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SNOW MELTING EQUIPMENT

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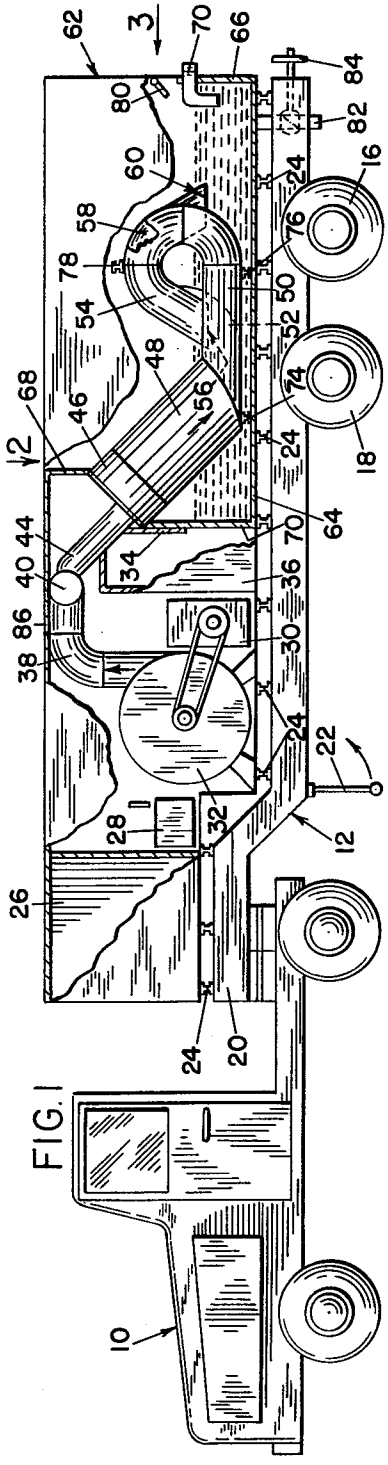


FIG. 1

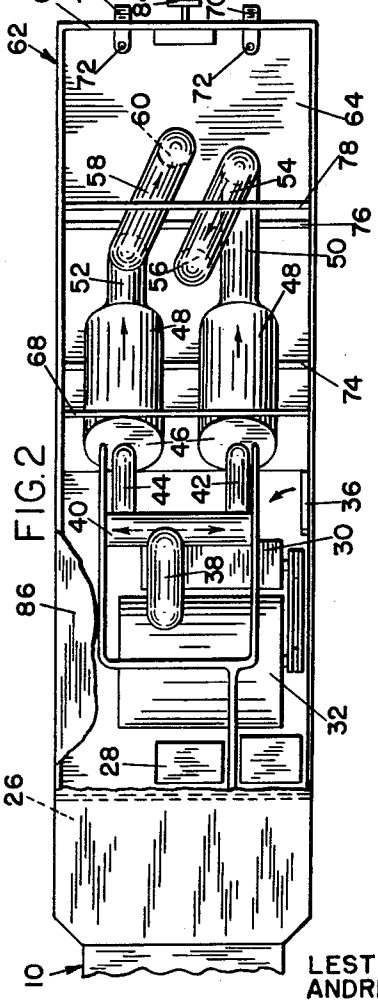


FIG. 2

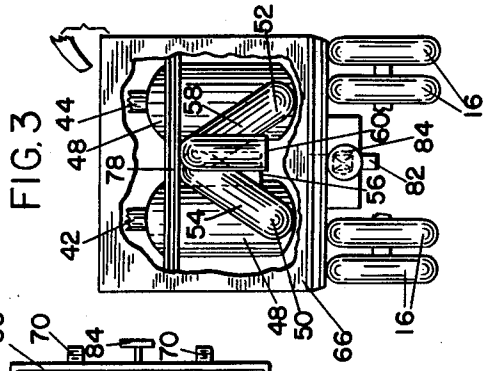


FIG. 3

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SNOW MELTING EQUIPMENT

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This invention relates to snow and ice melting machines in general, and the principal object of the invention is to provide an improved snow and ice melting machine for use in melting snow and ice in city streets and in parking lots; the provision of a device of the class described which is mobile and may be moved from place-to-place and also in combination with a snow blower, the same being well known to those skilled in the art, so that the snow blower may transfer the snow directly from the street or parking area into the snow melting tank of the present device with the snow blower and snow melting machine proceeding along the area to be cleared together at the same speed.

Further objects of the invention reside in the provision of a snow and ice melting equipment of the class described including principally a snow melting tank and a certain new and improved fuel burner arrangement including a fuel burner having connected thereto and formed as a part thereof a plurality of relatively large tubes located principally under water through which the products of combustion are forced, the tubes having partial coils or loops extending upwardly out of the water in the tank and being reversed downwardly again having the orifices thereof located under water providing heat and extreme turbulence of the water for melting the snow and ice, to the end that snow and ice dumped into the snow melting tank is very rapidly melted by using combined heat and extreme turbulence, whereby the process of melting the snow and ice is greatly speeded up so that the apparatus not only is economical in use of the fuel but also melts the snow and ice very rapidly so as to provide for a capacity fast enough to do away with the snow and ice at the same speed or even faster than the capacity of the snow blower to load the snow melting tank with the snow.

Further objects of the invention include greater economy in operation by burning gas or oil in a combustion chamber before the products of combustion become chilled by cold surfaces and by a novel construction using the flue products to inject heat into the water in the tank with attendant agitation.

The invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly set forth in the appended claims.

Reference is to be had to the accompanying drawings, in which

FIG. 1 is a view in side elevation with parts removed illustrating the invention;

FIG. 2 is a plan view thereof with parts removed, looking in the direction of arrow 2 in FIG. 1, and

FIG. 3 is a view in rear elevation with parts removed to illustrate the construction.

This invention has been illustrated as mounted upon a mobile vehicle but of course the apparatus including the vehicle is adapted to be located in stationary position or the snow melter may be located in a central location without mobility. However, the invention includes a device which is particularly adapted for mobility and to this end a tractor unit 10 which is conventional may be utilized to haul a trailer generally indicated at 12 upon which the apparatus is mounted.

This trailer will be provided with swivel means in the usual manner of trailers which are drawn by separate tractors as is well known in the art. The trailer

12 may take any form desired but conveniently is made of a pair of elongated stringers extending fore-and-aft and mounted upon the axles of the wheels 16 and 18 and having at the forward portion thereof an elevated part at 20 upon which the swivel pin for the tractor may be mounted. The stringers are conveniently located between the wheels as illustrated and a pivot support 22 may be utilized in a conventional manner to support the apparatus if it is desired to use the tractor 10 for some other purpose in the off season.

The snow melting apparatus is conveniently mounted upon the stringers by a series of I-beams which are indicated at 24, there being as many as these I-beams as may be necessary in order to support the weight of the snow melting apparatus. The snow melting apparatus may be made of steel plates and at its forward portion it comprises an enclosed fuel tank as at 26, the fuel of which is to be used for providing the heat for melting the snow and ice. A motor generator set 28 may also be provided and a gasoline engine 30 is operated to drive a blower 32 as will be hereinafter described.

There is a control panel 34 located within the apparatus and this may be enclosed, having an access door 36. This control panel will be provided with all the controls necessary for operating the snow melting machine at whatever desired flow of fuel may be necessary in order to process the load of snow and ice to be melted.

The blower 32 is provided with a pipe 38 which carries the draft to a headbox or the like 40 where it is distributed by means of pipes 42 and 44 to the burners of which there are shown two herein, these burners being indicated at 46 and being just alike.

The burners themselves are connected of course to the fuel oil tank at 26 by conventional piping and combustion is caused in any way desired in a refractory casing of general cylindrical form as indicated at 48, 48, with of course the products of combustion flowing in the direction of the arrows.

The lower ends of the refractory casings 48, 48 are connected to relatively large diameter steel tubes at 50, 52 which are generally alike, one being longer than the other as will be seen from FIG. 2. As will be hereinafter explained, these tubes are under water as are also portions of the refractory casings 48, 48.

The tube 50 is located adjacent the floor of the tank and extends toward the rear of the vehicle for a distance. Then it extends upwardly and reversely into a hump or coil 54, this being offset (see FIG. 2) in order to clear tube 50, extending downwardly to its orifice 56 on a slant (see FIG. 1), so that the products of combustion rush from this orifice in a relatively inclined direction from the rear toward the front.

Extending from the steel tubing 52 there is another upwardly extending hump or coil 58 which is similar to that at 54 but reversed, i.e., it extends straightaway from its tube 52, but inwardly and downwardly, terminating in the orifice at 60, so that the products of combustion in this case extend toward the rear. The heat and products of combustion, etc. also are directed in a side-to-side inclination, with the hump portions parallel.

The refractory tubes 48, 48 and the steel tubes 50, 52, etc. are all located in the open top snow melting tank which is generally indicated at 62, this having a bottom indicated at 64, a rear wall 66, and a front wall at 68, the front wall at 68 extending forwardly to the point 70 so as to provide for a good portion of the combustion tubes at 48 to extend under the water in the tank.

The level of the water in the tank is controlled by means of a discharge water hose connection at 70. There may be two of these if desired and each is provided with a

vent 72 so as to provide against siphoning of the water. It will be seen that as long as these are the only discharge orifices, the water level will be held as indicated in FIG. 1, so that the water is approximately twenty-four inches deep and the tubes 50 and 52 are completely under water.

It is very important to the operation of the present invention that the orifices 56 and 60 should at all times be under water as if this is not the case, a large part of the capacity for melting snow and ice in the present invention will be lost. The refractory tubes 48, 48 are mounted on the forward wall of the open top melting tank and the tubes 50 and 52 are provided with cross beams 74 and 76, together with a cross beam 78 extending from side-to-side of the tank above the coils or the humps 54 and 58 in order to dampen the extreme vibration of these pipes which results from the forces of combustion. A safety overflow discharge door 80 may be utilized in case of need and a sludge cleanout at 82 controlled by a manually operated handle 84 may be utilized also.

The fuel in the tank 26 is provided under pressure and is piped in a conventional manner to the controls of the burners where it is mixed with air under pressure to produce the heating flame. The control board may be provided with equipment to properly adjust the mixture of the fuel and the air to secure and hold the intensity of the flame desired. The heat generated in the refractory burner tubes 48, 48 is forced down into the steel tubes 50 and 52 under the water, circulating through the humps or coils 54 and 58 until it comes to the orifices of the tubes at 56 and 60 where it shoots out into the water in the tank, heating the water and causing extreme turbulence of the water. The snow and ice dumped into the tank at the open top thereof is rapidly melted by the combined heat and the turbulence, and it is especially stressed that it is principally the turbulence of the water under the influence of the heat from the products of combustion splashing up into the tank which causes the melting of the snow and ice as it descends from the open top of the tank into the water. This turbulence is enhanced by the shape and position of the tubes 50, 52 and the humps or coils 54, 58. The run-off water can be conveyed from the discharge water hose connections to any point desired such as catch basins or into surface sewer systems or the like or even into the street if the street is slanted enough to carry it off.

The water level at twenty-four inches in the particular illustration herein is sufficient to provide that the orifices at 56 and 60 shall be continuously under water, this being necessary as stated above at all times, up to and including a ten percent grade, either going up or going down, and this will take care of practically all inclined streets upon which equipment of the present case might possibly be utilized.

It will be seen that the device can be used in stationary position with snow trucks coming up and dumping the snow into the open top of the tank, but mounted on the trailer with the tractor 10 as shown, the device may be slowly moved along the street that is being cleared as for instance by a snow blower, or trucks may come up and dump the snow into the tank with the resultant water running off into the catch basins along the street curbing. The combustion gases are driven through the tubes at a high temperature and velocity and the coils or humps 54, 58 form goosenecks which lead the products of combustion at least six inches under the water level, resulting in the high agitation of the water in the tank mentioned above, and the water in the tank may be run out at a temperature of thirty-four degrees for instance forming a very high efficiency of operation in comparison of the fuel used to the weight of snow and ice melted and thus disposed of.

It will be noted that the orifices of the pipes extend in a direction so as to cause some water to be splashed up against the front and rear walls of the tank and also to some extent onto the side walls, and it is pointed out that the turbulence is increased by this action. The inclination of the pipes is provided for the maximum turbulence possible. Also it will be noted that the pipes 50 and 52 right out to the orifices 56 and 60 respectively are also relatively large so as to spread the products of combustion over as wide an area as is possible in consideration of the fuel to be used and to raise the efficiency of the machine, and this again causes the greatest possible turbulence of the water in the tank.

Furthermore, it will be noted that the orifice at 56 is located generally centrally of the forward part of the tank and the orifice at 60 is located generally and centrally of the rearward part of the tank, so that all of the water in the tank, insofar as is possible, is equally agitated and thus made equally turbulent.

Furthermore, the entire device may be lifted from the stringers of the trailer 12 and stored for the summer while the tractor and trailer may be utilized for other purposes if this should be desired. Also the entire snow melting equipment may be provided with a closed top at 86 with the exception of the open top tank, and thus the apparatus will be fully protected at all times.

Having thus described our invention and the advantages thereof, we do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what we claim is:

1. Snow melting apparatus comprising a housing, an air blower, a fuel reservoir and a control panel located in the housing, an open topped tank having front, rear, and side walls and a bottom, said tank being adjacent to and connected to said housing, a pair of refractory tubular burners of relatively large diameter located in said tank and receiving air and fuel under pressure from the blower and fuel reservoir, said refractory burners being located at an incline with relation to the bottom of the tank, relatively large metal tubes extending generally horizontally from the lower ends of said tubular refractory burners adjacent the bottom of the open tank in closely spaced relation thereto, there being water in the tank and said metal tubes being located at least partially in the water, one tube extending forwardly, then upwardly out of the water, then reversely, and then downwardly, the other tube extending upwardly out of the water, forwardly and downwardly, both tubes terminating in relatively large orifices under water, the products of combustion traversing the lengths of the tubes from the refractory burners to the orifices and entering the water beneath the surface, violently agitating as well as heating the water.

2. The snow melting apparatus of claim 1 wherein the orifices are spaced fore-and-aft as respects the tank.

3. The snow melting apparatus of claim 1 wherein the terminal portions of said tubes are inclined relative to the front and rear walls of the tank.

4. The snow melting apparatus of claim 1 including means to maintain the water level at a predetermined height.

5. The snow melting apparatus of claim 1 wherein the extending parts of the tubes are laterally offset at an incline relative to the parts of the tubes adjacent the burners, the orifices being located in fore-and-aft zones in the tank.

6. The snow melting apparatus of claim 1 wherein the extending parts of the tubes are laterally offset at an incline relative to the parts of the tubes adjacent the burners, the orifices being located in fore-and-aft zones in the tank and each orifice being located to provide a wide spread of agitation in its zone.

7. Snow melting apparatus comprising a housing, an air blower, a fuel reservoir and a control panel located in the housing, an open topped tank having front, rear, and side walls and a bottom, said tank being adjacent to and connected to said housing, a pair of refractory tubular burners of relatively large diameter mounted on a wall of the tank and receiving air and fuel under pressure

from the blower and fuel reservoir, said refractory burners being located at an incline with relation to the bottom of the tank, metal tubes extending generally horizontally from the lower ends of said tubular refractory burners adjacent the bottom of the open tank in closely spaced relation thereto, there being water in the tank and said metal tubes being located partially in the water, one tube extending forwardly, then upwardly out of the water, then reversely, and then downwardly forming a coil, the other tube extending upwardly out of the water, forwardly and downwardly forming an opposite coil, both tubes terminating in relatively larger orifices under water, cross members in the tank supporting the tubes against vibration at the uppermost portions thereof, the products of combustion traversing the lengths of the tubes from the refractory burners to the orifices and entering the water beneath the surface, violently agitating as well as heating the water.

8. The snow melting apparatus of claim 7 including a wheeled vehicle for mounting the entire apparatus for mobility thereof and means mounting the apparatus on the vehicle in detachable and removable relationship therewith.

9. Snow melting apparatus comprising a housing, an air source and a fuel source located in the housing, an open topped tank having front, rear, and side walls and a bottom, said tank being adjacent to and connected to said

housing, a pair of elongated refractory tubes, burners in the tubes, said tubes being located in said tank and receiving air and fuel from the air and fuel sources, said refractory tubes being located at an incline with relation to the bottom of the tank, and extending adjacent thereto, relatively large metal tubes extending generally horizontally from the lower ends of said refractory tubes adjacent the bottom of the open tank in closely spaced relation thereto, there being water in the tank and said metal tubes being located in the water, one metal tube extending reversely over itself forming a coil, the other metal tube extending upwardly and forwardly and downwardly, forming an opposite coil, both metal tubes terminating in relatively large orifices under water, the products of combustion traversing the lengths of the refractory and metal tubes to the orifices and entering the water beneath the surface, violently agitating as well as heating the water.

10. The snow melting apparatus of claim 9 including a vehicle support for the apparatus and means to removably mount the apparatus on the vehicle support.

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