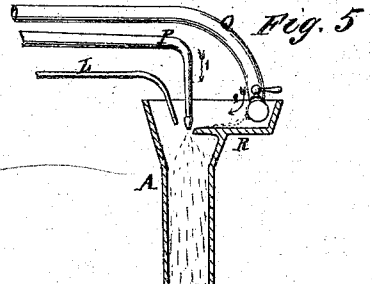
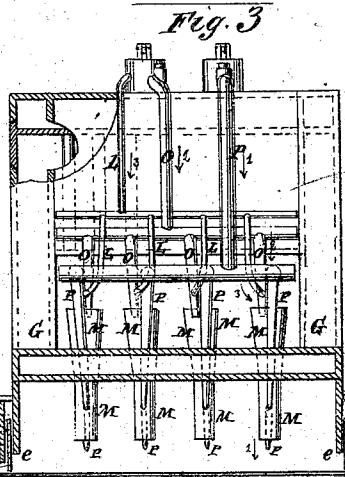
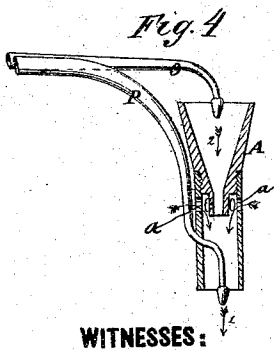
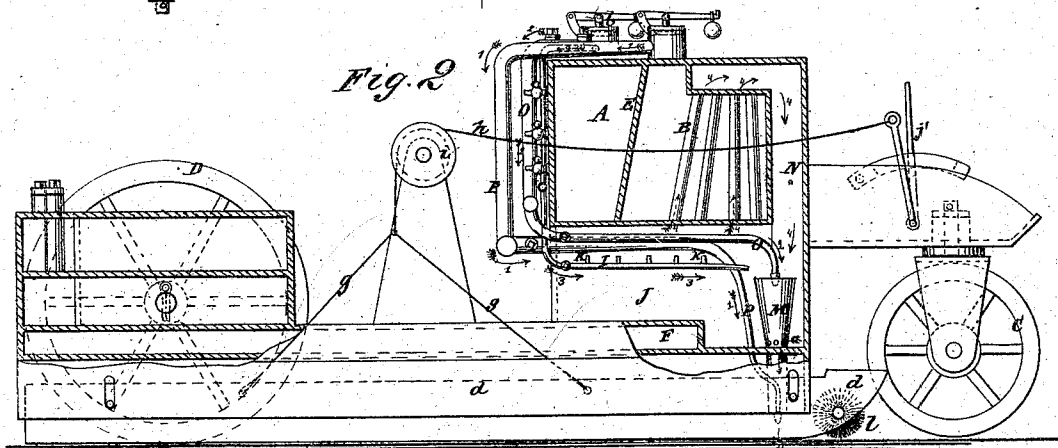
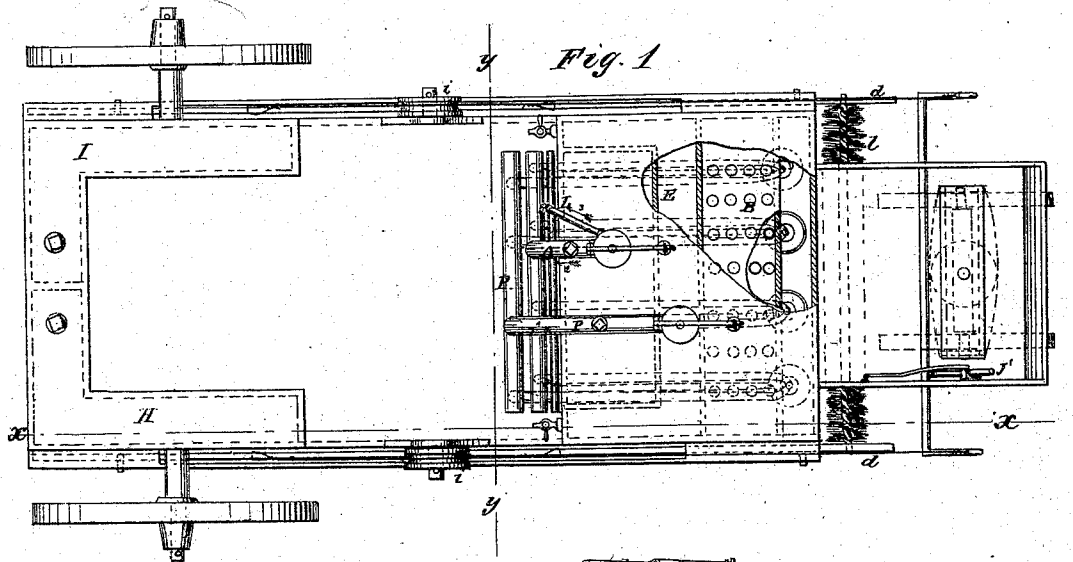


C. G. WATERBURY.
Machines for Melting Snow.

No. 157,559.

Patented Dec. 8, 1874.



WITNESSES:

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CHARLES G. WATERBURY, OF NEW YORK, N. Y.

IMPROVEMENT IN MACHINES FOR MELTING SNOW.

Specification forming part of Letters Patent No. **157,559**, dated December 8, 1874; application filed August 29, 1874.

To all whom it may concern:

Be it known that I, CHARLES G. WATERBURY, of the city, county, and State of New York, have invented a new and Improved Machine for Removing Snow and Ice from Roadways, of which the following is a specification:

The essential feature of this invention consists of a series of burners for hydrocarbon oils, or vapors thereof, arranged on a portable machine, in combination with a reservoir or a retort and suitable pipe-connections for supplying the oils, or vapors thereof, to the burners, the arrangement being such that when vapors are burned they will be discharged into the burners with the requisite force by means of pressure in the retort, to drive the flame down on the snow and ice to be melted with great force. The invention also consists of the combination, with the above, of a steam boiler and pipes, for discharging steam-jets into the burners, or below them, to combine with the vapors or oils, both for impelling the flame and for increasing the heat.

The burners receive the oil or vapors at the top, and the steam is either admitted to the top or discharged at the orifice below, and forces the flame with great velocity directly on the surface of the snow or ice. The steam will be discharged into the burner at the top when heavy oils are used, in order to vaporize them, the oils being preferably discharged upon a plate or pan for spreading and holding them, to be acted on by the steam.

The burners are contrived to greatly facilitate the supply of oxygen in large measure for effecting the most perfect combustion by having a funnel-shaped top and perforated sides for the drawing in of large quantities of air by the force of the jets of vapor, which will be impelled by such pressure in the retort or boiler as to produce a velocity of twelve hundred feet or thereabout per second, which is necessary to effectually prevent the flame from spreading out laterally and losing its force, and to project it upon the snow and ice with the requisite force for melting fast enough while moving slowly along the roadway, to render the machine practically useful.

The steam-pipe will be arranged outside of the burner-tube when discharging at the bot-

tom, in order not to interfere with the drawing in of the air through the perforations in the sides, by being forced down in a strong jet in the center and drawing the air from all directions. The burners are arranged a short distance apart, in a row extending crosswise of the machine, to clear a breadth about equal to the breadth of the track at each passage, and they will preferably be at the front of the machine.

The oil, vapor, and steam are, in this example, generated in boilers carried on the machine, both being contrived in one structure, and heated by one furnace, and by the combustion of vapor from the oil-vaporizer; and the melting-burners are fired from this furnace, and the products of combustion in it are, after passing through the boiler, carried off through the melting-burners, for utilizing the heat for melting purposes, and as the best means of disposing of them, as, after passing through the burners and coming in contact with the cold ice and snow, they are confined thereon until they escape at the rear end of the machine, and are thus cooled and condensed so as to be less injurious when finally escaping into space than if directly discharged from the furnace.

Another essential feature of the invention consists of runner-plates attached to the sides of the machine for closing in the space under the machine to the ground, for confining the heat, the said plates being capable of rising and falling, as required by irregularity of the surface, and for lifting them off the ground when the machine is to be turned around, and they are provided with means for raising and lowering them readily; and another essential feature of the invention is a horizontal revolving brush of steel wires, closing in the under space immediately in front of the burners, to prevent the escape of heat that way, and to be used for stirring and breaking up and throwing the particles of snow into the flames behind, when, by reason of being packed and saturated with water, the flames will not be sufficiently penetrating.

Figure 1 is a plan view of my improved machine, with some parts shown in horizontal section. Fig. 2 is partly a side elevation and

partly a longitudinal sectional elevation, the section being taken on the line *xx* of Fig. 1. Fig. 3 is a transverse sectional elevation taken on the line *yy* of Fig. 1. Fig. 4 is a detail section, showing the arrangement of the melting-burners when the steam is discharged at the lower end; and Fig. 5 is a detail section, showing the arrangement when the steam is discharged at the top, together with oil to be vaporized by the steam.

Similar letters of reference indicate corresponding parts.

A represents a boiler or retort for vaporizing hydrocarbon substances, and B is a steam-generator mounted on the body of a truck or car of any approved kind, having wheels C and D, and contrived to be drawn along a common roadway or on a railway. These generators are, in this example, contrived in one shell or structure, and separated by a partition, E, but they may be arranged separately, if preferred. The steam-generator is designed to be in communication with a water-chamber, F, in the platform of the truck, through the sides G of the furnace, and the water is to be supplied from a reservoir, H, by a pump or injector of any kind. This water-chamber F will be the main generator of steam, being heated below by the heat forced down under it for melting the snow. The oil-retort A will be supplied from another reservoir, I, in the same way. J is the furnace, which is to be heated by vapor-burners K, to be supplied, by small pipes L, from the retort. M represents the melting-burners, which are arranged in a row across the machine, near the front of the truck and in the back part of the furnace, being supported in the bed-plate or platform of the truck, so that the end out of which the flame issues is but a short distance above the ground, while the funnel-shaped receiving end for receiving the vapor or oil is above, in the furnace, to insure a powerful combustion, and to afford means for utilizing the heat of the furnace itself for melting purposes, the same being delivered to the burners, through the revertible flue N, from the top of the boiler. The vapor from the retort is supplied to the burners by tubes O, having a nozzle for discharging it in a forcible jet to convey it downward. P represents the steam-pipes for discharging the steam-jets at the burners. These will extend down to the mouths of the burners, as in Figs. 2, 3, and 4, when vapor is to be burned; but, when the oil is to be delivered directly to the burners, they will discharge at the top, as in Fig. 5, and in this case the oil will be discharged from a pipe, Q, upon a pan or plate, R, for retaining and spreading it, so that the jet of steam which will be discharged at the edge of the pan will be enabled to act in the best manner for thoroughly vaporizing the oil. The steam-pipes P and the vapor-pipes O pass from the boiler and the retort through the furnace, and directly over the burners K, in order to superheat the steam and vapor to

prepare them for the most perfect combustion, and the pipes have suitable cocks for regulating the quantities discharged. The oil-pipes Q will not pass through the furnace, so as not to heat the oil until it comes to the burners. The pipes L, for supplying vapor to the furnace-burners, may also extend into the burners M, and discharge thereat. The furnace-burners might be attached to the vapor-pipes O, but this would necessitate a cock between them and the discharging-nozzle for each pipe to prevent the escape of vapor while heating up to begin with, and at times when the machine will be standing, and such cocks would be difficult to keep tight and to manipulate in consequence of being exposed to the fire.

By having separate pipes to each set of burners the cocks may be placed outside of the furnace, as at S T, where they will not be exposed to the fire, and can be managed better. When oil is discharged into the burners M it may be necessary to have the small pipes L, or other small pipes, projecting into the burners to be used for lighting them, the vapor being generated in said pipes, to begin with, by fire of some kind—say, a torch held under them for a short time.

The burners M have perforations *a* in the sides, above the platform, for the supply of oxygen, by means of air to be drawn in through the furnace, or perforations in its sides, by the draft produced by the discharge of the steam or vapor jets in the burner. A safety-valve, *b*, is provided to the retort, to guard against any injurious effect from excessive pressure that may accidentally occur, but it is not designed to raise the pressure of the vapor very high. The temperature of the vapor may be controlled while maintaining higher temperature on the steam-boiler by opening and closing some of the burners K. *d* represents the runners connected with the sides of the machine, for confining the heat-currents so as not to escape at the side plates *e*, and guards *f*, to be held upright, while being, at the same time, allowed to rise and fall, and they are connected, by chains or cords *g h* and a pulley, *i*, with a lever, *j*, arranged so that the driver can raise and lower them at will. *l* is the brush of steel wires arranged at the front of the machine to prevent the escape of heat thereat, and to be used for breaking up the packed snow to facilitate the melting of it. For this latter purpose it will be geared by means of belts and pulleys, or other contrivances, with one of the wheels of the truck, to be revolved thereby. This roller is, in this example, mounted in the runners, so as to be raised and lowered with them; but it may be mounted independently of them, but it will be necessary to have it rise for convenience in turning the machine around.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, in a portable machine,

of a series of hydrocarbon oil or vapor burners, M, to discharge the heat and flame upon ice and snow, a retort or reservoir, and pipes for supplying oil or vapor to the burners, substantially as described.

2. The combination, in a portable machine, of a series of hydrocarbon oil or vapor burners, to discharge the heat and flame upon ice and snow, a retort or reservoir, and pipes for supplying the oil or vapor to the burners, and a boiler and pipes for combining steam-jets with the flames for impelling them and increasing the heat, substantially as specified.

3. The combination of the hydrocarbon-burners M, furnace J, steam-boiler B, retort A, steam-pipes P, and oil or vapor pipes O or a, all in a portable machine, substantially as specified.

4. The combination of the vertically-adjustable guard-runners d with a portable ice and snow melting machine, substantially as specified.

5. The combination of a revolving brush, l, with a portable ice and snow melting machine, to rise and fall and open and close at the front end of the melting-space under the truck, substantially as specified.

6. The boiler, furnace, and its escape-passage, combined and arranged with the burners M, to cause the escaping heat to pass through and be utilized in the burners, substantially as specified.

7. The combination of the water-chamber F over the melting-space and the boiler B, substantially as specified.

8. The combination, with the burner-tubes M, of a vapor-tube to discharge into the top, and a steam-pipe to discharge in or near the bottom of the same, substantially as specified.

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Witnesses:

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ALEX. F. ROBERTS.