enlarged, of a preferred form of air-operated valve for controlling the flow of cooling water.

Fig. 3 is a section, enlarged, of a preferred form of magnetic valve for controlling the air which operates the cooling apparatus.

Fig. 4 is an elevation, enlarged and partly in section, of a preferred form of delayed action switch for controlling the water ejecting mechanism.

Referring more particularly to the drawings, the reference numeral 11 designates a storage tank mounted in any convenient location on the car and adapted to contain a supply of water. 12 is a discharge pipe leading from said tank 11 and provided with branches 13, one leading to each truck of the car. The branch pipes 13 terminate in discharge nozzles 14 positioned above the wheels of the truck, and adapted to discharge the water directly onto said wheels.

The water discharge pipe 12 is provided with a control valve 15, which can, if desired, be any ordinary form of manually operated valve. However, I prefer to employ a pneumatically controlled valve shown in detail in Fig. 2. In this form of valve, which is inclosed in a housing 16, a spring 17 holds the valve closed. In order to open it, air under pressure is admitted to a chamber 18 above a diaphragm 19 which is connected with the valve 15 by a stem 20. Air pressure in the chamber 18 depresses the diaphragm and opens the valve.

The air for operating the valve 15 is drawn from a reservoir 21, Fig. 1, which may conveniently be the reservoir of the air brake system of the car, from which leads the usual brake pipe 22 with branches 23 to the brake cylinders 24 of each truck. The brake is controlled by the usual mechanism, which I have shown for the sake of illustration as a valve structure 25 in which is a double piston valve 26 operated in one direction by a diaphragm 27 and in the other direction by a spring 28. The operating valve 25 is controlled, as usual, by the engineer's valve 29 herein indicated as a simple form of valve for admitting air from the train line reservoir 30 through pipes 31 and 32 to the space above the diaphragm 27. When the pressure in the train line 32 is relieved, the piston valve 26 is moved upwardly, allowing air from the brake reservoir 21 to flow through the pipes 22 and 23 to the brake cylinders 24 to apply the brakes. The mechanical structure of the brake mechanism can be of any ordinary form, herein shown as a system of levers 33 and links 34, which apply the brake shoes 35 against the wheels 36.

The same operation of the brake valve 25 which admits air to the brake pipe 22 also admits air to a branch 37 of said pipe, and thence to the chamber 18 of the water control valve 15, so that when the brake is applied the water control valve 15 is also automatically opened, allowing the cooling water to flow through the pipes 12 and 13 and to discharge onto the wheels.

In order to prevent automatic operation of the water valve with the brake valve, and to enable the water valve to be controlled manually, independently of the operation of the brake, I prefer to provide a magnetically operated valve 38 in the air pipe 37. The valve 38, shown in detail in Fig. 3, is normally held closed by a spring 39, and is opened by an electromagnet 40 which attracts an armature 41 attached to the stem 42 of said valve. Electric power for

operating the magnet 40 is supplied from any suitable source indicated at 43 in Fig. 1, which is connected with the magnet by a manual selector switch 44 and a wire 45, the return circuit being grounded on the frame of the car, as indicated at 46. Thus, when the switch 44 is open, as shown, the valve 38 remains closed, and the water control valve 15 is not operated automatically by the application of the brake. When the switch 44 is closed, however, the valve 38 is held open and the water control valve is automatically operated with the brake as described above.

In order to provide for manual control of the water valve 15, a connection is made by pipes 47 and 48 between the air tank 21 and the chamber 18 of the water valve. The pipe 48 is controlled by a magnetic valve 49 similar in construction to the valve 38 described above. A manually operated switch or key 50 and a wire 51 connect the source of current 43 with the magnet windings of the valve 49, the return circuit being grounded. Closing of the key energizes the magnet of said valve and allows air to flow through the pipes 47 and 48 to the water valve. The valve 49 is closed by a spring when the key is open.

There is also provided an additional means for controlling the water valve automatically by the heat generated by the braking of the wheels. A thermostatic switch, indicated as a pair of contacts 52 and 53, are connected by wires 54 and 55 in parallel with the contacts of the key 50. The contact 53 is a bimetallic element responsive to heat, and is positioned in close proximity to the rim of one of the wheels and the brake shoe acting thereon. When the temperature of the wheel rises to a predetermined value, the thermostatic contacts are closed, supplying current through the wires 55 and 54 to the magnetic valve 49, and thereby admitting air to the water valve 15. The water will flow onto the wheels until their temperature is reduced sufficiently to open the thermostatic contacts.

The water pipes 12 and 13, especially the latter, are necessarily in exposed positions underneath the car, and any water which may remain in them after the closing of the water valve is likely to freeze in cold weather. Such freezing would, of course, clog the pipes and render the system inoperative. In order to prevent this, I provide means for expelling the remaining water from the pipes 12 and 13, automatically, upon the closing of the control valve 15. A pipe 56 connects the air brake valve chamber 25 with the water pipe 12. The pipe 56 is so connected with the chamber of the valve 25 that it is closed when the pistons 26 of said valve are raised to permit air to flow from the tank 21 into the brake pipe 22. When the supply of air to the brakes, and also to the water valve 15, is cut off by the downward movement of the pistons 26 to the position shown in the drawings, the pipe 56 is open to the interior of the brake valve chamber and conducts the air pressure remaining therein to the water pipe 12. This air is sufficient to expel from the pipe 12 and its branches 13 the water trapped therein by the closing of the water valve 15.

To achieve the same result when the water valve is controlled either manually or thermostatically through the magnetic valve 49, I provide a pipe 57 connecting the air pipe 47 with the water pipe 12. The air pipe 57 is controlled by a magnetic valve 58 similar in construction to the magnetic valve 38 hereinbefore described. The magnetic valve 58, which is normally held closed by a spring, is opened either manually, for example by a key 59 connected with its windings by a wire 60, or automatically by the pressure in the air pipe 48, through a suitable delayed contact self resetting switch indicated generally by the numeral 61. A preferred form of such a switch is illustrated in Fig. 4 and comprises a cylinder 62 in communication with the air pipe 48 and provided with a piston 63. A rod 64 connected with said piston carries a rotatable disk 65 whose periphery has frictional engagement with a stationary vertical surface 66. Electrical contact segments 67 are mounted in the disk and the vertical surface 66 and are so positioned that upon the upward stroke of the rod 64 electrical connection is not established between the said contacts. The rotation of the disk 65 is limited, in both directions, by shoulders 68 and a pin 69. Upon the upward stroke, the disk rolls upon the surface 66 without making electrical connection between the contacts 67 until the lower shoulder 68 strikes against the pin 69. for the rest of the upward stroke, the disk slides over the surface 66, thereby altering the positional relation between the two contacts. Upon the downward stroke, the disk again rolls, this time in the reverse direction, and because of their altered relation due to the slippage described above, the contacts 67 now make connection and close the electrical circuit for a short period of time during the downward stroke. The contacts 67 connect the windings of the magnetic valve 58 with the source of current through the wires 55, 70, and 71, the return circuit being grounded as before, as shown in Fig. 1.

The piston 63 is raised when air pressure is admitted to the pipe 48 to open the water valve 15, and as long as the pressure continues in said pipe 48, the magnetic valve 58 remains closed because no connection has been established between the contacts 67. When the air is cut off from the pipe 48, the piston 63 is moved slowly downwardly by a spring 72, Fig. 4, the air beneath it escaping through a bleeder port 73. During this slow downward movement, electrical connection is established between the contacts 67, and the magnetic valve 58, Fig. 1, is held open for a sufficient length of time to permit air to flow through the pipe 57 and to blow out the water from the pipes 12 and 13. At the end of the downward movement of the piston 63, the connection is again broken between the contacts 67 and the magnetic valve 58 is again returned to its normal closed position.

Check valves 74 are interposed in the pipes 37 and 48 leading to the chamber 18 of the water valve, and also in the ejector air pipes 56 and 57, in order to prevent reverse flow of air.

My system is adaptable either to a single car or to a train of cars. The diagram (Fig. 1) shows the apparatus for a single car. For train operation, the brake train pipe 32 is, of course, extended to and through all the cars of the train. The wires 47, 51, 60, and 55, are likewise extended throughout the train. The apparatus shown below the train pipe 32 is repeated in each car, and all sets of such apparatus are controlled simultaneously by the engineer's valve 29, the selector switch 44, and the keys 50 and 59. These four control elements are positioned in the engineer's cab. The keys 50 and 59 may, if desired, be duplicated in each car, so that a trainman in any car can operate the cooling system inde-

pendently of the engineer. The keys 50 and 59 operate the cooling system in either position of the selector switch 44.

It will be seen from the foregoing that my system provides means for cooling the wheels, which can be operated manually or automatically, the automatic control functioning either in response to heat developed in the wheels and brake shoes, or simultaneously with the normal operation of the brakes. It further provides means for ejecting any water that may remain in the exposed portions of the water pipes, which would be in danger of freezing in cold weather. The ejecting function may be controlled manually, or may be entirely automatic, being set in operation whenever the water valve is closed.

I claim:

1. In a railway vehicle having an air operated brake and a valve for controlling the supply of air thereto, means for cooling the wheels of the vehicle comprising a pipe for conducting cooling fluid to said wheels, a valve in said pipe, means for operating said valve by air pressure, a connection between the brake controlling valve and the operating means of the cooling fluid valve, whereby said cooling fluid valve is automatically operated simultaneously with the brake, and a second connection between said brake valve and said cooling fluid pipe whereby air is admitted to said pipe to eject the cooling fluid therefrom after the closing of said cooling fluid valve.

2. In a railway vehicle having a brake system, apparatus for cooling the wheels of said vehicle comprising means for conducting cooling fluid to said wheels, means for automatically controlling the flow of said fluid simultaneously with the operation of said brake, and means for manually controlling said fluid independently of the operation of said brake.

3. In a railway vehicle, means for cooling the wheels thereof, brakes for said wheels, means for operating said brakes, means for automatically operating said cooling means simultaneously with the operation of said brakes, and means for operating said cooling means independently of the operation of said brakes.

4. In a railway vehicle, means for cooling the wheels thereof, brakes for said wheels, means for operating said brakes, means for automatically operating said cooling means simultaneously with the operation of said brakes, means for operating said cooling means independently of the operation of said brakes, and means responsive to the heat generated by the braking of said wheels for operating said cooling means independently of said brake operating means.

5. In a railway vehicle, means for cooling the wheels thereof, brakes for said wheels, means for operating said brakes, means for operating said cooling means simultaneously with the operation of said brakes, and means responsive to the heat generated by the braking of said wheels for operating said cooling means independently of said brake operating means.

6. In a railway vehicle having wheels and brakes therefor, means for cooling said wheels, means responsive to the heat generated by the braking of said wheels for operating said cooling means, and means for manually operating said cooling means independently of said heat responsive operating means.

7. In a railway vehicle, apparatus for cooling the wheels thereof comprising a pipe for conducting cooling water to said wheels, a valve for controlling the supply of water to said pipe, air-pressure actuated means for operating said valve, a source of air under pressure, a conduit connecting said source with said valve operating means, an air valve for controlling the supply of air to said conduit, a connection between said air conduit and said water pipe, and means for controlling said connection whereby the residual pressure remaining in said air conduit after the closing of said air valve is supplied to said pipe to eject the water therefrom.

8. In a railway vehicle, apparatus for cooling the wheels thereof comprising a pipe for conducting cooling water to said wheels, a valve for controlling the supply of water to said pipe, air-pressure actuated means for operating said valve, a source of air under pressure, a conduit connecting said source with said valve operating means, an air valve in said conduit, a normally closed connection between said source of air and said water pipe, and means for opening said connection automatically for a predetermined time upon the closing of said water valve.

9. In a railway vehicle having an air brake system including a source of air under pressure and a brake controlling valve, apparatus for cooling the wheels of said vehicle comprising means for supplying cooling water to said wheels, an air pressure operated valve for controlling said cooling water, means for conducting air from said brake system to said water valve whereby the latter is automatically operated simultaneously with the brakes, and electrically controlled means for conducting air from said source to said water valve to operate the latter independently of said brakes.

10. In a railway vehicle, an air operated brake system, means for cooling the wheels of the vehicle comprising a pipe for conducting cooling fluid to said wheels, means for controlling the flow of fluid through said pipe, and controllable means for conducting air from said brake system to said pipe to eject the cooling fluid therefrom.

11. In a railway vehicle, an air operated brake system, a valve for controlling the supply of air thereto, means for conducting cooling fluid to the wheels of the vehicle, an air operated valve for controlling said cooling fluid, and means for conducting air from the brake system to the cooling fluid valve whereby said cooling fluid valve is operated automatically simultaneously with the brake.

12. In a railway vehicle, an air operated brake system, means for controlling said brake, air operated means for delivering cooling fluid to the wheels of the vehicle, and means for conducting air from the brake system to the cooling means to operate said cooling means simultaneously with the brake.

GEORGE McCORMICK.