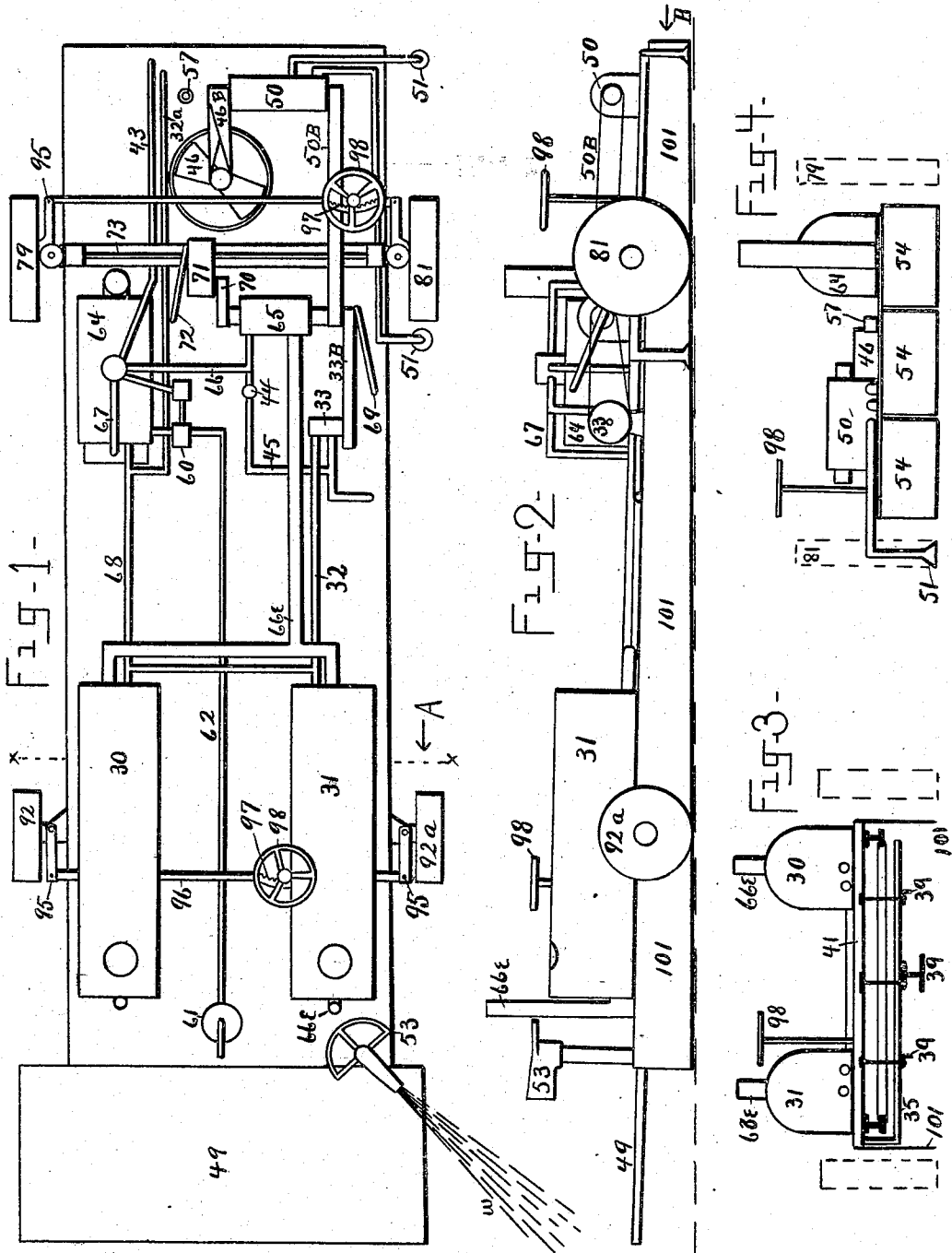


H. E. WILLSIE.
 MACHINE FOR MELTING SNOW FROM STREETS AND SIDEWALKS.
 APPLICATION FILED OCT. 30, 1902.

939,461.

Patented Nov. 9, 1909.

3 SHEETS-SHEET 1.



WITNESSES:
 M. E. Emery.
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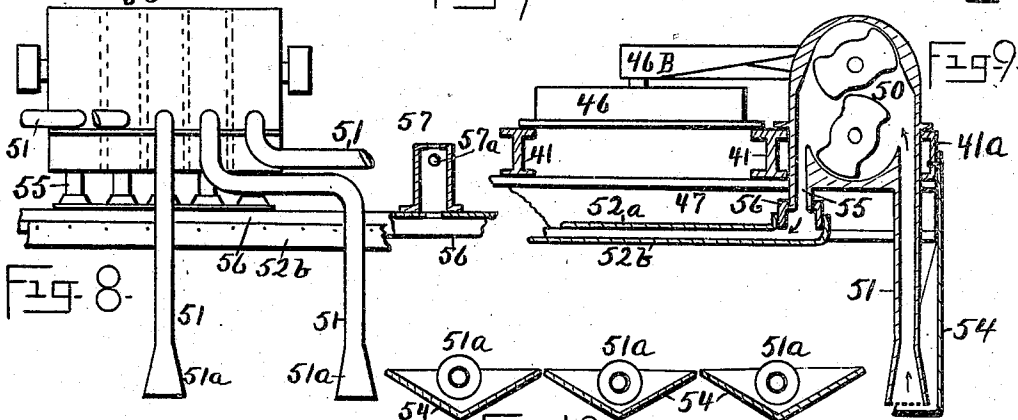
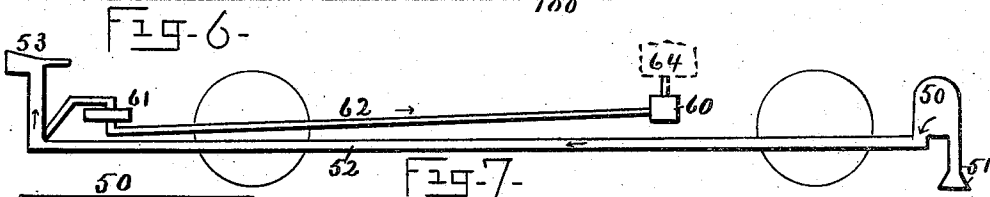
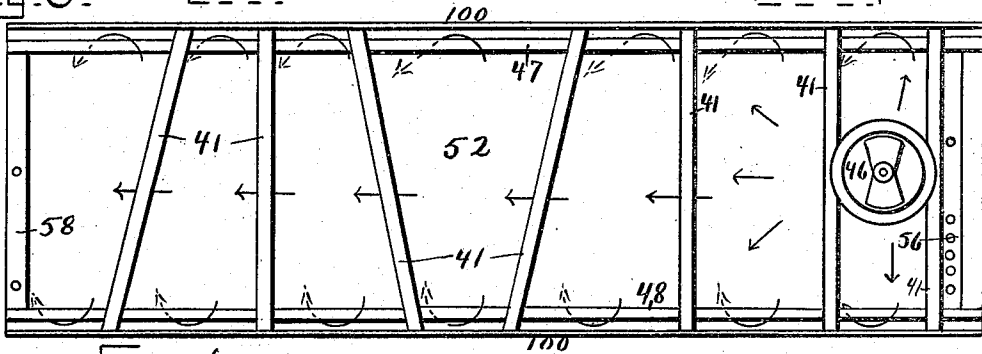
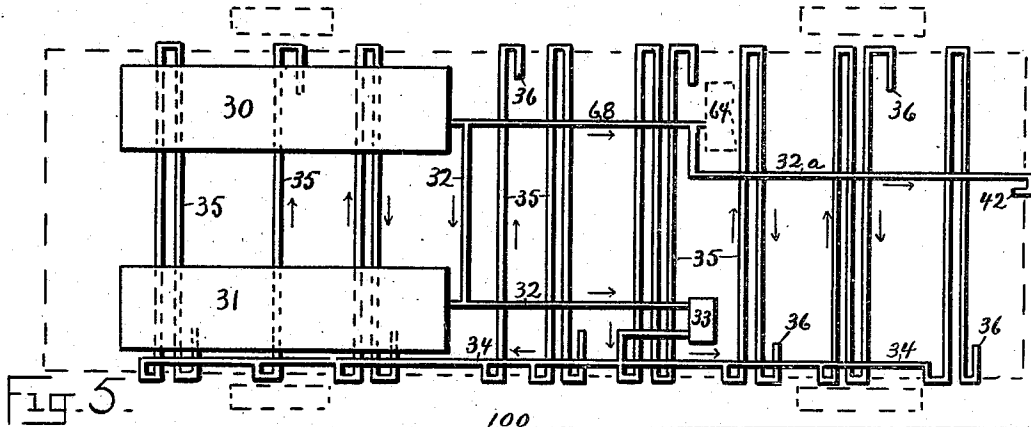
INVENTOR:
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8 SHEETS—SHEET 2.



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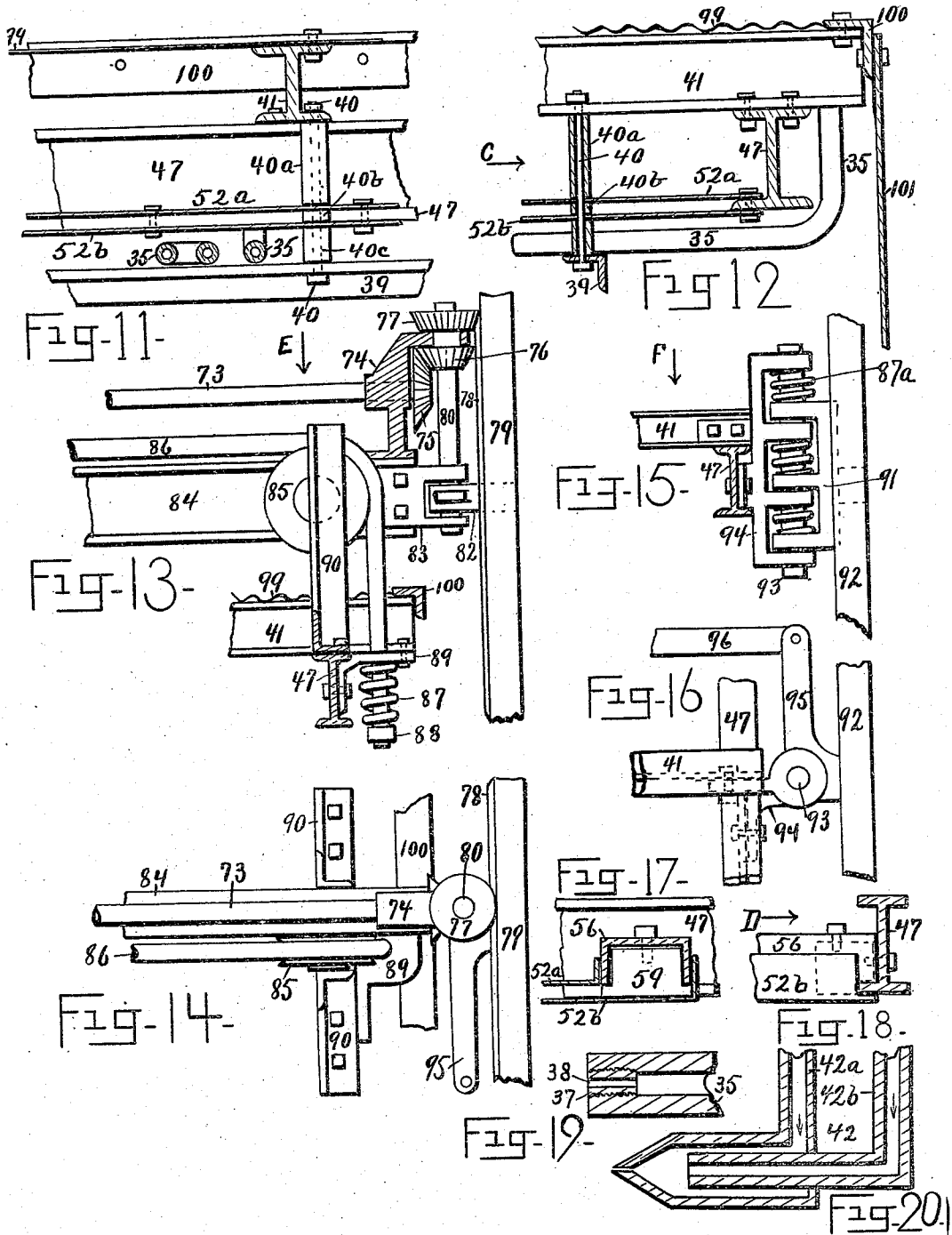
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

HENRY E. WILLISIE, OF NEW YORK, N. Y.

MACHINE FOR MELTING SNOW FROM STREETS AND SIDEWALKS.

939,461.

Specification of Letters Patent.

Patented Nov. 9, 1909.

Application filed October 30, 1902. Serial No. 129,375.

To all whom it may concern:

Be it known that I, HENRY E. WILLISIE, a citizen of the United States, residing at New York, in the State of New York, have invented a new and useful Improvement in Machines for Melting Snow from Streets and Sidewalks, of which the following is a specification.

My invention relates to improvements in snow-melting machines, which apply heat directly upon the snow to be melted; and the objects of my invention are: first, to provide means for the generation of large quantities of heat, so that the machine may move quickly along a street, permitting rapid drainage and preventing the accumulation of slush; second, to provide means to flush the adjacent snow covered sidewalk with water pumped from the street and heated, and, third, to mount these means upon a suitable self propelled vehicle. I attain these objects by the means shown in the accompanying drawings in which similar characters refer to similar parts throughout the several views.

The complete machine comprises: 1, a truck with steering devices and means for propulsion; 2, a fuel system consisting of pumps, tanks, burners and suitable connections; 3, an air system furnishing air for the proper combustion of the fuel; 4, a hot water system consisting of pumps and connections, a heater and a flushing nozzle; 5, a power system consisting of a boiler and pipe connections, engines and transmission devices.

Referring to the drawings: Figure 1 is a plan view of the machine; Fig. 2 is a side view of the same; Fig. 3 is a sectional view on the line $x-x$ in Fig. 1; Fig. 4 is a partial view of the machine in the direction of the arrow B, Fig. 2; Fig. 5 is a diagrammatical view of the crude oil system; Fig. 6 is a diagrammatical view of the air system; Fig. 7 is a diagrammatical view of the hot water system; Fig. 8 is a view of the water pump in the direction of the arrow B, Fig. 2; Fig. 9 is a vertical sectional view of the same; Fig. 10 is a horizontal sectional view of the scraper part of the fire curtains; Fig. 11 is a view of the construction in Fig. 12 in the direction of the arrow C; Fig. 12 shows the construction for supporting the gasifying pipes and the water heater; Fig. 13 is a vertical view of the supporting and steering constructions; Fig. 14 is a view of Fig. 13

in the direction of the arrow E; Fig. 15 shows the construction of the spring support for the front end of the vehicle; Fig. 16 is a view in the direction of the arrow F of the construction in Fig. 15; Fig. 17 is a vertical longitudinal section of the construction of the end of the heater and is a view of Fig. 18 in the direction of the arrow D; Fig. 18 shows part of the construction of the end of the heater; Fig. 19 is sectional view of the burner; and Fig. 20 is a diagrammatical section of the pilot burner.

The construction and operation of the machine is as follows:

Referring to Fig. 5, the oil storage tanks, 30, 31, are connected by the pipe 32 to the power driven oil pump 33 which forces the oil into the pipe 34 from which at intervals branch the gasifying pipes 35, 35. These gasifiers consist of thick metal pipes, preferably of copper, bent back and forth under the machine and ending in burners 36, 36. A simple form of such a burner is shown in Fig. 19, in which a plug 37, having a small orifice 38, is screwed into the end of the gasifying pipe 35. The pipe 35 rests upon the angle irons 39, 39 extending lengthwise of the machine and supported at intervals by bolts 40, 40 from the crosswise angle irons 41, 41 of the truck frame. As these copper gasifying pipes 35, 35 are entirely surrounded by flame, the oil pumped into the pipes will be gasified if the heating surface has been properly proportioned to the amount of oil, and the resulting gas will escape through the orifice 38, mix with the necessary amount of air, and burn. The height of the machine above the ground should be such that the combustion will be complete before the gas is liable to come into contact with the snow. For the preliminary heating of the pipes 35, 35 and for ignition, the pilot burner 42 is provided. This burner is shown in section in Fig. 20. Oil from the pipe 32^a flows into the burner at 42^a and is sprayed, in the usual manner, by steam from the pipe 42 entering the burner at 42^b. The plan of burning oil by first gasifying it is more economical in this machine than by spraying or vaporizing with either steam or air jets, and it has the further advantage of requiring less boiler capacity. To clean the pipes of any residue that the oil may leave, the valve 44 in the steam pipe 45 is opened, allowing live steam to flow through the gasifying part of the oil system. As about 20

pounds of air are needed for the burning of each pound of oil, means for moving large quantities of air into the zone of combustion is provided. A disk fan 46, power driven, supported by the I beams 41, 41, shown in Figs. 1, 6 and 9, forces the air downward upon the water heater 52 where it spreads, passes under the beams 41, 41, over the I beams 47, 48 and into the zone of combustion, as shown by the arrows in Figs. 6 and 12. The products of combustion pass out under the hood 49 at the forward end of the machine. The air draft is from the sides and rear of the machine toward the front end.

It is evident that no system of clearing away city snow is complete that does not include the removal of snow from the sidewalks. The snow should be removed from the sidewalks before or at the time of the removal from the adjacent street. Owing to various obstructions on sidewalks, to their varying widths, and often to their lack of strong support, the running of a machine upon them is hardly practicable. The hot water system of this machine provides for these conditions.

Referring to Figs. 1, 2, 6, 7, 8, 9, 10, 11 and 12; the power driven rotary pump, 50, takes the melted snow water from the street surface, up through the suction pipes 51, 51, forces it through the heater 52 and out of the flushing nozzle 53 onto the adjacent sidewalk. The pump is supported by the angle irons 41, 41^a. The suction pipe consists of a flexible metal pipe having a strainer 51^a close to the street surface. The lower portion of the fire curtains 54, 54, 54, at the rear of the machine form scrapers (see Fig. 10) to accumulate the water about the strainers. Owing to the irregular supply of melted snow water one or more of these suction pipes may be drawing air. For this reason the rotary pump 50 is divided with partitions into compartments as shown by the dotted lines in Fig. 8, so that if one strainer is out of water the water suction of the other compartments may not be broken. The discharge pipes 55, 55 of the pump enter the channel iron 56, which is supported by the side beams 47 and 48. To allow the air occasionally pumped to escape the air valve 57 having the floating valve ball 57^a is provided.

The water heater consists of a sheet iron top 52^a and a sheet copper bottom 52^b, and is secured to the channel iron 56 in the manner shown in Figs. 9, 17, and 18. An iron block 59 is bolted inside each end of the channel. The other end of the heater is secured in a similar manner to the channel iron 58. The sides of the heater are formed by bolting the sheet iron and the sheet copper to the lower flanges of the I beams 47 and 48, as shown in Figs. 11 and 12. In

order that the bolts 40, 40 may pass through the heater the washers 40^a, 40^b, 40^c are tightly clamped in the positions shown in Figs. 11 and 12. The nozzle 53 is swiveled so that the hot water may be flushed upon the sidewalk, or thrown ahead of the machine to wash down snow drifts. A convenient but not necessary portion of the hot water system is the arrangement of the boiler feed pump 60 to take water from the channel 58 through the water filter 61 and the pipe 62. This feed pump, filter and connections are of the usual types.

Power for the machine is furnished by the steam boiler 64 and the steam engine 65, connected by the pipe 66. Both boiler and engine are of types now used on automobiles. The boiler is heated by a burner similar to the pilot burner previously described. For the burner the steam pipe is 67 and the oil pipe 68. The exhaust steam pipe 66^c passes from the engine through the oil tanks 30, 31 in order to warm the oil before it is pumped.

The pulley at one end of the engine shaft carries a belt 33^b to the pulley of the oil pump 33. Another belt 50^b connects the engine with the water pump 50. The belt 46^b connects the fan 46 with the shaft of the water pump 50. The diameters of the pulleys for such belts are of such dimensions that the correct proportions of oil, air and water are moved. The engine pulley is connected with the engine shaft by a clutch operated by the handle 69. The other end of the engine shaft is connected by the belt or chain 70 to the speed changing or reversing gear 71. This gearing consists of the usual inclosed sets of spur gears combined with a sliding clutch operated by the handle 72. This gearing is secured to the shaft 73.

In order that the driving wheels may also be steering wheels, a system of bevel gears is used. As the speed is slow the extra friction will not be so objectionable as the lack of steering. The shaft 73, supported by the bearing 74, carries the bevel gear 75 which meshes with the bevel gear 76. The gear 76 is integral with the bevel gear 77 which meshes with the bevel gear 78 secured to the wheel 79. The gears 76, 77 revolve freely on the pin 80 and are held in place by a collar extending from the bearing 74. The other driving wheel 81 is similarly connected with the shaft 73. The axle 82 of the wheel 79 is connected by the pin 80 and the forging 83 with the I beam 84. To the forging 83 is pivotally secured the grooved wheel 85. The cable 86 runs in the groove, passes through the spring 87 and ends in the nut 88. The upper part of the spring bears against the casting 89 which is bolted to the beams 41, 47. The angle iron braces 90, 90, secured to the beam 47, permit an up-and-down but not a lengthwise movement of forging and beam 83 and 84. This

means of support is duplicated on the other side of the machine thus furnishing a flexible spring support for a wide machine on an uneven pavement.

5 The axle 91 of the wheel 92 is pivoted by the pin 93 to the forging 94 which is bolted to the beams 41 and 47. Compression springs separate the axle 91 from the forging 94. Similar devices are provided for the other
10 front wheel 92^a. The steering levers 95, 95 for both front and rear wheels are connected by the rod 96 having a curved rack 97 in which meshes a gear secured to the hand wheel 98. The general plan of the frame of
15 the truck, as shown in Fig. 6, consists of two side I beams 47 and 48 to which are bolted the cross beams 41, 41. Upon these beams is laid a corrugated sheet iron flooring 99, Fig. 12. To the ends of the beams 41, 41 are
20 secured the angle irons 100, 100. Secured to these angle irons are the fire curtains 101, 101 which prevent the flames blowing out at the sides of the machine. These curtains may be of sheet iron lined with
25 asbestos.

All parts of the frame liable to overheating are in contact with water or with moving cold air.

Many small parts such as valves, oil cups, bolts, rivets, stays, are not shown, as the
30 placing of such parts is evident to any one skilled in making the devices used in this snow melting machine.

Now having fully described the construction and operation of my invention what I
35 claim and desire to secure by Letters Patent is:

1. The combination, with a self-propelled vehicle, of fuel burners adapted to generate
40 heat in proximity to the road surface, reservoirs for fuel, connections between said reservoirs and said burners, means adapted to feed said fuel from said reservoirs to said burners, a blower for supplying air for the
45 combustion of the fuel, a water compartment adapted to protect the frame of said vehicle from the heat of combustion, and means for circulating water through said compartment.

50 2. The combination, in a self-propelled vehicle, of oil burners, oil tanks with pipe connections to said burners, an oil pump adapted to force oil through said connections from tanks to burners, a fan for supplying air for the combustion of the oil, a
55 steam boiler, a steam engine, steam connections between said boiler and said engine, an oil burner located within the fire-box of said boiler, pipe connections between said
60 oil tanks and said burner, steam connections between said boiler and said burner, and transmission devices connecting said engine with said oil pump, fan and vehicle.

3. The combination, in a self-propelled
65 vehicle, of oil burners, oil tanks, an oil

pump, pipe connections between said tanks, burners and pump, a fan for supplying air for the combustion of the oil, a steam boiler, a steam engine, steam connections between
70 said boiler and said engine, an oil burner located within the fire box of said boiler, pipe connections between said oil tanks and said burner, steam connections between said boiler and said burner, a pilot burner with
75 connection to said oil tanks and said boiler adapted to heat and ignite the first mentioned burners, and power transmission devices connecting said engine with said oil pump, fan and vehicle.

4. In combination with a snow melting
80 vehicle, a water heater, a power driven pump adapted to take water from near the road surface and force said water into said heater, and a nozzle for the discharge of the heated water from said heater.

5. In combination with a snow melting
85 vehicle, means adapted to take water from near the road surface, means adapted to heat said water, and means for discharging the heated water upon snow adjacent to said
90 vehicle.

6. In combination with a snow melting vehicle, means adapted to take water from
95 near the road surface, means adapted to heat said water, and means for discharging the heated water upon the snow adjacent to said vehicle.

7. In combination with a self propelled snow melting vehicle, a water heater, means
100 for heating said water, a pump adapted to take water from near the road surface and force the water into said heater, a nozzle for the discharge of the heated water from said heater upon snow adjacent to said vehicle, and means for propelling said vehicle and
105 operating said pump.

8. The combination, in a snow melting vehicle, of a water heater, fuel burners adapted to heat the road surface and said
110 water heater, means for supplying said burners with fuel and air, means adapted to take water from near the road surface and force the water into said heater, and a nozzle adapted to discharge the heated water upon the snow adjacent to said vehicle.

9. In a snow melting vehicle provided
115 with a water heater, a rotary pump divided into compartments, each compartment connected to said heater and provided with a separate suction pipe.

10. In a snow melting vehicle, provided
120 with a water heater the combination with a pump, of an air valve for the escape of air pumped into said heater.

11. In a snow melting vehicle, provided
125 with a pump for taking water from near the road surface, the combination with the suction pipes of said pump of scrapers adapted to collect the water on the road surface about the inlet of said pipes.

12. In a self propelled snow melting vehicle, the combination of a steam boiler, means adapted to take water from near the road surface while said vehicle is moving over said road surface, a water filter with suitable pipe connections to said boiler and to said means for taking water from near the road surface, and means to force the filtered water into said boiler.

10 13. In combination with a vehicle, a water heater forming the bottom of the body of said vehicle, the top and bottom of said heater being made of sheets of metal secured to the frame of said vehicle.

15 14. In a self propelled snow melting vehicle means for cooling the frame of said vehicle with currents of water and currents of air.

20 15. The combination with a self propelled snow melting vehicle, an engine connected by means of power transmission devices to the driving wheels of said vehicle, said engine also connected by power transmission devices to an oil pump, a water pump and an air blower carried by said vehicle.

25 16. The combination with a self propelled snow melting vehicle, of power transmission devices consisting in part of speed changing and reversing gears connecting the engine to the driving wheels of said vehicle, power transmission devices connecting said engine to an oil pump, a water pump and an air blower, and a clutch adapted to dis-

connect and connect said transmission devices from said engine.

35 17. The combination with a self propelled vehicle of oil burners adapted to direct heat upon the road surface, oil tanks connected with said burners, a fan for supplying air for the combustion of the oil, a water heater 40 above said burners, a pump adapted to put water from the road surface into said heater, a nozzle adapted to direct the heated water discharged from said heater, and an engine with power transmission connections to said 45 fan and said pump.

18. The combination, in a snow melting vehicle, of fuel burners adapted to produce heat in proximity to a road surface, fuel reservoirs, connected with said burners, a 50 fan adapted to supply air for the combustion of said fuel, a water heater, a pump adapted to put water into said heater, an engine with power transmission connections to said fan and to said pump, and a nozzle 55 to direct the heated water discharged from said heater.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses, this fifth day of April 1902. 60

HENRY E. WILLISIE.

Witnesses:

I. S. PINE,

J. B. SPEDDY.