Jan. 12, 1932. A. O. HAGEN 1,841,245

SNOW REMOVING MACHINE

Filed Aug. 30, 1929 6 Sheets-Sheet 1

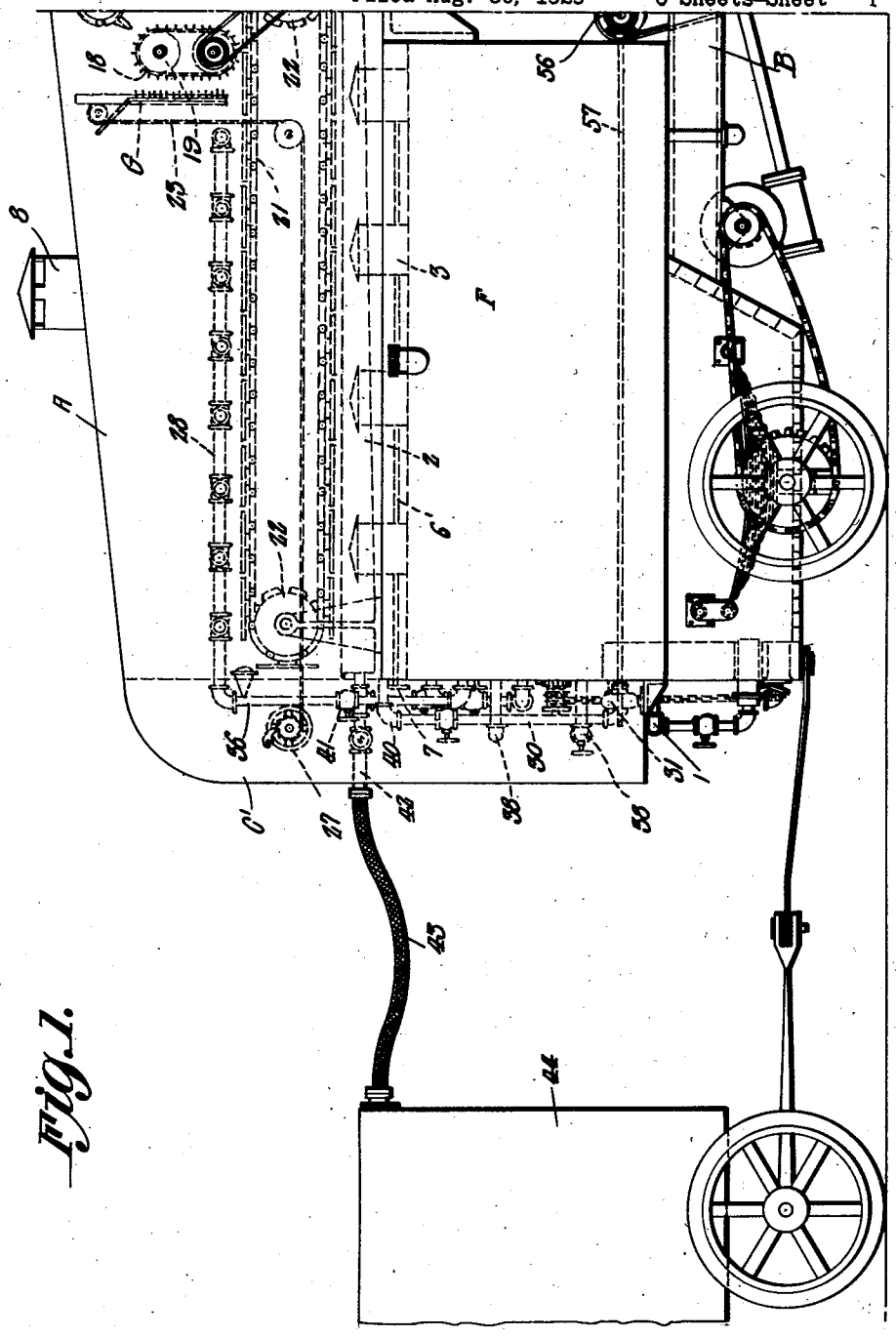



Fig. 1.

A. O. HAGEN, INVENTOR

BY Victor J. Evans

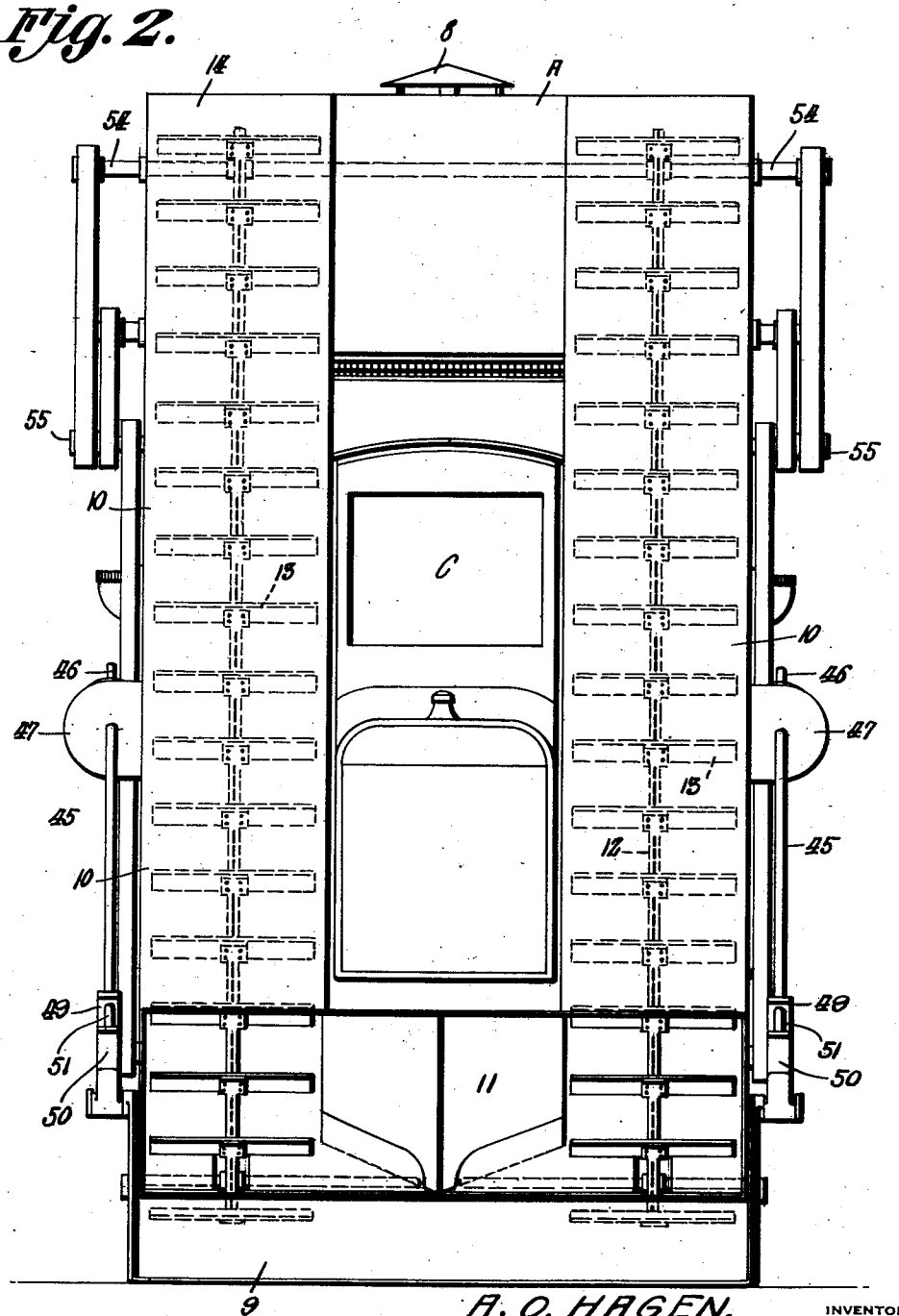
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SNOW REMOVING MACHINE

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Fig. 2.




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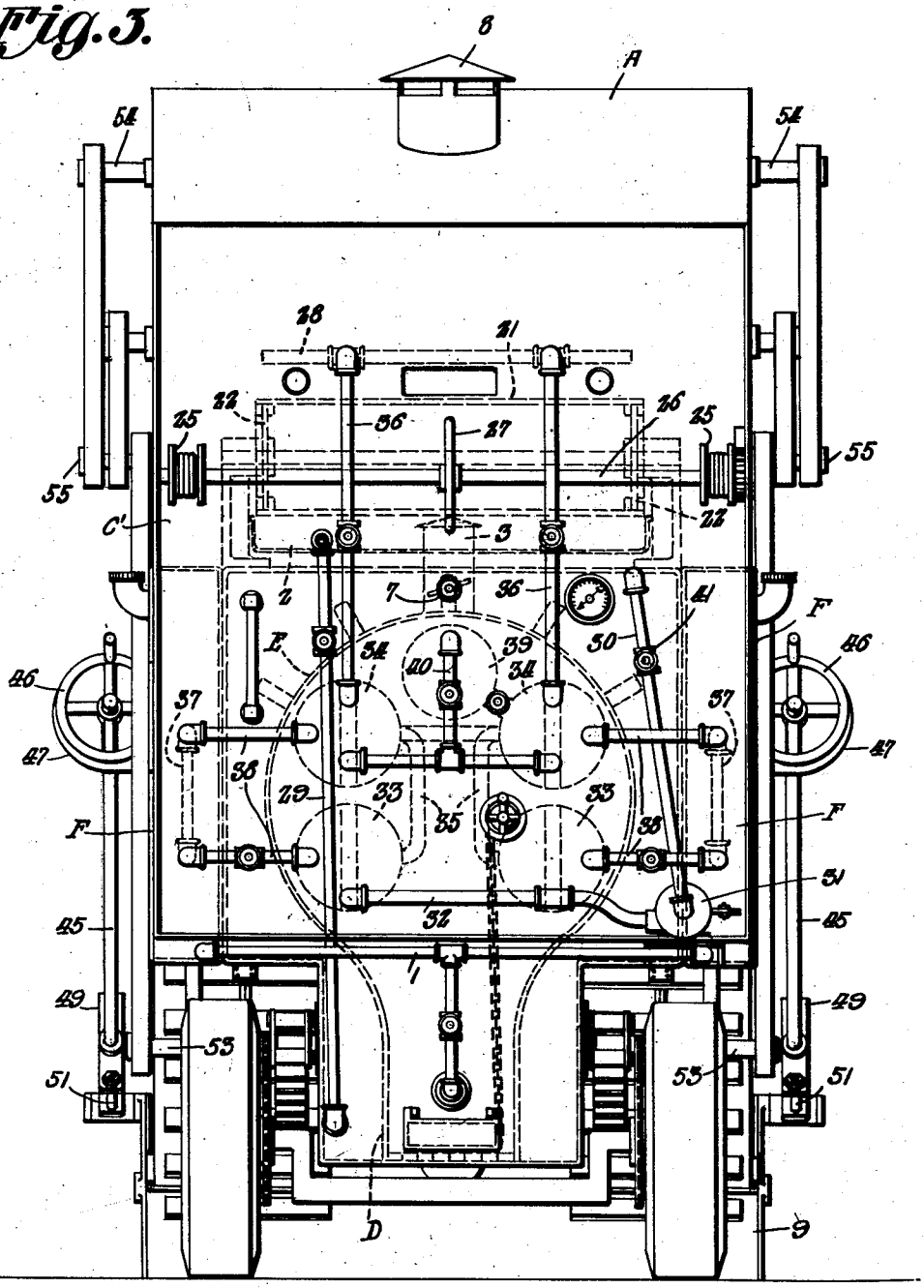
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SNOW REMOVING MACHINE

Filed Aug. 30, 1929 6 Sheets-Sheet 3

Fig. 3.




A. O. HAGEN, INVENTOR

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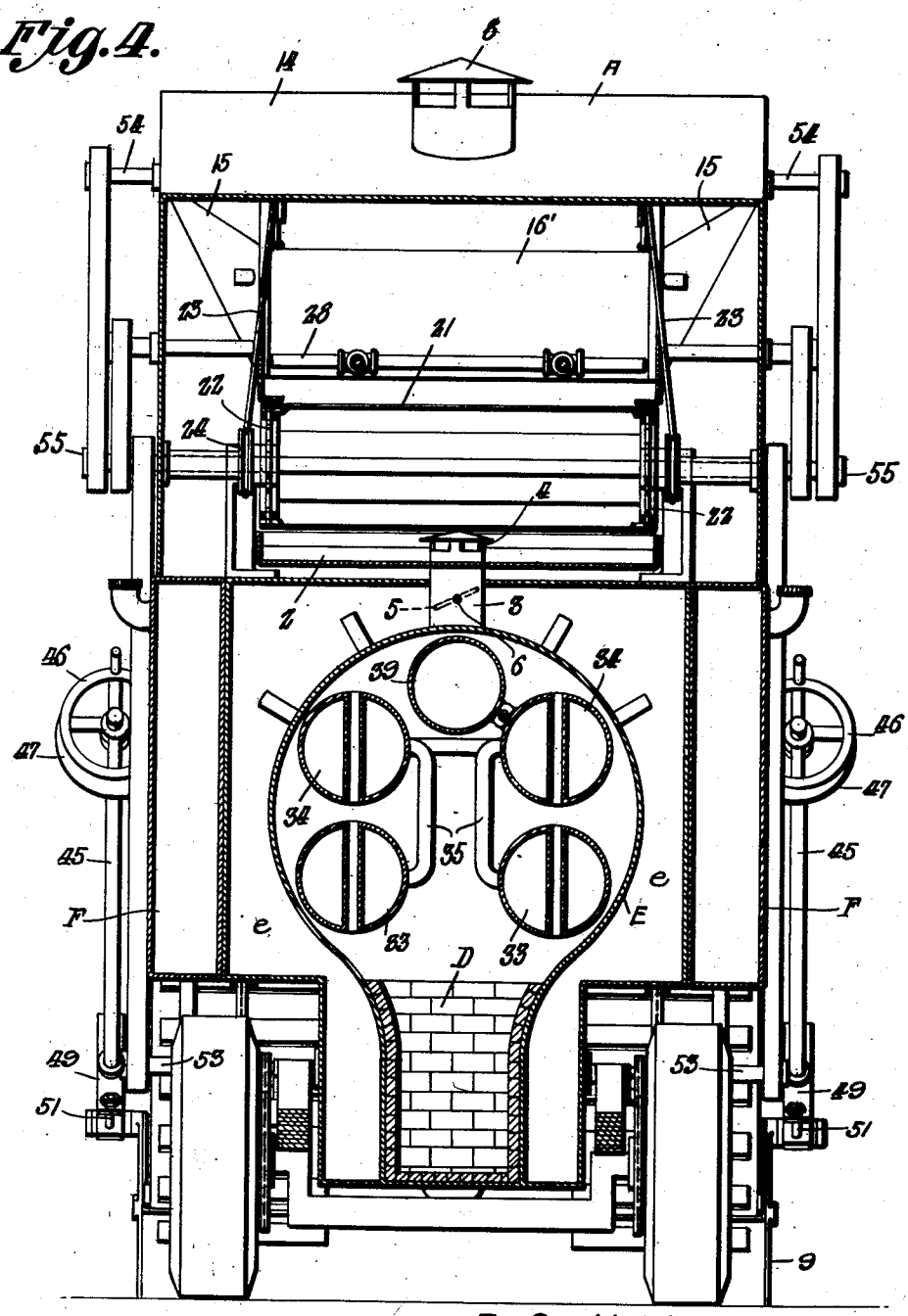
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Jan. 12, 1932. A. O. HAGEN 1,841,245

SNOW REMOVING MACHINE

Filed Aug. 30, 1929 6 Sheets-Sheet 4

Fig. 4.




A. O. HAGEN, INVENTOR

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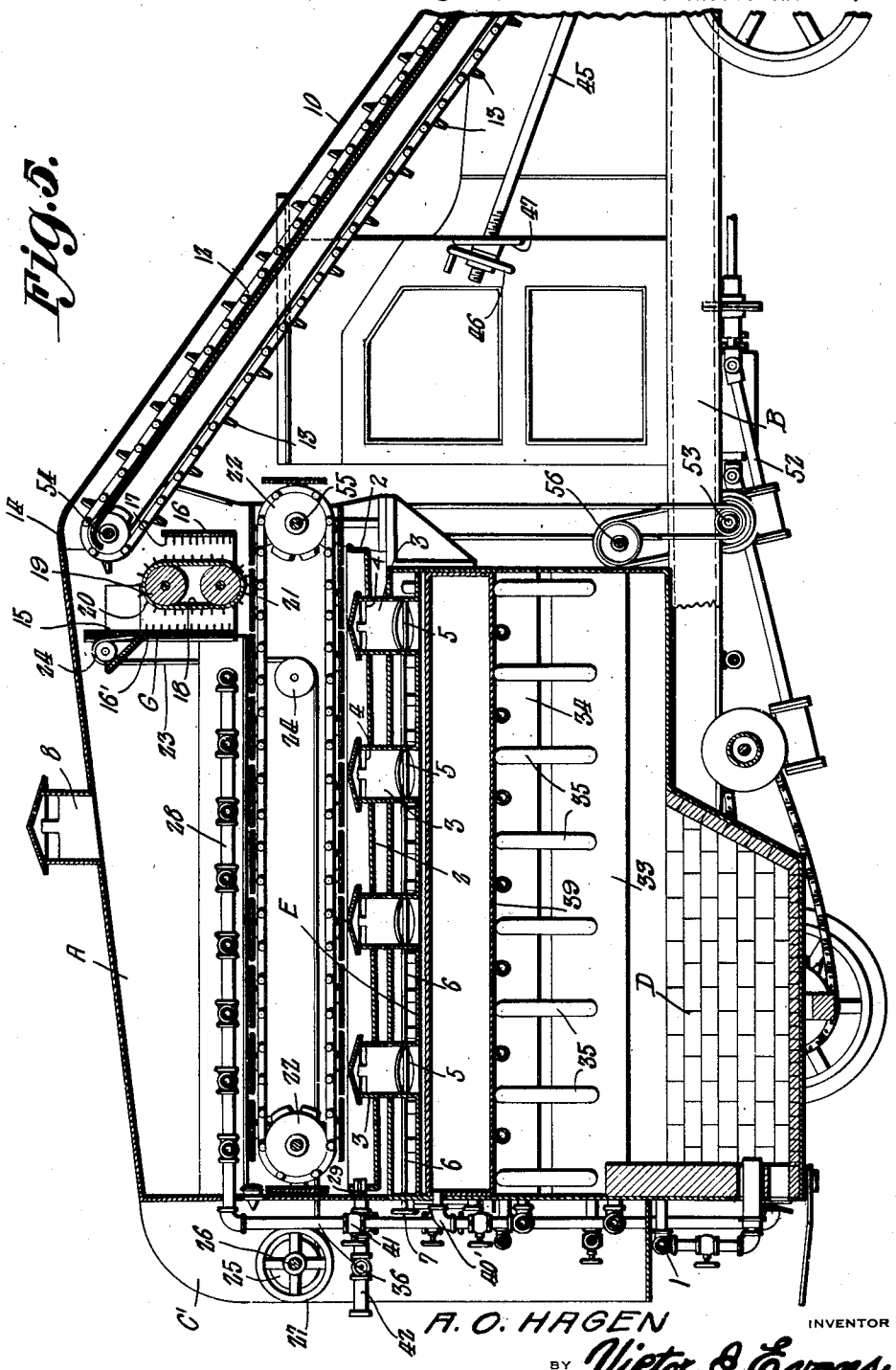
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SNOW REMOVING MACHINE

Filed Aug. 30, 1929 6 Sheets-Sheet 5

Fig. 5.



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Jan. 12, 1932. A. O. HAGEN 1,841,245

SNOW REMOVING MACHINE

Filed Aug. 30, 1929 6 Sheets-Sheet 6

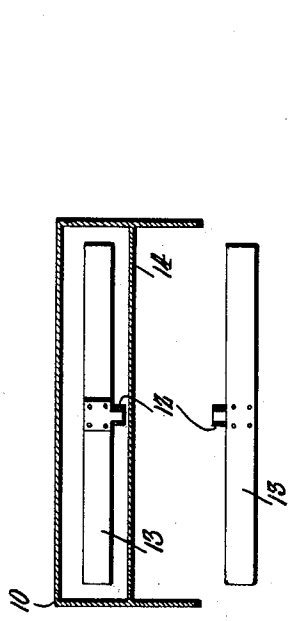



Fig. 6.




Fig. 1a.

A. O. HAGEN, INVENTOR

BY Victor J. Evans

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Patented Jan. 12, 1932 1,841,245

# UNITED STATES PATENT OFFICE

ALBERT O. HAGEN, OF TACOMA, WASHINGTON, ASSIGNOR OF FORTY-FIVE PER CENT TO LEONARD O. HAGEN, OF SEATTLE, WASHINGTON

## SNOW REMOVING MACHINE

Application filed August 30, 1929. Serial No. 389,482.

This invention relates to a process of and apparatus for removing snow from streets, roads, tracks and other surfaces, the general object of the invention being to provide means for picking up the snow from a surface and conveying it to a conveyor and subjecting the snow to the action of a hot water spray, whereby the snow will be melted and then conveying the snow water to a heating apparatus, from which the hot water is pumped to the spray device for melting the snow on the conveyor.

Another object of the invention is to provide means for taking care of the surplus snow water not used in the heating apparatus, and to provide means for breaking up the snow before it reaches the conveyor and for spreading the snow on the conveyor and also to adjust the level of snow on the conveyor.

This invention also consists in certain other features of construction and in the combination and arrangement of the several parts, to be hereinafter fully described, illustrated in the accompanying drawings and specifically pointed out in the appended claims.

In describing the invention in detail, reference will be had to the accompanying drawings wherein like characters denote like or corresponding parts throughout the several views, and in which:—

Figure 1 is an elevation of the rear part of the apparatus and showing a trailer tank connected therewith.

Figure 1ª is an elevation of the front part of the apparatus.

Figure 2 is a front view of the apparatus.

Figure 3 is a rear view, with the rear cab removed.

Figure 4 is a transverse sectional view through the apparatus.

Figure 5 is a longitudinal sectional view thereof.

Figure 6 is a section on line 6—6 of Figure 1ª.

In these views, the letter A indicates a closed body placed on a truck B, said truck being provided with the driver's cab C and the body having a cab C′ at its rear for the operator of the apparatus. A furnace D is placed in the body and said furnace is enclosed by a boiler E. If the furnace is heated by an oil burner, which is preferable, oil tanks F are placed at the sides of the boiler and are connected by the pipes 1 with the burner in the furnace. A tray 2 is supported in spaced relation above the boiler and a number of chimneys 3 is connected with the top of the furnace and have their upper closed ends passing into the tray, the openings 4 in the chimneys being arranged within the tray. These chimneys are provided with the dampers 5 which can be operated from the cab C by the rod 6 and its handle 7. A chimney 8 is placed on the top of the body so that the products of combustion passing through the chimneys 3 will pass around the tray and through the upper part of the body and escape through the chimney 8.

A tiltable shovel 9 is arranged at the front of the apparatus and is supported by the inclined conveyor frame 10 which is supported from the front part of the truck. This frame is formed with a wide lower part and a pair of upper parts, these upper parts being arranged at the sides of the front of the truck in the cab C. A deflector member 11 is arranged in the center of the wide part of the frame and acts to deflect the snow coming from the shovel into each side part and each side part contains a conveyor 12, including the flights 13, for conveying the snow from the lower part of the frame into the front upper part of the body A. The upper reach of each conveyor is arranged in a casing 14 forming part of the conveyor frame. The snow dropping from the upper ends of the conveyors fall upon the inclines 15, which direct the snow into a combined spreader and breaker G arranged in the front upper part of the housing A. This device comprises a vertical casing 16 having the spikes 17 on its walls and an endless member 18 passing over the rolls 19, with spikes 20 on the endless member. Thus it will be seen that the endless member acts to carry the snow downwardly through the casing and the spikes will act to break up lumps in the snow. An endless conveyor 21 passes over the rolls 22, this conveyor being ar-

ranged over the tray 2, with its forward end under the device G, so that the snow will be delivered by the device G upon the forward part of the upper reach of the conveyor 21. The rear wall 16' of the device G is supported for vertical movement so that its lower edge acts as a leveler for the snow dropping upon the conveyor and can be adjusted to control the depth of snow on the conveyor through means of the cables 23 attached to the movable wall and passing over the pulleys 24 to the drums 25 carried by a shaft 26 journaled in the cab C', said shaft having a hand wheel 27 thereon whereby the operator in said cab can adjust the movable wall 16'.

A spray device 28 is arranged above the conveyor 21 for spraying hot water on the snow on the conveyor so as to melt the snow and the water therefrom will drop into the tray 2. This tray slopes rearwardly and its lower end is connected by a pipe 29 with the lower part of the boiler E which as shown consists of a secondary combustion chamber having the outlet flues 3. Located within the secondary combustion chamber is a plurality of large water tubes or boilers 33 and 34, which with the pipe 35 and pump means 31 are in association with the space *e*, so that the snow water will enter said boiler and the upper part of the boiler is connected by a pipe 30 with the pump 31, the outlet of this pump being connected by the pipes 32 with the lower pair of the large water tubes 33 arranged in the furnace D and this lower pair of tubes 33 is connected with an upper pair of tubes 34 by the pipes 35 and these tubes 34 are connected by the pipes 36 with the spray device 28, so that the water, after being heated, is delivered to the spray device to melt the snow on the conveyor, the primary heating of the water being had in the space *e* and is then circulated through the large water tubes 33 and 34 located within the combustion chamber by means of the pump 31. The water is heated to a higher temperature in these large water tubes 33 and 34 and is conducted to the spray device. Coils 37 are arranged in the oil tanks F and these coils are connected to the large water tubes by the pipes 38 so that some of the hot water will circulate through the coils in the oil tanks to heat the oil so that it will flow freely in cold weather.

A steam boiler 39 is arranged in the upper part of the furnace and is connected by a valve coupling 40 with one of the tubes 34 so that steam from the system will enter the boiler 39 and the steam space of said boiler 39 is connected by the pipe 40' with the lower portions of the tubes 34, so that the steam will enter the water in said tubes 34, and thus add to the heating effect of the apparatus and it will, of course, be understood that steam can be delivered to other portions of the boilers, if desired, and it can also be delivered to the burners, if desired. This steam boiler 39 can also be provided with a connection whereby it can be connected to an exterior steam supply, to be filled with steam at the starting up of the apparatus. The pipes can be provided with valves, as shown at 41, wherever necessary or desired.

The lower end of the tray 2 is also provided with a valve connection 42 whereby the surplus water from the tray not needed in the heating system can be conveyed by a hose 43 to a tank 44 forming part of a trailer, or this surplus water can be discharged into the gutters or otherwise disposed of.

The shovel can be raised and lowered from the front cab C through means of the rods 45 which have their lower ends pivotally connected with the shovel and their upper ends threaded to receive the hand wheels 46, these upper ends of the rods passing through the bushings 47, the hand wheels being so arranged that they can be readily reached by a person in the cab C. I also provide shock absorbers for the shovel, these shock absorbers comprising springs 48 arranged on telescopic parts of the rods 45 and a cross piece 49, attached to one part of each rod 45 and a cross piece 50 attached to the other part thereof, with bolts 51 slidably connecting the cross pieces together.

The conveyors are operated from the take-off shaft 52 which is connected with one of the transmission shafts of the propelling means of the truck, this shaft being geared to a transversely arranged shaft 53 supported by the chassis and this shaft is connected by sprockets and chains or pulleys and belts to the upper shaft 54 of the elevating conveyors and to the front shaft 55 of the conveyor 21 and to a shaft of one of the rolls 19 of the device G and this shaft 53 is also connected in any suitable manner to a shaft 56 which is geared to a shaft 57 which operates the pump 31. The parts are provided with suitable clutch means which can be controlled from either the front cab or the rear cab.

From the foregoing it will be seen that as the apparatus travels along, the snow is picked up by the shovel and elevated by the front conveyors which deposit the snow into the spreading and breaking device G, which spreads the snow on the front end of the upper reach of the conveyor 21. This conveyor carries the snow under the spraying device 28 so that the snow is melted by the hot water from this spraying device and the water from the melting snow drops into the tray 2, from which it is piped into the boilers and after being heated in the boilers, the water is forced into the spray device. Thus the snow is melted and the water therefrom used to melt more snow after being heated. While the drawings show the boiler being heated by fuel oil, it will, of course, be understood that it can be otherwise heated and the

apparatus can be placed on a railroad car or a street car instead of being placed on the chassis of a truck. The products of combustion, circulating around the tray and the conveyor 21, will also help to melt the snow.

It is thought from the foregoing description that the advantages and novel features of the invention will be readily apparent.

It is to be understood that changes may be made in the construction and in the combination and arrangement of the several parts, provided that such changes fall within the scope of the appended claims.

What I claim is:—

1. An apparatus of the class described comprising a body, a conveyor in the body on which the snow is placed, a spray device arranged above the conveyor for spraying the snow thereon with hot water, a tray under the conveyor for catching the water, a boiler in the body, means for conveying the water from the tray into the boiler, means for conveying the heated water from the boiler to the spray means and means arranged at the front end of the conveyor for spreading the snow on the conveyor and breaking lumps therein.

2. An apparatus of the class described comprising a body, a conveyor in the body, on which the snow is placed, a spray device arranged above the conveyor for spraying the snow thereon with hot water, a tray under the conveyor for catching the water, a boiler in the body, means for conveying the water from the tray into the boiler, means for conveying the heated water from the boiler to the spray means, means arranged at the front end of the conveyor for spreading the snow on the conveyor and breaking lumps therein and means associated with the last mentioned means for regulating the depth of snow on the conveyor.

3. An apparatus of the class described comprising a wheel supported body, a conveyor in the body on which the snow is placed, a spray device in the body arranged over the conveyor for spraying hot water on the snow on the conveyor, a tray under the conveyor for receiving the water, a furnace carried by the body, a boiler surrounding the furnace, a pipe connecting the tray with the bottom part of the boiler, a pump for pumping the water from the top part of the boiler, a plurality of boilers in the furnace, receiving the water from the pump and means for connecting some of these boilers with the spray device.

4. An apparatus of the class described comprising a wheel supported body, a conveyor in the body on which the snow is placed, a spray device in the body arranged over the conveyor for spraying hot water on the snow on the conveyor, a tray under the conveyor for receiving the water, a furnace carried by the body, a boiler surrounding the furnace, a pipe connecting the tray with the bottom part of the boiler, a pump for pumping the water from the top part of the boiler, a plurality of boilers in the furnace, receiving the water from the pump, means for connecting some of these boilers with the spray device, a steam boiler in the upper part of the furnace and connected with one of the other boilers and means for delivering the steam from said steam boiler into some of the other boilers.

5. An apparatus of the class described comprising a wheel supported body, a conveyor in the body on which the snow is placed, a spray device in the body arranged over the conveyor for spraying hot water on the snow on the conveyor, a tray under the conveyor for receiving the water, a furnace carried by the body, a boiler surrounding the furnace, a pipe connecting the tray with the bottom part of the boiler, a pump for pumping the water from the top part of the boiler, a plurality of boilers in the furnace receiving the water from the pump, means for connecting some of these boilers with the spray device, a steam boiler in the upper part of the furnace and connected with one of the other boilers, means for delivering the steam from said steam boiler into some of the other boilers, chimneys connected with the top of the furnace and discharging the products of combustion under the tray and a chimney connected with the top of the body.

6. An apparatus of the class described comprising a wheel supported body, a conveyor in the body on which the snow is placed, a spray device in the body arranged over the conveyor for spraying hot water on the snow on the conveyor, a tray under the conveyor for receiving the water, a furnace carried by the body, a boiler surrounding the furnace, a pipe connecting the tray with the bottom part of the boiler, a pump for pumping the water from the top part of the boiler, a plurality of boilers in the furnace receiving the water from the pump, means for connecting some of these boilers with the spray device, a steam boiler in the upper part of the furnace and connected with one of the other boilers, means for delivering the steam from said steam boiler into some of the other boilers, chimneys connected with the top of the furnace and discharging the products of combustion under the tray, a chimney connected with the top of the body, a cab at the end of the body, dampers in the chimneys connected with the furnace, means whereby a person in the cab can control the dampers, means whereby said person can regulate the spreading of the snow on the conveyor and valves in the water pipes operated from said cab.

7. An apparatus of the class described comprising a wheel supported body, a conveyor in the body on which the snow is placed,

a spray device in the body arranged over the conveyor for spraying hot water on the snow on the conveyor, a tray under the conveyor for receiving the water, a furnace carried by the body, a boiler surrounding the furnace, a pipe connecting the tray with the bottom part of the boiler, a pump for pumping the water from the top part of the boiler, a plurality of boilers in the furnace receiving the water from the pump, means for connecting some of these boilers with the spray device, a steam boiler in the upper part of the furnace and connected with one of the other boilers, means for delivering the steam from said steam boiler into some of the other boilers, chimneys connected with the top of the furnace and discharging the products of combustion under the tray, a chimney connected with the top of the body, a cab at the end of the body, dampers in the chimneys connected with the furnace, means whereby a person in the cab can control the dampers, means whereby said person can regulate the spreading of the snow on the conveyor, valves in the water pipes operated from said cab and means for operating the conveyor, the spreading means and the pump.

In testimony whereof I affix my signature.

ALBERT O. HAGEN.