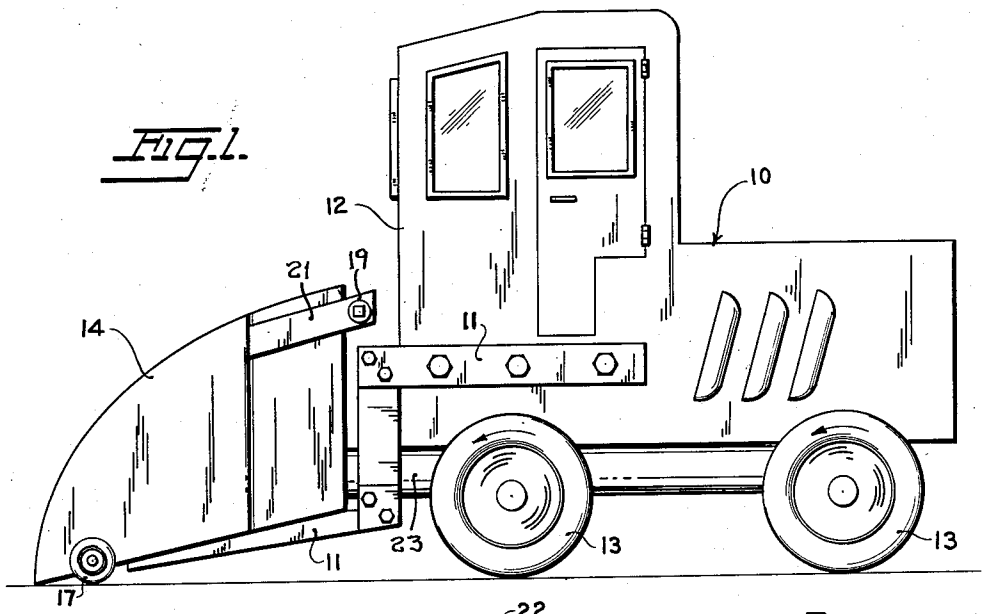
Dec. 2, 1952 F. VIVIANO 2,619,745

SNOW MELTING AND REMOVAL APPARATUS

Filed May 22, 1948 2 SHEETS—SHEET 1

Fig. 1.



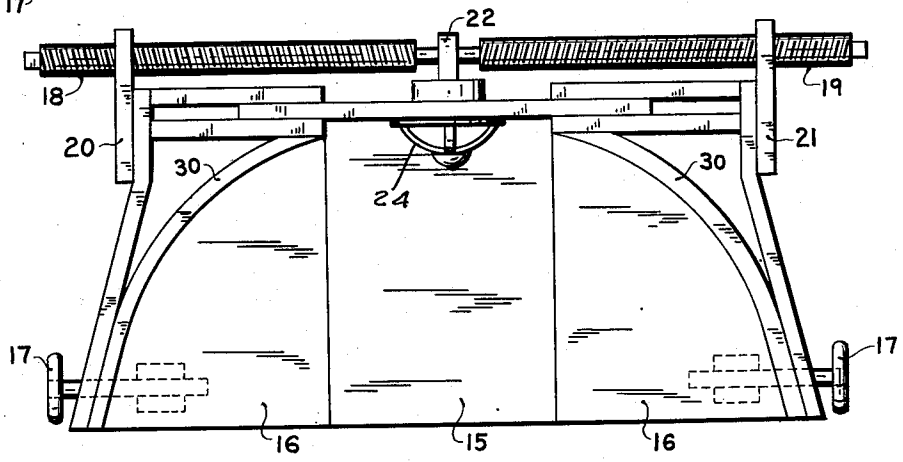


Fig. 3.

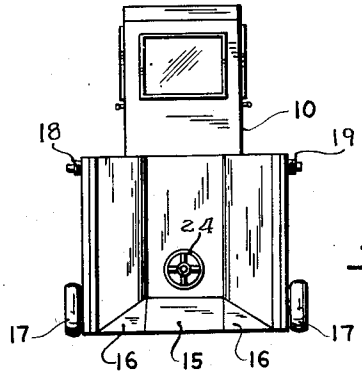


Fig. 2.

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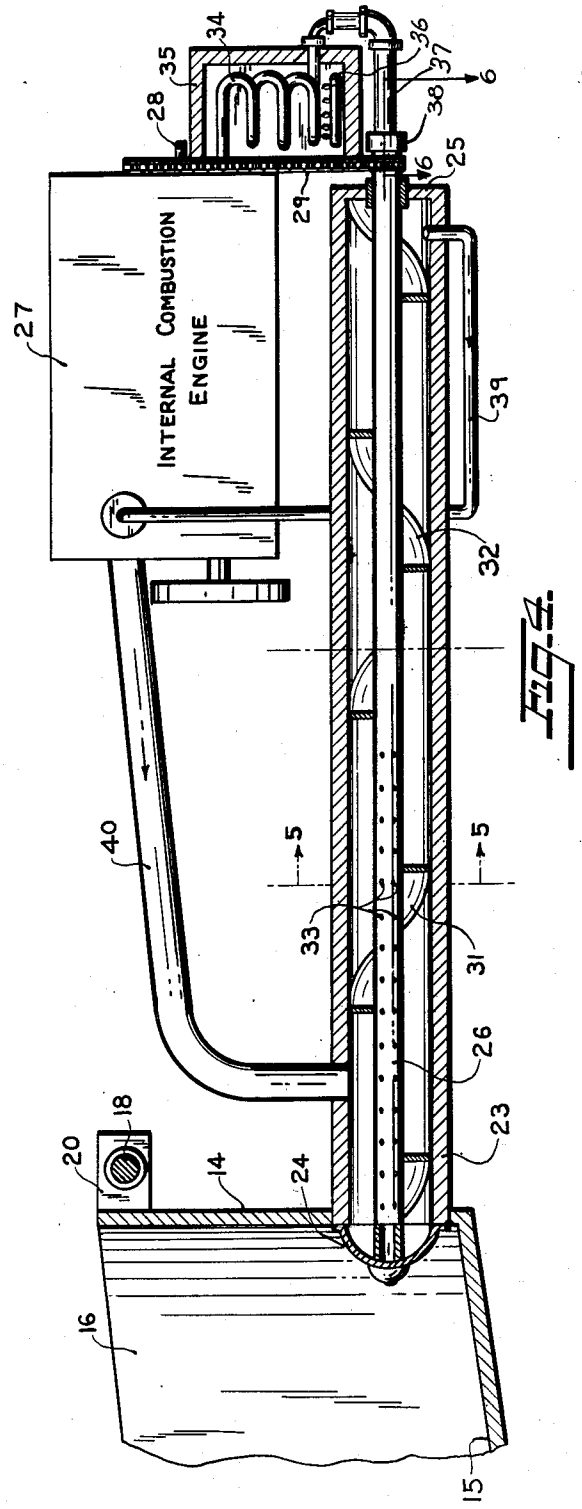

FIG. 4.

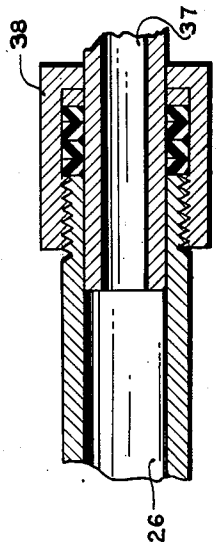

FIG. 6.

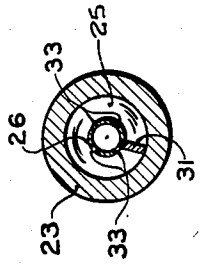

FIG. 5.

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SNOW MELTING AND REMOVAL APPARATUS

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Application May 22, 1948, Serial No. 28,653

6 Claims. (Cl. 37—12)

1

This invention relates to snow removal apparatus, and more particularly to a vehicle which can scoop up snow and melt it so that it is permanently disposed of.

It is well known, of course, to dispose of snow by various types of snow plows which push the snow off to one side of a road. In cities, however, and especially in such big cities as New York, Boston, Chicago and the like, pushing the snow off of the road means pushing it up onto the sidewalk, or at least blocking the gutters. This necessitates the costly carting of snow to a dump. For example, the snow is picked up by loading equipment and dumped into a truck and then carted to a river or to vacant lots for disposal.

It is an object of the present invention to provide snow removal equipment which not only plows the snow but also melts it to dispose of it so that it need not be carted away.

A further object is to provide apparatus as aforesaid having an adjustable plow.

Another object is to provide apparatus as aforesaid in which the snow which is picked up by the plow is mashed in a screw conveyor, and melted by hot water and/or steam.

Still another object is to provide a screw conveyor having, on the same shaft, opposite conveyor worms so that the first worm conducts the snow to the second worm, which mashes the snow.

Another object is to provide apparatus as aforesaid which utilizes the full heat of the internal combustion engine of the vehicle.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings, and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

Fig. 1 is a side view of snow removal apparatus constructed in accordance with the present invention.

Fig. 2 is a front view of the vehicle of Fig. 1.

Fig. 3 is a plan of the snow plow.

Fig. 4 is a side view, partly in section, of the snow-melting equipment.

Fig. 5 is a section on the line 5—5 of Fig. 4.

Fig. 6 is an enlarged section on the line 6—6 of Fig. 4.

The snow removal apparatus of the present invention is incorporated in an internal combustion engine motor vehicle 10 of the type having a short wheel base with the motor disposed at

2

the rear, but it is to be understood that the apparatus can be used with any type of vehicle, such as with tractors, ordinary dump trucks and street cleaning trucks, locomotives and trolley cars. The source of heat used to melt the snow may be provided electrically, or by means of burning oil or other fuel. In the present instance, the heat will be provided, by way of example, partly by the internal combustion engine and partly by an augmenting oil burner.

A brace or bracket 11 is bolted to the cab 12 of the vehicle 10 and extends downwardly in front of the front wheels 13 of the vehicle. The snow plow 14 is carried by this bracket. The snow plow consists of a center portion 15 telescoped in two end members 16 which are supported at their bottoms on wheels 17, the center portion 15 being secured, as by welding to the brace 11. The two end members are movable toward and away from each other by an integral worm shaft arrangement having opposite threads 18 and 19 which are threaded in lugs 20 and 21 secured to the end members 16. At its center between the worms 18 and 19, the shaft rotates freely in a bearing 22. The worm shaft can be rotated by means of a wrench to adjust the width of the plow.

A long horizontal tube or cylinder 23 is secured to the chassis of the vehicle and extends the full length thereof, opening at its front end through the rear wall of the center portion 15 of the snow plow. At its front, the tube has a spider bearing 24 and at its rear a wall 25. A conveyor shaft 26 is journalled in the bearing 24 and wall 25. This shaft projects rearwardly beyond the wall 25 and is rotated by an internal combustion engine 27, the shaft 28 of which is connected to the shaft 26 by a chain-sprocket drive 29. The snow plow converges toward the spider bearing 24, the end members 16 having baffle plates 30 for this purpose. The movement of the vehicle effects scooping up of snow which is forced into the tube 23, passing freely through the open network construction of the spider bearing 24.

A worm 31 is connected to the forward portion of the shaft 26 for receiving the snow and moving it rearwardly through the tube 23. A reverse worm 32 is connected to the rear portion of the shaft 26. This reverse worm rejects the snow and thereby works it over into slush. The shaft 26 is hollow and, along the worm 31, is provided with perforations 33.

The internal combustion engine cooling cells and chamber, there being no radiator in the pre-

ferred embodiment, is connected at the hot or outlet end to a coil **34** which is in a heater **35** and heated by an oil flame **36**. At its outlet end this coil terminates in a straight length or nipple **37** which is rotatably received by the rear end of the shaft **26** and is journalled therein. The joint is sealed by a gland **38**. Thus hot water from the engine is converted by the heater to wet steam or steam/water mixture and fed to the shaft **26**, from which it is distributed by the perforations **33**.

The tube **23** is connected, at its rear bottom portion, to a pipe **39** which returns cooling water to the internal combustion engine, completing the cooling cycle. The exhaust of the engine is piped by a conduit **40** to the tube **23** at a point a short distance from the inlet end of the tube **23**.

The operation of the apparatus is as follows:

The plow is first adjusted to the desired width, and the vehicle is then started up and moved slowly into a bank of snow lying on a vehicular highway or the like. The snow is forced into the tube **23** by the movement of the vehicle, and caught up and severely worked over by the worm **31** which continually moves the snow rearwardly. Due to the progress of the vehicle, a considerable plug of snow is formed at the entrance portion of the tube **23**. To the rear of this the snow is continually being melted by the hot exhaust gases entering the tube **23** from the conduit **40** and by the steam-hot water mixture entering the tube **23** from the distributing perforations **33**.

The melting converts the snow into a slushy mixture which is further ground by the resisting worm **32**. As the snow melts and is converted into water, it flows back to the internal combustion engine through the pipe **39**. Pipe **39** will be within the influence of the water pump, or a separate water pump may be provided if desired. Since the amount of water present will always be increasing and since the engine capacity is constant, water will be forced to flow toward the forward end of the tube **23**, thus being forced through the snow in the tube **23**, aiding in melting the snow. This excess water will force itself out of the front end of the tube **23** where it will flow onto the highway, and aid in melting the snow on the highway and converting it to slush.

It is to be understood that if desired, there may be two or more parallel tubes or cylinders **23** to expedite the melting of the snow.

While I have illustrated and described the preferred embodiment of my invention, it is to be understood that I do not limit myself to the precise construction herein disclosed and the right is reserved to all changes and modifications coming within the scope of the invention as defined in the appended claims.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent is:

1. In a snow removal apparatus including a wheeled vehicle driven by a water cooled internal combustion engine and having a snow plow on the front thereof with a cylinder mounted on the plow and extending rearward therefrom beneath the vehicle, a spider mounted across the front end of the cylinder, a wall closing the rear end of the cylinder, a tubular shaft extended concentrically through the cylinder and having its front end rotatively supported in said spider and its rear end extended rotatively through the wall which closes the rear end of the cylinder, a worm on the front end of said tubular shaft for drawing snow from the plow into the cylinder, the front end of said tubular shaft being formed with perforations between the convolutions of said worm, a conduit connecting the hot side of the engine's cooling system to the projected rear end of said shaft for feeding hot water into said shaft to discharge through said perforations and melt the snow which enters the front end of the cylinder, and a pipe connecting the rear end of the cylinder to the intake of the cooling system for conveying some of the cooled water from the rear end of the interior of the cylinder to the cooling system, said cylinder being open at its front end permitting excess water to discharge from the front end of the cylinder.

2. In a snow removal apparatus including a wheeled vehicle driven by a water cooled internal combustion engine and having a snow plow on the front thereof with a cylinder mounted on the plow and extended rearward therefrom beneath the vehicle, a spider mounted across the front end of the cylinder, a wall closing the rear end of the cylinder, a tubular shaft extended concentrically through the cylinder and having its front end rotatively supported in said spider and its rear end extended rotatively through the wall which closes the rear end of the cylinder, a worm on the front end of said tubular shaft for drawing snow from the plow into the cylinder, the front end of said tubular shaft being formed with perforations between the convolutions of said worm, a conduit connecting the hot side of the engine's cooling system to the projected rear end of said shaft for feeding hot water into said shaft to discharge through said perforations and melt the snow which enters the front end of the cylinder, and a pipe connecting the rear end of the cylinder to the intake of the cooling system for conveying some of the cooled water from the rear end of the interior of the cylinder to the cooling system, said cylinder being open at its front end permitting excess water to discharge from the front end of the cylinder, and a heater surrounding a portion of said conduit for superheating the water before it enters said tubular shaft.

3. In a snow removal apparatus including a wheeled vehicle driven by a water cooled internal combustion engine and having a snow plow on the front thereof with a cylinder mounted on the plow and extended rearward therefrom beneath the vehicle, a spider mounted across the front end of the cylinder, a wall closing the rear end of the cylinder, a tubular shaft extended concentrically through the cylinder and having its front end rotatively supported in said spider and its rear end extended rotatively through the wall which closes the rear end of the cylinder, a worm on the front end of said tubular shaft for drawing snow from the plow into the cylinder, the front end of said tubular shaft being formed with perforations between the convolutions of said worm, a conduit connecting the hot side of the engine's cooling system to the projected rear end of said shaft for feeding hot water into said shaft to discharge through said perforations and melt the snow which enters the front end of the cylinder, and a pipe connecting the rear end of the cylinder to the intake of the cooling system for conveying some of the cooled water from the rear end of the interior of the cylinder to the cooling system, said cylinder being open at its front end permitting excess water to discharge from the front end of the cylinder, and a worm of reverse hand on the rear end of said tubular shaft to reject the snow drawn into the

cylinder by said first worm forming a slush of the snow and the water.

4. In a snow removal apparatus including a wheeled vehicle driven by a water cooled internal combustion engine and having a snow plow on the front thereof with a cylinder mounted on the plow and extended rearward therefrom beneath the vehicle, a spider mounted across the front end of the cylinder, a wall closing the rear end of the cylinder, a tubular shaft extended concentrically through the cylinder and having its front end rotatively supported in said spider and its rear end extended rotatively through the wall which closes the rear end of the cylinder, a worm on the front end of said tubular shaft for drawing snow from the plow into the cylinder, the front end of said tubular shaft being formed with perforations between the convolutions of said worm, a conduit connecting the hot side of the engine's cooling system to the projected rear end of said shaft for feeding hot water into said shaft to discharge through said perforations and melt the snow which enters the front end of the cylinder, and a pipe connecting the rear end of the cylinder to the intake of the cooling system for conveying some of the cooled water from the rear end of the interior of the cylinder to the cooling system, said cylinder being open at its front end permitting excess water to discharge from the front end of the cylinder, and a second conduit extending from the exhaust of the engine and discharging into the front of the cylinder for conveying the hot gases of combustion into the front of the cylinder.

5. In a snow removal apparatus including a wheeled vehicle driven by a water cooled internal combustion engine and having a snow plow on the front thereof with a cylinder mounted on the plow and extended rearward therefrom beneath the vehicle, a spider mounted across the front end of the cylinder, a wall closing the rear end of the cylinder, a tubular shaft extended concentrically through the cylinder and having its front end rotatively supported in said spider and its rear end extended rotatively through the wall which closes the rear end of the cylinder, a worm on the front end of said tubular shaft for drawing snow from the plow into the cylinder, the front end of said tubular shaft being formed with perforations between the convolutions of said worm, a conduit connecting the hot side of the engine's cooling system to the projected rear end of said shaft for feeding hot water into said shaft to discharge through said perforations and melt the snow which enters the front end of the cylinder, and a pipe connecting the rear end of the cylinder to the intake of the cooling system for conveying some of the cooled water from the rear end of the interior of the cylinder to the cooling system, said cylinder being open at its front end permitting excess water to discharge from the front end of the cylinder, and a chain drive between said tubular shaft and the internal combustion engine for driving the tubular shaft.

6. A snow removal apparatus including a wheeled vehicle driven by a water cooled internal combustion engine, a snow plow mounted on the front of the vehicle, said plow having a center portion fixedly mounted on the vehicle and end members slidably mounted on the side of said center portion, means for moving said end members laterally relative to said center portion, a cylinder mounted on said center portion and extended rearward therefrom beneath the vehicle, a spider mounted across the front end of said cylinder, a wall closing the rear end of said cylinder, a tubular shaft extended concentrically through said cylinder and having its front end rotatively supported in said spider and its rear end extended rotatively through the wall which closes the rear end of the cylinder, a worm on the front end of said tubular shaft for drawing snow from the plow into the cylinder, the front end of said tubular shaft being formed with perforations between the convolutions of said worm, a conduit connecting the hot side of the engine's cooling system to the projected rear end of said shaft for feeding hot water into said shaft to discharge through said perforations and melt the snow which enters the front end of the cylinder, and a pipe connecting the rear end of said cylinder to the intake of the cooling system for conveying some of the cooled water from the rear end of the interior of said cylinder to the cooling system, said cylinder being open at its front end permitting excess water to discharge from the front end of said cylinder.

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