June 22, 1954 B. J. POLLARD 2,681,828

PROCESS OF AND APPARATUS FOR REMOVING ICE FROM STREETS

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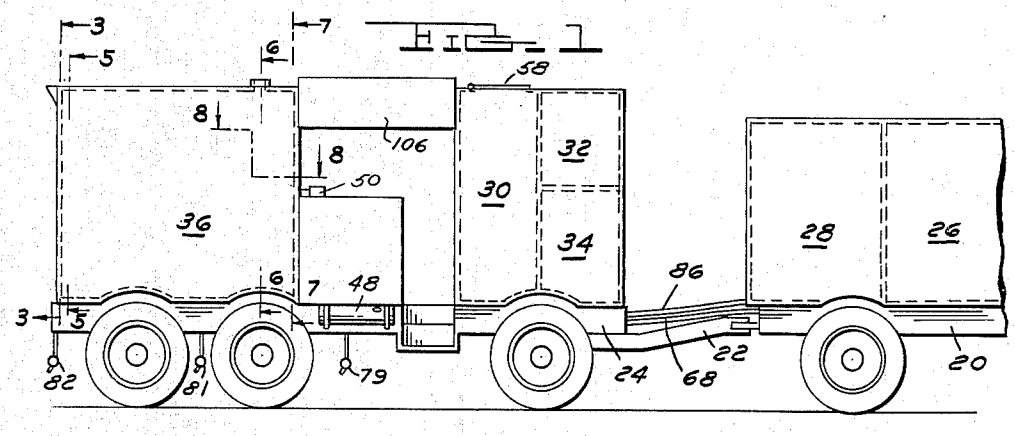
FIG. 1



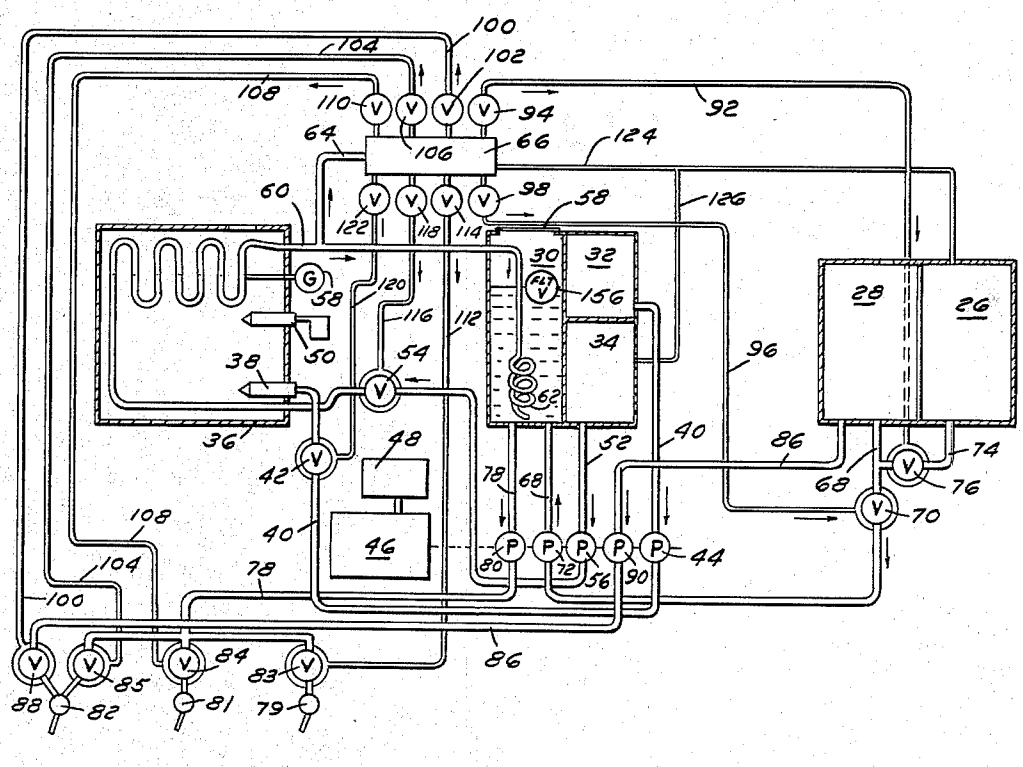


FIG. 2

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FIG. 7

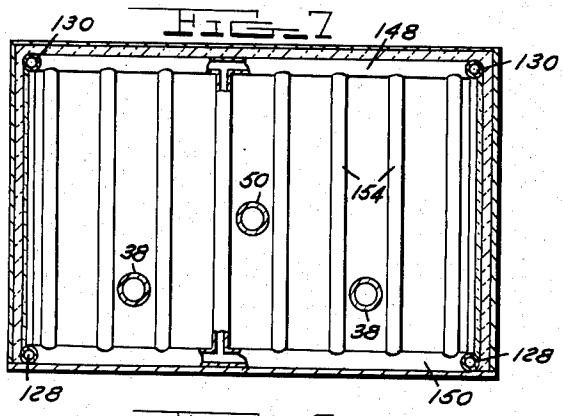


FIG. 4

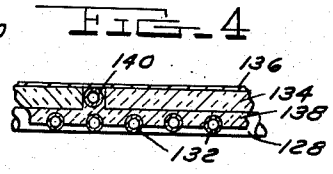


FIG. 3

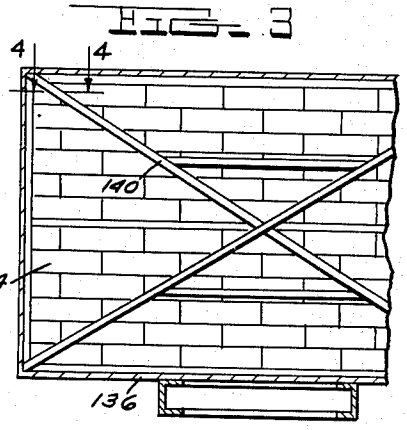


FIG. 6

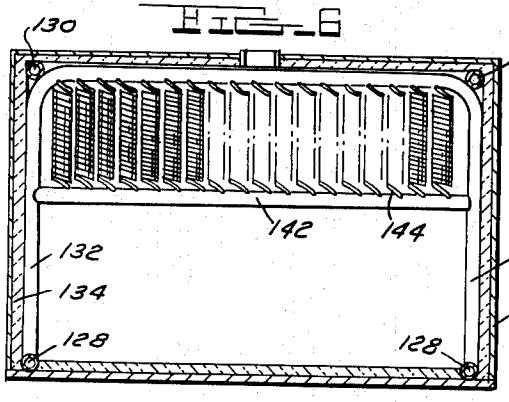


FIG. 8

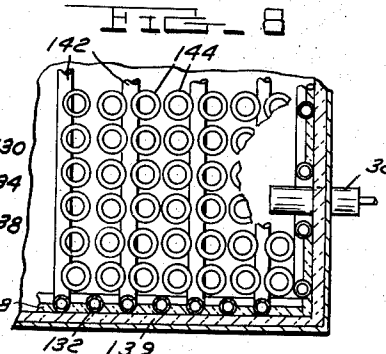


FIG. 5

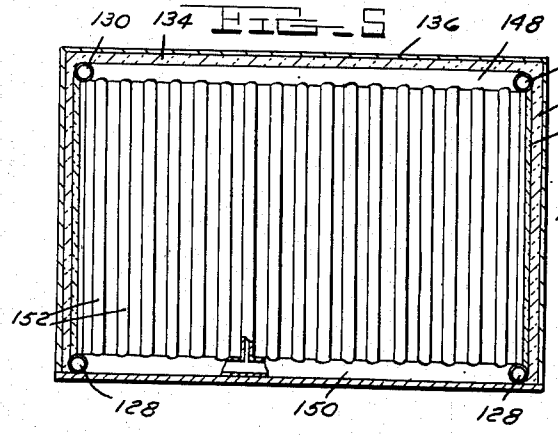
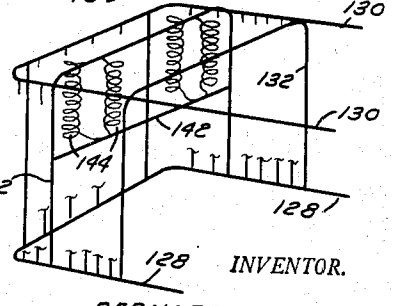


FIG. 9



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UNITED STATES PATENT OFFICE

2,681,828

PROCESS OF AND APPARATUS FOR REMOVING ICE FROM STREETS

Bernard J. Pollard, Detroit, Mich.

Application August 2, 1951, Serial No. 240,010

5 Claims. (Cl. 299—36)

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This invention relates to improvements in method of and apparatus for the removal of snow and ice from pavements or the like. More particularly it relates to improvements in means for removing from pavements snow and ice and facilitating removal thereof by other conventional mechanism. It comprises applying, by spraying or the like, a hot solution of calcium chloride or some other hot chemical solution to a snow or ice covered pavement to lower the freezing point thereof and thereby dissipate the snow and ice.

One common method heretofore practiced for the removal of ice and snow from sidewalks and pavements has been to spread calcium chloride or other salt crystals upon the ice and snow covered surface. Such practice employed a large amount of dry granule material. It was slow to carry out and the accomplishment of the desired end was likewise slow.

An object of this invention is to provide apparatus for delivering a hot solution of the character described, such as a hot calcium chloride solution, upon a snow or ice covered surface and delivering the same at the desired temperature and concentration to facilitate the removal of the snow and ice. If snow is falling or if already fallen snow is light it may be completely flushed off of the pavement into the sewer with a hot weak solution. If the snow is packed or sleet or ice is present a more concentrated solution may be needed. Even though the snow and ice will not flush off through applying the solution it will be broken up so that it may be easily and quickly removed with other conventional mechanical apparatus normally provided for such purpose.

Through employing the apparatus herein described a large surface area may be quickly treated and a relatively small quantity of calcium chloride will serve to treat a relatively large area as compared with a relatively large quantity of calcium chloride crystals required to treat the same area by the application of the dry granule substance thereto.

A further object is to provide apparatus of the character described which is of light weight and which may be carried readily upon a road vehicle provided for the purpose. The apparatus is so constructed and arranged that a hot solution is provided in such quantity as to serve a large area and is constantly maintained through the employment of an improved boiler and heating means. The entire apparatus is sufficiently compact and light in weight as to be capable of being mounted upon a motor vehicle and transported thereby.

The construction is such that the liquid employed to form the solution is protected from freezing notwithstanding the cold weather during which the apparatus is used and the valves provided to control the flow of liquid are likewise kept from freezing. The arrangement and construction is such that the hot solution is constantly maintained and readily available for discharge as desired. The concentration and temperature of the solution may be controlled as desired.

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The novel type of boiler provided for the purpose is one that is light in weight yet will quickly heat the water to provide steam. It is designed to not only to produce steam quickly but is designed to produce steam in substantial quantity. My improved boiler requires a minimum amount of insulation material and provides a maximum amount of steam producing capacity quickly available for use.

Other objects, advantages and meritorious features will more fully appear from the following description, claims and accompanying drawings wherein:

Fig. 1 is a schematic elevation of a portion of a truck and trailer provided with the equipment of my invention;

Fig. 2 is a diagrammatic layout of the liquid and steam lines and containers including the boiler and liquid tanks provided for the invention;

Fig. 3 is a vertical fragmentary section taken on the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary horizontal section taken on line 4—4 of Fig. 3;

Fig. 5 is a vertical cross sectional view taken on line 5—5 of Fig. 1;

Fig. 6 is a vertical cross sectional view taken on the line 6—6 of Fig. 1;

Fig. 7 is a vertical cross sectional view taken on the line 7—7 of Fig. 1;

Fig. 8 is a fragmentary horizontal sectional view taken on the line 8—8 of Fig. 1;

Fig. 9 is a diagrammatic view illustrating in part the boiler structure.

My improved apparatus is designed particularly for the removal of snow and ice from pavements over which motor vehicles travel. It is shown as mounted upon a self-propelled vehicle and its trailer. The tow truck is indicated as 20. A coupling bar 22 hitches a trailer 24 thereto. Most of the apparatus is mounted on the trailer, but a portion of it is shown as mounted on the truck. Obviously the relative disposition upon the truck and the trailer might be as found most convenient.

It has been found that the removal of snow

and ice from city pavements by mechanical means is a slow and costly process. It has likewise been found that applying granular calcium chloride or other salt or chemicals to the snow and ice covered pavements is likewise costly and slow. Not only is the application of the crystalline material to the snow and ice covered surface a slow operation, but the crystals function slowly to accomplish their purpose. Furthermore, a large amount of the crystalline material is required and the operation is a costly one. In addition, due to the excess amount of material required the destructive effect upon the finish of motor vehicles traveling over the pavement is pronounced.

It is my purpose to accomplish the removal of the snow and ice more rapidly and more cheaply and by the application of the snow and ice covered surface of a hot solution of calcium chloride or other chemical. The temperature of the solution will depend upon the character of the surface treated. The process is one wherein heat of the solution as well as the chemical activity thereof serves to accomplish the purpose desired.

In Fig. 1 of the drawing there is shown mounted on the tow truck 20 a water tank 26 and a concentrated solution tank 28. Mounted upon the trailer is the remainder of the apparatus. There is a hot solution tank 30 and fuel tank 32, a boiler water supply tank 34, and a boiler 36, all mounted upon the trailer. Burner 38, shown in Fig. 2 is for the heating of the boiler. This burner may be of any suitable type such as an oil burner which communicates by a feed line 40 with the fuel tank 32. A valve 42 is shown in the line 40 and a pump 44 is illustrated diagrammatically as driven by motor 46 to feed fuel from the fuel tank to the burner. Such pump may be of the centrifugal variety and may be driven off the motor 46 which motor may be fed with fuel from a tank 48 in any desired manner. This pump 44 is one of a series of pumps hereinafter described all of which are driven from the motor 46 in unison. Each pump may be a centrifugal pump and when the valve is closed in the line through which the pump forces liquid the action of the pump will merely be against the head of the valve.

50 indicates an auxiliary burner which may be provided in any character desired. It is merely a standby burner to be brought into operation if the regular burner fails for one reason or another. The boiler is adapted to produce steam to maintain the required temperature in the hot solution tank 30. The construction of the boiler is hereinafter more particularly described but there is a water line 52 leading from the boiler water tank 34 to the boiler. A valve 54 is provided in such line to control the flow of water therethrough. A pump 56 coupled with the motor 46 is provided to feed water from the tank 34 to the boiler. Water would normally be maintained within the boiler at a level such as indicated by X in Fig. 2 by an automatic valve gauge device indicated by the numeral 58. This is a conventional type of guage device. A steam line 60 leads from the boiler to the hot solution tank 30 and is provided with a syphon outlet 62 within the tank 30 and adjacent to the bottom thereof whereby steam may be discharged from such line silently. A branch 64 leads off from the line 60 to a steam manifold 66. Suitable steam lines lead from this manifold to points hereinafter described.

A feed line 68 leads from the concentrated solution tank 28 to the hot solution tank 30 and a valve 70 if provided in such feed line. A pump 72 is provided for such line and this pump is coupled with the motor 46 to be driven thereby. A water line 74 leads from the water tank into the feed line 68. A valve 76 is provided in this water line 74. The desired concentration of solution may therefore be withdrawn through the line 68 by regulating the valve 76 and the amount may be controlled by the valve 70 as at the pump 72.

A discharge line for hot solution is indicated at 76. A pump 80 is disposed to withdraw liquid through such line 78 from the solution tank 30. This pump 80 is driven by the motor 46. This line 76 discharges through spray nozzles indicated as 79, 81 and 82 as shown in Fig. 2. These spray nozzles might be provided in such number as found desirable. They would be arranged as found suitable. Valves 83, 84 and 85 are provided to control the flow of hot solution to the spray nozzles 79, 81 and 82 respectively all as indicated schematically in Fig. 2.

Under certain conditions it may be desired to deliver a particularly concentrated solution of chemical upon the pavement. The snow may be packed hard or there may be sleet or ice present in quantity. Under these conditions the hot solution will not completely disintegrate or completely remove the snow and ice and a more concentrated solution may be required in order to accomplish the desired end. A liquid line 86 is therefore provided leading from the concentrated solution tank 28 to nozzle 82. This line 86 is shown as provided with a control valve 88. A pump 90 is provided to deliver concentrated solution through the line 86 from the tank 28 to the spray nozzle. Obviously this line 86 might lead to more than one spray nozzle or to any one desired. The pump 90 is driven from the motor 46 as are the other pumps heretofore described. It is apparent that by control of the valves 85 and 88 the concentration of the solution delivered by the spray nozzle 82 may be regulated.

In order to eliminate the possibility of freezing up of the valves or any of them, steam lines have been provided leading from the steam manifold 66 to the several valves and extending thereabout to heat the same. A steam line 92 controlled by valve 94 leads from the manifold 66 to the valve 76. A steam line 96 controlled by valve 98 leads from the manifold 66 to the valve 70. A steam line 100 controlled by the valve 102 leads from the manifold 66 to the valve 88. A steam line 104 controlled by valve 106 leads from the manifold 66 to valve 85. A steam line 108 controlled by valve 110 leads from the manifold 66 to the valve 84. A steam line 112 controlled by valve 114 leads from the manifold 66 to the valve 83. A steam line 116 controlled by valve 118 leads from the manifold 66 to valve 54. A steam line 120 controlled by valve 122 leads from the manifold 66 to valve 42.

Each of these steam lines is connected with the valve body to pass steam thereabout to heat the valve and keep it from freezing. A steam line 124 is shown as leading from the manifold 66 to the water tank to discharge steam thereinto to keep the water therein from freezing. A branch 126 may be taken off of this line and led to the boiler water tank 34 for the same purpose.

The boiler itself is what might be termed a semi-flash type. It is adapted to heat up quickly. It is relatively light in weight. It will furnish

a substantial amount of steam. The boiler is mounted on and carried by the trailer. As shown in Fig. 7, the boiler comprises a pair of spaced horizontal lower water legs 128 and a pair of spaced upper horizontal complementary water legs 130. There is provided a series of inverted U-shaped vertically disposed water legs 132. These U-shaped vertical water legs are arranged in a horizontal series. The lower ends of these U legs 132 communicate with the lower horizontal water legs 128. These vertical U-shaped water legs communicate at the top with the upper pair of horizontal water legs 130 as shown particularly in Fig. 6.

These U-shaped water legs are arranged relatively close together, as shown in the fragment of Fig. 8. Insulation is provided enclosing these water legs. A layer of such insulation is indicated at 134. This particular layer of insulation may be in the form of insulating brick 134, as shown in Fig. 3. A metal shell 136 encloses the insulation. A second layer of insulation is indicated at 138. This layer of insulation may be a poured layer and partially surrounds the upright water legs 132. In Figs. 3 and 4 the shell 136 is shown as braced by struts 140.

Certain of the upright inverted U-shaped water legs 132 are provided with a supplemental bottom line 142 which extends parallel to the bottom of the U and spaced therebelow. Note particularly Figs. 6 and 9. One desirable arrangement is to have each alternate U-member 132 provided with such supplemental line 142. These U-shaped water legs 132 which are provided with the supplemental lines 142 are also provided with two rows of water coils 144. These rows of water coils are arranged on opposite sides of and between the supplemental line 142 and the bottom of the U and communicate at opposite ends therewith as shown in Fig. 6. They provide a substantially large area for the exposure of surface to the heat of the burner.

The alternate U-shaped members 132 which are not provided with the supplemental bottom lines 142 and are not provided with the coils 144 are plain U-shaped members. All of the U members 132 whether provided with the supplemental lines 142 or not communicate with the upper and lower horizontal water legs. Due to having the upright portions of the water legs of the U-members 132 arranged closely adjacent to each other, as shown, a relatively small amount of insulating brick and insulation will suffice and a substantial area of surface is exposed to be heated.

The upper horizontal water legs 130 are connected by end portions 148. The lower horizontal water legs 128 are connected by end portions 150. Fig. 5 shows the outer end of the boiler and the end portions 148 and 150 connecting and communicating with the horizontal water legs 130 and 128 respectively. This view also shows that the upper and lower end portions 148 and 150 are further connected by communicating vertical water legs 152 extending therebetween and arranged closely adjacent to each other.

Fig. 7 shows the inner end or burner end of the boiler. In this view there are provided vertical water legs 154 connecting the upper and lower portions 148 and 150. These vertical water legs 154 are spaced apart so as to permit the burner elements 38 to be received therebetween, as shown

in Fig. 7. The auxiliary burner 50 is also shown as received between these spaced upright water legs 154. These burners are arranged below the water coils 144 and below the supplemental bottom lines 142. This boiler presents a substantial amount of water jacket surface area to be heated. It is designed to heat up the water rapidly. The boiler is relatively light in weight. Water is pumped into the boiler as heretofore described from the tank 34 through line 52. Steam is taken from the boiler through a steam line 60 to be discharged into the hot solution tank 30 and to also be conducted by a branch line 64 to the steam manifold 66. The height of the hot solution within the tank 30 is controlled by a float valve device 156. This valve device is of conventional construction. It is designed to maintain the liquid in the solution tank at the desired height. A gauge may be provided to indicate such height. The tank is also provided with a removable cover 158 which is free so that it may lift to permit the escape of steam if the steam pressure within the tank rises too high.

What I claim is:

1. In a road vehicle, a concentrated salt solution tank, a water tank, a hot solution tank communicating with the concentrated solution tank and with the water tank to receive liquid from each, a boiler, means for heating the boiler, means for heating the hot solution tank from the boiler, a discharge line leading from the hot solution tank and provided with a spray nozzle for the discharge of the hot solution upon the road over which the vehicle travels, a discharge line leading from the concentrated solution tank into the discharge line leading from the hot solution tank.

2. In a road vehicle, a concentrated salt solution tank, a water tank, a hot solution tank communicating with the concentrated solution tank and with the water tank to receive liquid from each, a boiler, means for heating the boiler, a steam line leading from the boiler to the hot solution tank terminating therein in an outlet adjacent to the bottom of the tank, a discharge line leading from the hot solution tank and provided with a spray nozzle for the discharge of the hot solution upon the road over which the vehicle travels, a valve in the line leading from the water tank to the hot solution tank, and a steam line leading from the boiler and passing about said valve to heat the same.

3. In a road vehicle, a concentrated salt solution tank, a water tank, a hot solution tank communicating with the concentrated solution tank and with the water tank to receive liquid from each, a boiler, means for heating the water in the boiler, a water tank communicating with the boiler to supply water thereto, a steam line leading from the boiler to the hot solution tank to deliver steam thereinto adjacent to the bottom thereof, a discharge line leading from the hot solution tank and terminating in a spray nozzle disposed to direct a solution spray upon the surface of the road over which the vehicle is adapted to travel, valves in the liquid lines leading from the several tanks and controlling the flow of liquid therefrom.

4. In a road vehicle, a concentrated salt solution tank, a water tank, a hot solution tank communicating with the concentrated solution tank and with the water tank to receive liquid from each, a boiler, means for heating the water in the boiler, a water tank communicating with the boiler to supply water thereto, a steam line

leading from the boiler to the hot solution tank to deliver steam thereinto adjacent to the bottom thereof, a discharge line leading from the hot solution tank and terminating in a spray nozzle disposed to direct a solution spray upon the surface of the road over which the vehicle is adapted to travel, valves in the liquid lines leading from the several tanks and controlling the flow of liquid thereover, a pump in each of said liquid lines to move liquid therethrough, a steam manifold communicating with the boiler, steam lines leading from the manifold to each of said valves to pass steam thereabout to heat the valves.

5. That process of treating a surface to remove ice and snow therefrom comprising providing a solution of calcium chloride, delivering steam

continuously into said solution to maintain the same heated, delivering concentrated calcium chloride solution and water into said steam heated solution to constantly replenish the same and discharging the heated solution therefrom on to the surface to be treated.

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