

[54] SNOW MELTING DEVICE FOR RAILROAD
TURNOUT

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[22] Filed: Feb. 8, 1974

[21] Appl. No.: 440,709

[30] Foreign Application Priority Data

Feb. 23, 1973 Japan..... 48-22726

[52] U.S. Cl..... 126/271.2 B

[51] Int. Cl..... F23c 5/00

[58] Field of Search... 126/271.1, 271.2 A, 271.2 B,
126/360 A

[56]

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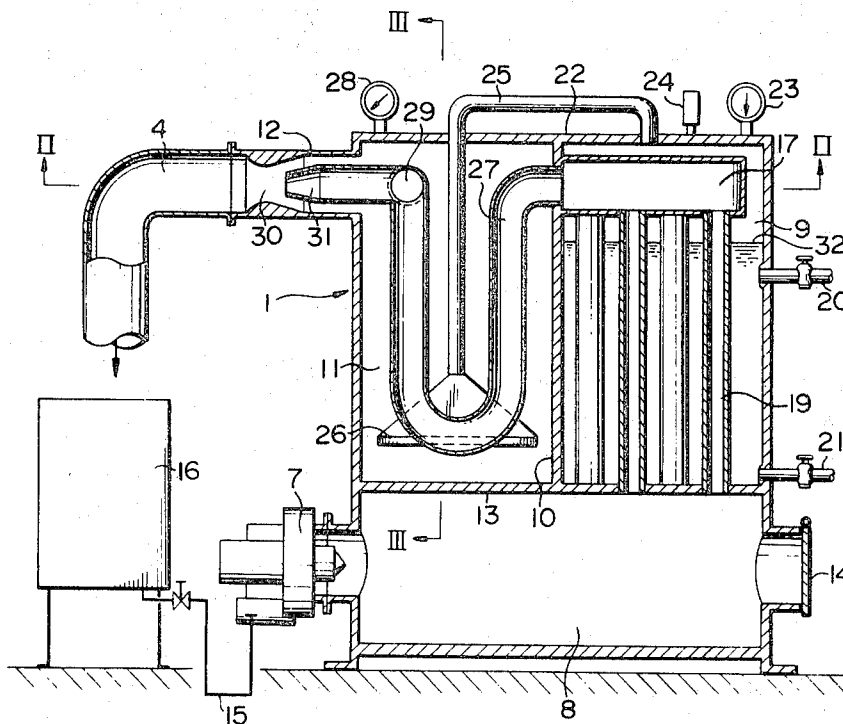
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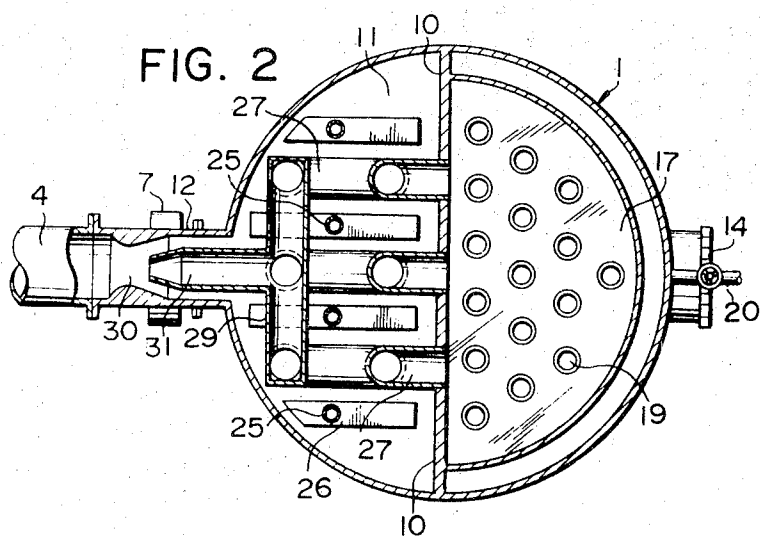
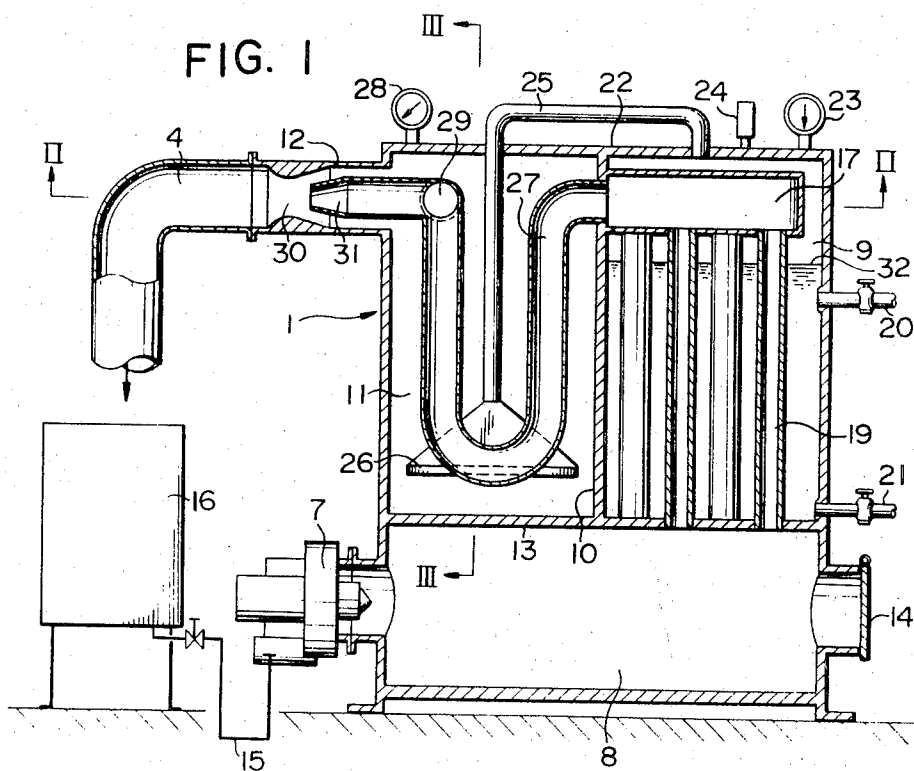
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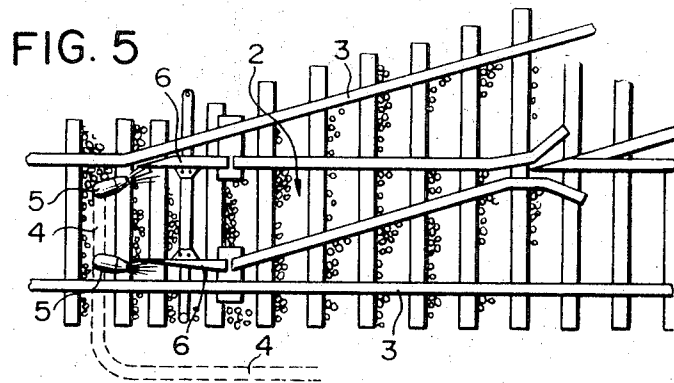
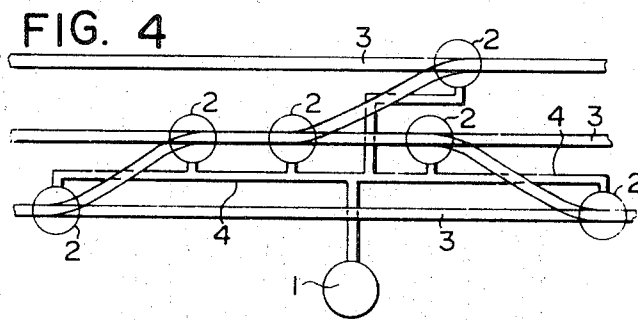
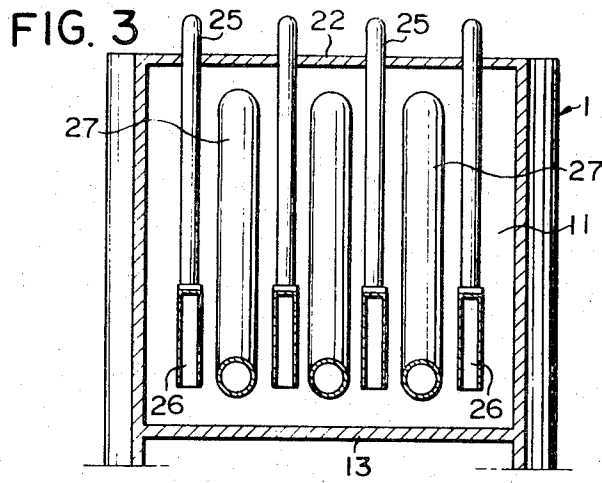
ABSTRACT

A boiler is located near a railroad turnout or switch and the steam from the said boiler is heated by the exhaust gas of the burners of the said boiler to be mixed together with the exhaust gas. The mixture is then sent to the points of the turnout or switch to be utilized in melting the snow piled at and around the turnout.

7 Claims, 5 Drawing Figures







SNOW MELTING DEVICE FOR RAILROAD TURNOUT

BACKGROUND OF THE INVENTION

The present invention concerns a novel snow melting device for points of the railroad turnouts or switches for preventing the turnouts or switches from becoming paralyzed because of the snow, by feeding a gaseous mixture of high temperature steam from a boiler and the high temperature exhaust air from the burners of said boiler.

Rails are often switched after a considerable period of time at the time at the point of railroad turnouts, so that the railroad turnouts or switches in snow-bound areas are frequently frozen because of the snow and the low temperature. In this condition it becomes impossible to move the switch rods. Heretofore, various methods have been proposed to obviate these difficulties; namely a method of removing snow by manpower, a method of melting the snow by pouring warm air or water, a method of heating with electricity or small lamps to prevent freezing, etc. However, these methods have turned out to be not satisfactory and they are not widely used today.

In removing the snow by manpower, it is necessary for the men to be always doing the work while the snow is falling in order to remove the snow from around the switch or turnout point and prevent the same from freezing, and the stations with many turnouts under their supervision would have difficulties in maintaining a required number of men ready for such work. Melting snow by electricity is fatally defective in that the effective scope of the operation is limited compared to the high cost it requires for the facilities and electricity. The same is true of the method of melting snow by warm air, which often employs electricity as the source of heat, and which, therefore, requires provision of electric air heaters at the respective turnout at a high cost. Moreover, the heaters need to be located underground causing instability of the subbase and of the device which is constantly subjected to the vibration of passing trains. The methods of melting snow with oil lamps depends a lot on the direction of the wind as the flames are exposed and the heating efficiency is likely to lower as the wind changes its direction. The method of melting snow by pouring warm water such as underground water to the switch or turnout point was found defective in that the vicinity of the turnout would be constantly flooded and other parts would be frozen and in that it is difficult to remove the water from around the rails.

The present invention was contrived with a view of offering a novel snow melting device using high temperature steam and obviating the problems presently encountered in the field.

SUMMARY OF THE INVENTION

The present invention provides a snow melting device wherein a comparatively small sized boiler is provided near the railroad in the vicinity of a station having a great number of turnouts or switches the said boiler being connected to the point at the respective turnouts via steam feeding pipes. The steam is fed via the said steam feeding pipes to the turnout points and the snow around the turnout points is melted by the heat of the steam.

In accordance with the present invention, the steam from the boiler is heated by the heat from the burners used for generating the steam to obtain the dry steam, mixed with high temperature exhaust gas from the burners and the obtained mixture of the said dry steam and exhaust gas is fed to the point of the turnout.

Further, the present invention provides a steam feeding device for melting snow wherein a steam drying chamber is provided adjacent to a steam generating chamber in the boiler for mixing the steam from the boiler with the exhaust gas from burners. The steam is first introduced into the said dry chamber, then high temperature exhaust gas from the combustion chamber is introduced into the said steam drying chamber via the exhaust pipes provided therein and extending from the said combustion chamber, and cycled in order to heat and dry the steam in the drying chamber. Then the steam coming out of the drying chamber and the exhaust gas discharged from the discharge pipes are mixed in the mixing chamber having a Venturi pipe provided in a part of the steam drying chamber.

BRIEF DESCRIPTION OF DRAWINGS

The purposes of and advantages of the present invention will become more apparent from the following description of the invention taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a vertical cross sectional view of a boiler in the snow melting device in accordance with the present invention;

FIG. 2 is a cross sectional view along the lines II—II in FIG. 1;

FIG. 3 is a cross sectional view along the lines III—III in FIG. 1;

FIG. 4 is a diagram to explain the piping arrangement of the steam feeding pipes connecting the boiler with turnouts of the railroad; and

FIG. 5 is a plan view showing the location of outlets for the steam feeding pipes in the turnouts.

DESCRIPTION OF PREFERRED EMBODIMENT

FIGS. 1 to 3 show a concrete plan of a boiler 1 for mixing the steam and the exhaust gas. The boiler 1 is to be located in the vicinity of the railroad 3 which has comparatively large number of turnouts or switches 2 such as in the compound of a railroad station as shown in FIG. 4. The boiler 1 is to be located, preferably, in a position approximately halfway between the two turnouts 2 by giving consideration to the positions of the respective turnouts 2. The steam feeding pipes 4 are arranged in branched out positions to be connected to the turnouts 2 in respective rails 3 with the pipes partly buried underground, and as shown in FIG. 5, the nozzles 5 open against the points 6 at the turnout 2 at the end of the respective branched out portions of the steam feeding pipes 4. Since the boiler 1 is used to feed the steam to the turnouts 2, it does not have to be a large sized boiler, but a small sized portable type will suffice. Then, the boiler may conveniently be stored in storage during the summer months when there is no snow by removing the same from the steam feeder pipes 4 so that it may not be unnecessarily subjected to the repeated shocks from the violent vibrations of the passing trains.

The cylindrical boiler 1 comprises a combustion chamber 8 having a combustion burner 7, a steam generating chamber 9 positioned on top of the said com-

bustion chamber 8, a steam drying chamber 11 partitioned by a partition wall 10 from the said steam generating chamber 9 and a mixing chamber 12 for mixing the steam and the exhaust gas provided outside the said steam drying chamber 11. The chambers are arranged in such a way that the combustion chamber 8 is positioned at the lowermost side and the partition wall 10 separating the boiler 1 approximately in half longitudinally is provided atop the ceiling 13 of the said combustion chamber 8, one of the spaces thus partitioned serving as the steam generator 9 and the other as the steam drying chamber 11. The combustion chamber 7 is attached to the side near the steam drying chamber 11 in the combustion chamber 8 whereas on the opposite side of the said burners 7 in the said combustion chamber 8 is provided the door 14. The burner 7 is connected to the oil tank 16 via the oil feeding pipe 15. On top of the steam generating chamber 9 is provided an exhaust air chamber 17 fixed to the partition wall 10 at one end thereof, and a plural number of pipes 19 are arranged longitudinally through the bottom plates of the exhaust air chamber 17, and ceiling 13 of the combustion chamber 8 respectively. The water pipe 20 and the exhaust pipe 21 are connected to the steam generating chamber 9 from outside and the water 32 is stored within the said chamber. There is provided a pressure gauge 23 and a safety valve 24 on the outside of the ceiling 22 of the steam generating chamber 9, and a plural number of steam guide pipes 25 to connect the same with the said chamber 9 are connected at one end thereof. These pipes 25 extend through the ceiling 22 directly above the steam drying chamber 11 and toward the lower side of the said chamber 11, and the lower end of the pipe 25 has a hopper 26 for dispersing the steam toward the bottom of the drying chamber 11. On the other hand, a plurality of exhaust air pipes 27 with a large diameter extend into the steam drying chamber 11 passing through the partition wall 10 from the exhaust air chamber 17 provided atop the steam generating chamber 9, and the pipes 27 bend upwardly at the bottom of the said chamber 11 after being bent once downwardly within the said chamber 11, and further point toward the gathering pipe 29 positioned in the upper part of the chamber. There is provided a pressure gauge 28 on the outside of the ceiling 22 of the steam drying chamber 11, while the cylinder shaped mixing chamber 12 for exhausting the steam from within the said chamber extends outwardly. Within the mixing chamber 12, there is provided a Venturi pipe 30 and the pipe end 31 extending from the gathering pipe 29 of the said exhaust air pipe 27 extending upwardly in the steam drying chamber 11 is positioned in such a way that it comes to the back of the said Venturi pipe 30 passing through the mixing chamber 12. At one end of the mixing chamber 12 is connected the said steam feeding pipe 4 toward the respective turnouts 2 as shown in FIG. 4.

When the snow season starts and working of turnouts becomes difficult, the boiler 1 may be set at a predetermined position and connected to the mixing chamber 12 and to the steam feeding pipe 4 already laid out, and after allowing the predetermined amount of water 32 stored in the steam generating chamber 9 via the water feeding pipe 20, the burner 7 is ignited. The heat from the burner 7 heats the water 32 in the steam generating chamber 9 and the steam drying chamber 11 via the ceiling 13 of the combustion chamber 8. The exhaust

gas within the combustion chamber 8 enters the exhaust air pipe 17 via the pipe 19 within the steam generating chamber 9 and is sent to the mixing chamber 12 via the exhaust air pipe 27. While the exhaust air is travelling, the pipe 19 further heats the water 32 to accelerate the generation of a great amount of steam within the steam generating chamber 9. The steam thus generated in the steam generating chamber 9 is sent to the steam drying chamber 11 via the steam guide pipe 25 and dispersingly discharged into the said drying chamber 11 thus heated. The steam discharged in the drying chamber 11 is the wet steam of 100°C temperature, but while it travels upwardly from the bottom of the pre-heated chamber 11, it comes into contact with the high temperature within the said chamber 11 and with the exhaust air pipe 27 extending the length of the same to become a high temperature dry steam. The said dry steam is then sent to the mixing chamber 12 and increases its velocity when passing through the Venturi pipe 30 and creates a minus load at the end of the mixing chamber 21. The minus load acts to let the exhaust gas discharged out of the end 31 of the exhaust air pipe forcibly be absorbed into the end of the mixing chamber 21 where it is mixed completely with the dry steam and becomes a mixed gaseous substance of about 220°C and at the same time accelerates a complete combustion within the combustion chamber 8. That is to say, the mixing chamber 12 acts as the smoke stack for the boiler in generating the absorbent energy and eliminates a need for the smoke stack in this apparatus. The mixed air of steam and exhaust gas that has come out of the mixing chamber 12 and entered the steam feeding pipe 4 flows toward respective turnouts 2 and is discharged toward the point 6.

The snow melting device in accordance with the present invention utilizes the high temperature exhaust gas from the boiler 1 without wastefully discharging the same into the air by heating and drying the steam and then mixing the gas therein. Thus, the heating efficiency is quite high and the discharged mixed air in the direction of the point 6 or the respective turnouts is almost colorless and the temperature is about 180°C, so that it does not obstruct the view of the trains as does the white colored non-transparent wet steam does. Another advantage of the present invention is that the steam generated by the boiler becomes a high temperature mixed air as it is mixed with the exhaust air from combustion, thereby eliminating a need for a large sized boiler. The boiler to be used in this invention needs to be a small sized boiler which may be easily and freely moved about. Such a boiler is easy to handle and costs little in installation and maintainance, thus providing still another advantage of the present invention.

What is claimed is:

1. A snow melting apparatus for railroad switches or turnouts, comprising:

a high temperature mixed air producing means including:

a boiler (1) having a combustion chamber (8) and means for heating said combustion chamber (8);
a steam generating chamber (9) and a steam drying chamber (11) partitioned from each other by a partition wall (10) in the upper part of said boiler (1);

a steam guiding pipe (25) extending from said steam generating chamber (9) into said steam drying chamber (11);

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an exhaust air pipe means (19, 27) extending from said combustion chamber (8) into said steam drying chamber (11) and passing through said steam drying chamber (11) without discharging exhaust air into said steam drying chamber (11); and a mixing chamber (12) having a Venturi pipe (30) connected to said steam drying chamber (11) and to an outlet (31) of said exhaust air pipe means (19, 27) for mixing the dry steam from said steam drying chamber (11) and the exhaust gas from said exhaust air pipe means (19, 27); and feed pipe means (4) coupled to said mixing chamber (12) for feeding said mixed dry steam and exhaust gas to said switches or turnouts.

2. Apparatus according to claim 1 comprising a hopper (26) within said steam drying chamber (11) and connected to the end of said steam guiding pipe (25) for introducing said steam into said steam drying chamber (11).

3. Apparatus according to claim 1 wherein said exhaust air pipe means passes adjacent the outlet of said steam guiding pipe (25) in said steam drying chamber (11).

4. Apparatus according to claim 1 wherein said mixing chamber is generally cylindrically shaped and is connected to the upper portion of said steam drying

chamber (11), said outlet (31) of said exhaust air pipe means (19, 27) extending into said mixing chamber (12), the velocity of the dry steam entering into said mixing chamber (12) from said steam drying chamber (11) being accelerated by said Venturi pipe (30) to cause a negative load at the end of said mixing chamber (12), said negative load operating to draw the exhaust gas from said exhaust air pipe means (19, 27) to enhance the mixing of the dry steam with the exhaust gas.

5. Apparatus according to claim 1 wherein said exhaust air pipe means comprises first pipe means (19) extending from said combustion chamber (8) into said steam generating chamber (9), an exhaust air chamber (17) coupled to said first pipe means (19) and located in the upper portion of said steam generating chamber (9), and second pipe means (27) extending from said exhaust air chamber (17) through said steam drying chamber (11).

6. Apparatus according to claim 1 wherein said exhaust pipe means (19, 27) extends through said partition wall (10).

7. Apparatus according to claim 1 wherein said feed pipe means (4) includes a plurality of nozzles (5) for directing said mixed dry steam and exhaust gas toward a plurality of said switches or turnouts.

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