Sept. 20, 1927.

1,642,895

C. B. ROBINSON ET AL

SNOW REMOVING MACHINE

Filed April 30. 1926

4 Sheets-Sheet 1

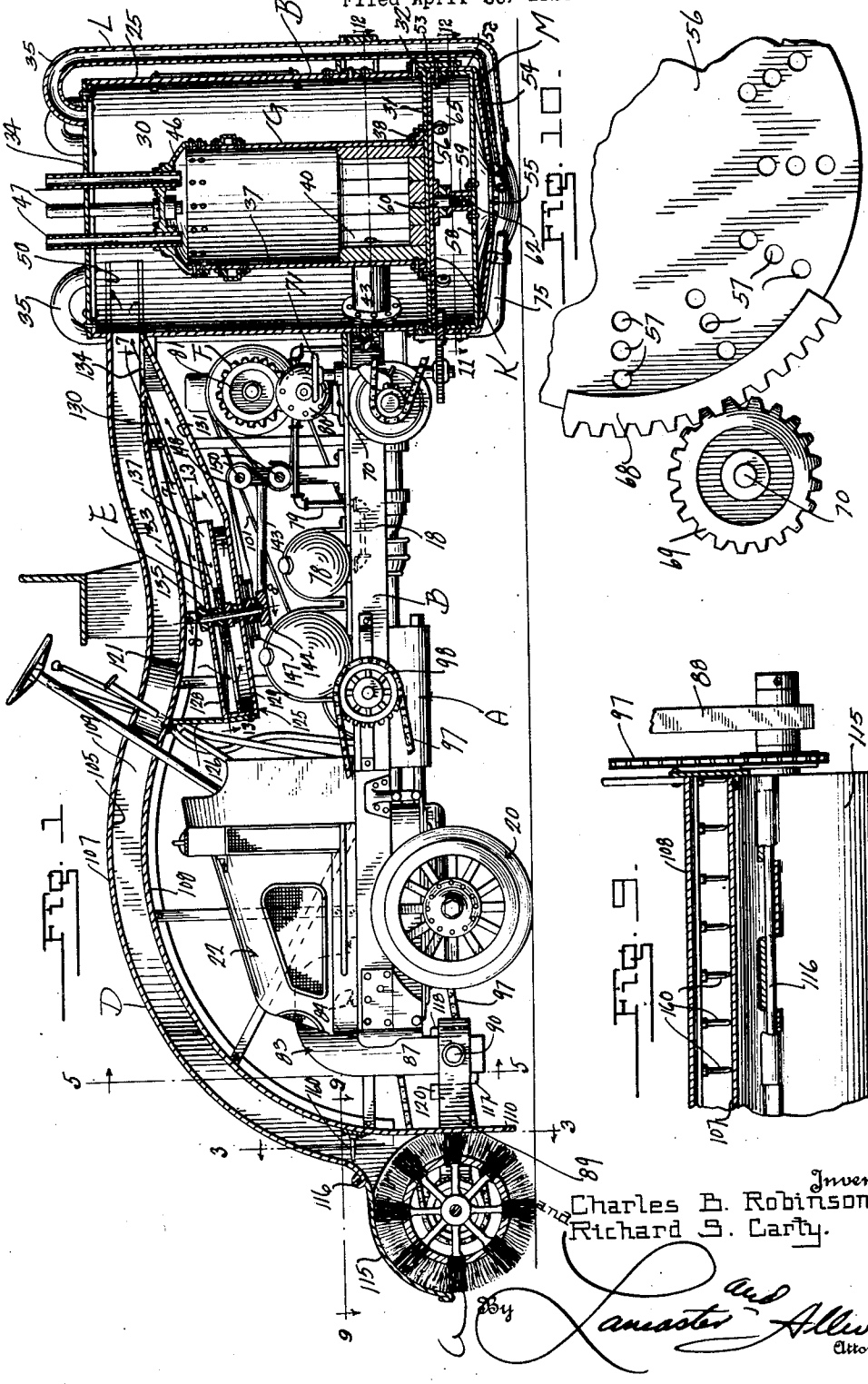


Fig. 1

Fig. 10.

Fig. 9.

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SNOW REMOVING MACHINE

Filed April 30, 1926 4 Sheets-Sheet 2

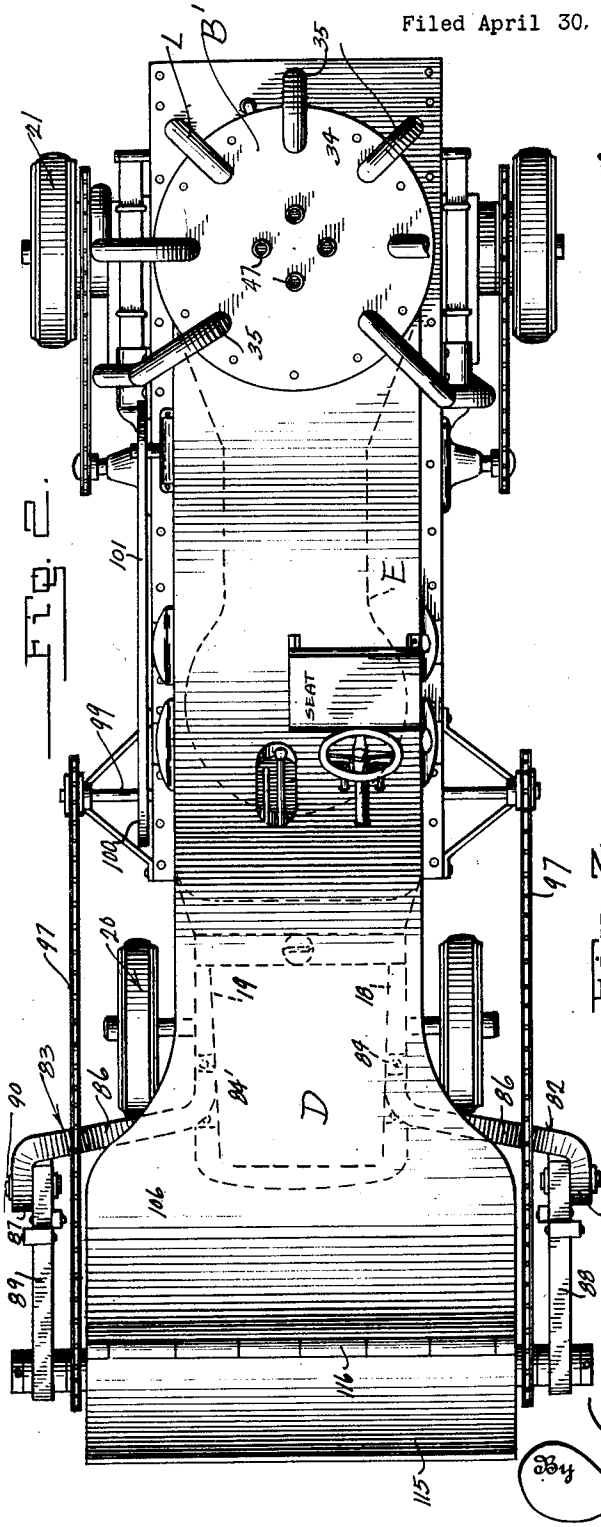


Fig. 2.

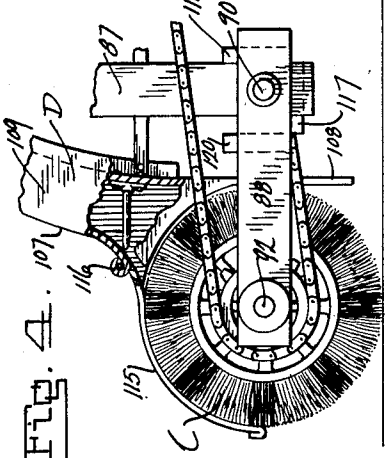


Fig. 4.

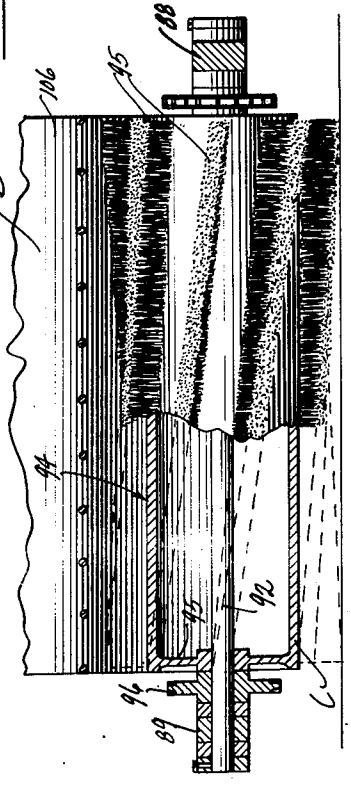


Fig. 3.

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SNOW REMOVING MACHINE

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Fig. 6.

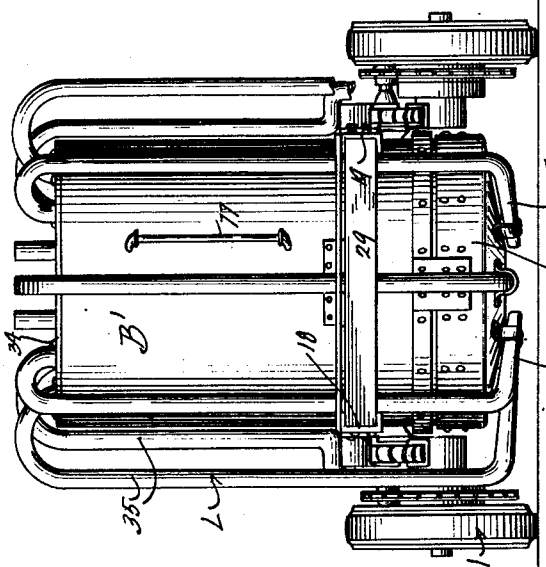


Fig. 8.

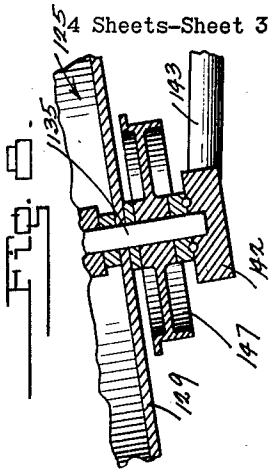


Fig. 5.

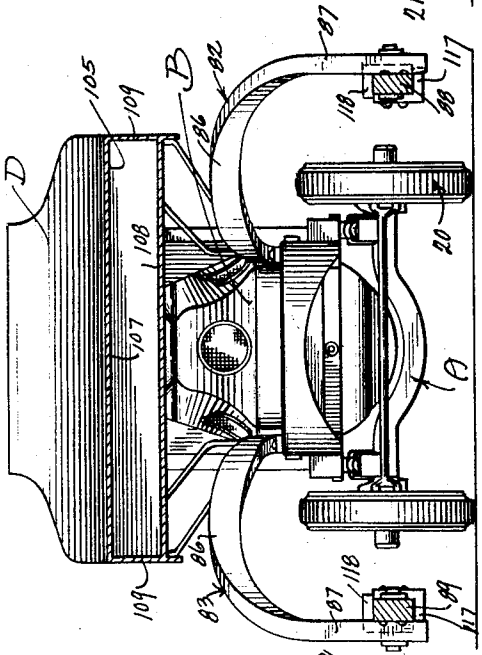
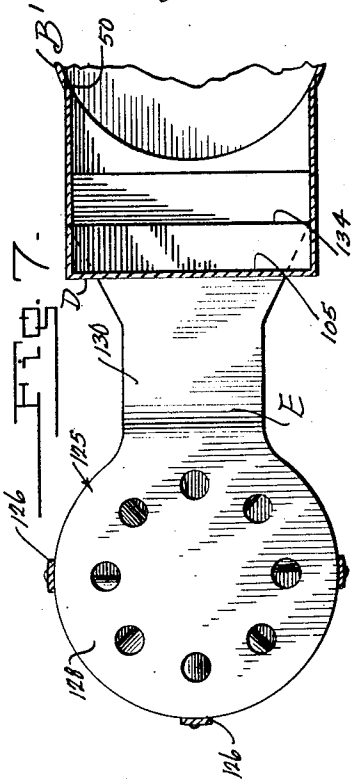


Fig. 7.



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SNOW REMOVING MACHINE

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Fig. 12.

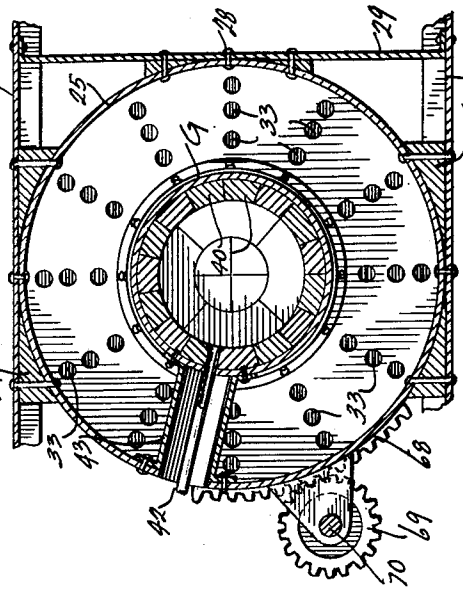


Fig. 14.

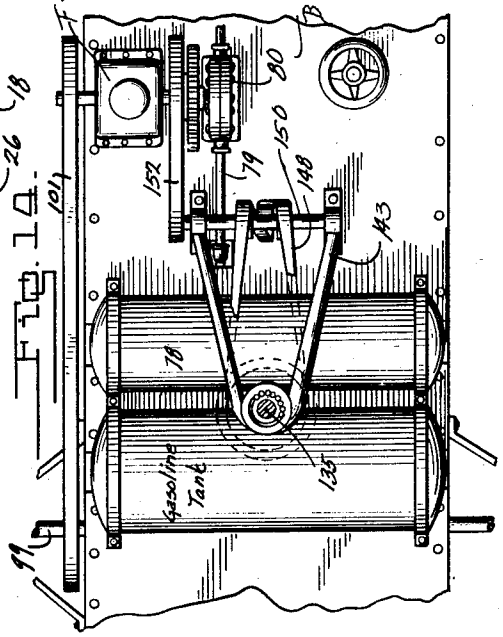


Fig. 11.

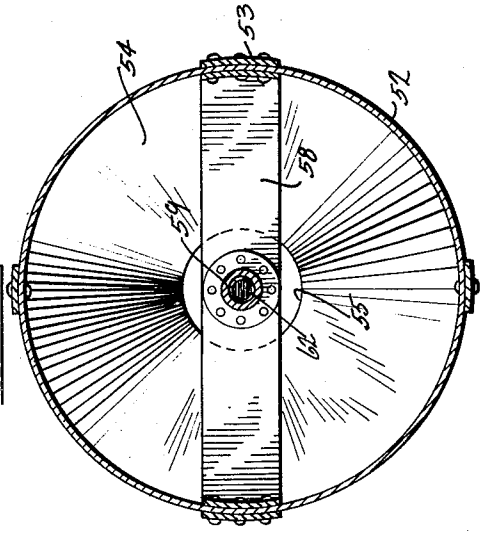


Fig. 13.

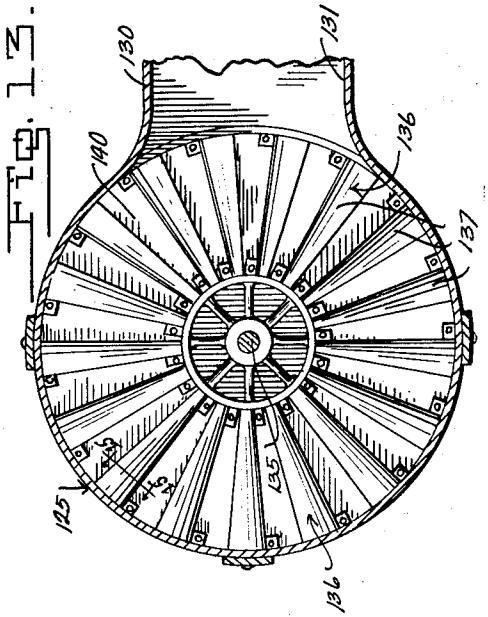
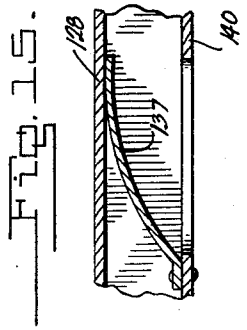


Fig. 15.



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Patented Sept. 20, 1927. 1,642,895

UNITED STATES PATENT OFFICE.

CHARLES B. ROBINSON AND RICHARD S. CARTY, OF DETROIT, MICHIGAN.

SNOW-REMOVING MACHINE.

Application filed April 30, 1926. Serial No. 105,792.

This invention relates to improvements in machines for removing snow from streets, pavements, highways, or the like, in an expeditious manner.

The primary object of this invention is the provision of a relatively compact and efficient snow removing device for lifting snow from a ground surface, and conveying it to a heater where the same will be melted almost instantly upon its entrance to a heating chamber, and retained in the form of steam or water until a suitable location has been reached to permit of the discharge of the water.

A further object of this invention is the provision of an improved snow removing and melting machine embodying an improved assemblage of parts which may be compactly and conveniently arranged upon the chassis of a conventional automotive vehicle, in such manner that the snow may be removed from forwardly of the vehicle and conveyed longitudinally of the vehicle to a heat plant at the rear of the vehicle, where the snow will be almost instantly melted upon its entrance into a heating compartment and discharged in the form of steam or water.

A further object of this invention is the provision of an improved snow lifting and conveying means for use in a snow removing vehicle, embodying means for pneumatically conveying the snow to a heater or like place of disposition.

Other objects and advantages of this invention will be apparent during the course of the following detailed description.

In the accompanying drawings, forming a part of this specification, and wherein similar reference characters designate corresponding parts throughout the several views,

Figure 1 is a longitudinal sectional view taken through the improved snow removing and treating apparatus showing the mounting thereof upon a chassis of a conventional motor vehicle.

Figure 2 is a plan view of the improved snow removing apparatus.

Figure 3 is a fragmentary sectional view taken substantially on the line 3—3 of Figure 1, showing more particularly a brush construction for lifting the snow from a ground or street surface.

Figure 4 is a sectional view taken transversely at the brush end of the improved snow removing apparatus, showing more particularly the brush mounting and means for receiving the snow after the same has been lifted by the brush.

Figure 5 is a sectional view taken substantially on the line 5—5 of Figure 1.

Figure 6 is a rear view of the improved snow removing vehicle, showing the heating plant thereof.

Figure 7 is a sectional view taken substantially on the line 7—7 of Figure 1.

Figures 8 and 9 are sectional views taken substantially on their respective lines in Figure 1 of the drawings.

Figure 10 is a fragmentary view illustrating more particularly a discharge valve arrangement for discharge of the water after the same has been converted in the heating plant of the improved snow removing apparatus.

Figures 11, 12, and 13 are views taken substantally on their respective lines in Figure 1 of the drawings.

Figure 14 is a fragmentary plan view of details of the improved snow apparatus and equipment.

Figure 15 is an enlarged sectional view taken through a detail of the fan arrangement substantially on the line 15—15 of Figure 13.

In the drawings, wherein for the purpose of illustration is shown only a preferred embodiment of the invention, the letlet A may generally designate the improved snow removing apparatus, which may include a chassis B of the conventional motor vehicle type, having a receiving tank B′ mounted at the rear end thereof. At the front of the chassis B is disposed a brush construction C which is adapted to feed snow to a tube or conduit D of novel construction, wherein the snow is in part propelled by the action of the brush C, and mainly pneumatically by fan means E which is operated from a prime mover F preferably supported by the vehicle B. Within the receiving tank B′ is disposed a heating plant G of novel formation, which is preferably of the oil burner type, as will be subsequently described. In connection with the retainer tank, special valve means K is provided for controlling flow of liquid therefrom, and air and steam exit means L is provided in a cooperative relation with the tank B for discharging air and steam under pressure in a cooperative relation

with respect to the exit of liquid from a discharge pan M below the valve means K.

The motor vehicle chassis B is of the conventional or any approved construction, comprising the longitudinal side rails or beams 18 and 19, forwardly supported upon front running gear 20 of any approved character, and rearwardly supported upon rear running gear 21 of any approved character. The vehicle B is of course provided with a conventional engine (not shown) beneath a front hood and radiator construction 22, with suitable differential and driving connections for propelling the running gear of the vehicle. At the rear end of the vehicle chassis B the receiving tank B′ is mounted, the same including a cylindrical body portion 25 which is connected in any approved manner to the chassis rails 18 and 19 as is illustrated in Figure 12 of the drawings, where special bolt constructions 26 and 27 are shown for specially connecting the body 25 to the beams 18 and 19, and means 28 may also be provided for connecting the body 25 to suitable cross beams 29.

The tank body 25 provides a compartment 30 therein and the tank body 25 at the lower end thereof is provided with a base wall or plate 31 which is suitably riveted at 32 to the body 25; the base plate or bottom wall 31 having suitable openings 33 therein as is well illustrated in Figure 12 of the drawings. The tank B′ at the top thereof is provided with a top wall 34 within which the upper ends of suitable conduits 35 are connected, with U-shaped connections; the conduits 35 comprising part of the steam and air exhaust means L to be subsequently described in detail.

Within the compartment 30, in resting relation upon the bottom wall 31 of the tank B′ is disposed a heating unit G, which consists of a heater casing 37, of hollow cylindrical formation, the lower end of which is open, and bolted by angle connections 38 to the central portion of the bottom wall 31 of the receiving tank B′ so that between the outer surface of the casing 37 and the inner periphery of the body 25 is disposed an annular space wherein water may rise to a predetermined level incident to conversion of the snow as it enters the compartment 30. In the lower portion of the casing 37 is disposed a fire box 40, constructed of fire-brick, and the fuel for producing the flame in the fire box 40 is preferably of oil burner origin; the oil and air preferably entering the fire box 40 through a conduit 42 which leads to any suitable apparatus for feeding the fuel which will be subsequently described. A short tubular connection 43 is connected radially in the annular space between the body 25 of the tank B′ and the casing 37 of the heater unit G, wherein the fuel conduit 42 is located in a protected relation from the water and materials in the tank B′ as is readily apparent from Figure 12 of the drawings.

The casing 37 at the top thereof includes a dome 46, which is suitably bolted to the body of the casing and extending upwardly from the dome 46 are a plurality of exit conduits 47, which communicate with the compartment in the casing 37 and extend upwardly thru the top wall 34 of the tank B′, for exit of the products of combustion to the atmosphere exteriorly of the tank B′, as can readily be understood from Figure 1 of the drawings.

The tank B′ adjacent but below the top wall 34 is provided with a substantially rectangular opening 50, extending for a short distance thereabout, wherein the rear end of the snow conveying conduit D is connected for feed of snow into the upper part of the compartment 30, from whence it falls downwardly in the compartment 30 and is instantaneously melted by the heat generated in the heating unit G, and converted into either water or steam.

The pan M is adapted to receive the water after it has been released by the valve means K from the receiving tank B′. This pan M preferably comprises an annular side wall 52, which is bolted or connected by suitable means 53 to the lower portion of the tank body 25, so that the annular wall 52 is substantially contiguous with the body 25, below the base 31, and in slightly spaced relation at its upper edge with the base 31, if desired. The pan M furthermore comprises a bottom wall 54 tapering in downwardly sloping converging relation from the lower edge of the annular wall 52, and at the center thereof providing an exit opening 55 thru which water is discharged into any suitable drain or gutter.

As to the valve means K the same comprises a valve disc 56, rotatably supported in preferably sliding engagement beneath the base plate 31; the disc 56 having openings therein, as illustrated in Figure 10 of the drawings, at 57, which are adapted to register with the openings 33 of the base plate 31, to drain water from the tank into the pan M and then through the opening 55 to any desired location.

The valve disc 56 has a special central support; the pan M being provided with a transverse supporting beam 58 therein diametrically across the compartment in the pan M, midway between the ends of which is mounted an upstanding open sleeve 59, adapted to receive therein in a sliding relation the depending shank 60 which is preferably rigidly connected with the valve disc 56. A spring 62 is placed within the sleeve 59 for normally urging the shank 60 and the valve disc 56 upwardly against the apertured base plate 31 of the tank, to maintain a

leak-proof connection when the valve disc is closed with respect to the openings in the base plate 31. At its outer marginal edges the disc 56 is also preferably supported in anti-friction manner upon rollers 65 which are rotatably supported by bolts extending thru the pan M in the relation illustrated in Figure 1 of the drawings.

As to the means for rotating the disc 56, the disc 56 at its outer periphery along a portion thereof is provided with a toothed segment 68, as illustrated in Figure 10 of the drawings, with which a toothed pinion 69 meshes; the latter being supported upon a shaft 70 which is rotatably mounted in any approved manner upon the vehicle chassis and has a hand wheel 71 at the upper end thereof for regulating the position of the valve disc 56 relative to the apertured plate 31.

The steam discharge tubes 35 extend downwardly along the outer sides of the body 25, parallel therewith, and at their lower ends are inturned at 75, as illustrated in Figures 1 and 6 of the drawings; the ends 75 tapering toward their free ends, where they are provided with reduced nozzles facing below the opening 55 and where incident to the pressure of the steam and air exhausting through the nozzle openings, the water may be quickly withdrawn thru the opening 55 and kept from freezing. If desired the free nozzle ends of the conduit portions 75 may be downturned.

In order to determine the height of the liquid level in the compartment 30 a suitable gauge glass 77 may be provided upon the body 25 of the tank B' as illustrated in Figure 6 of the drawings.

Referring to the fuel feed for the heating plant G, an oil tank 78 is preferably supported on the chassis of the vehicle B, which has suitable connections 79 with a blower 80 operated by means of the prime mover F, which has a sprocket gear connection 81 therewith; the blower 80 having the conduit 42 above mentioned leading therefrom for feed of fuel to the fire box of the heater G; the said conduit being provided with the ordinary control valves (not shown).

Referring to the brush construction C, it is preferred to provide a pair of frame supporting beams 82 and 83, in a rigid connected relation upon the chassis B; the same at the rear ends thereof being bolted at 84 upon the forward ends of the rails 18 and 19, as is illustrated in Figure 2 of the drawings. The beams 82 and 83 from their connected ends on the rails extend upwardly and then outwardly at 86, substantially horizontal, and at their outer ends they take a vertical drop to provide the vertical supporting portions 87. At the lower ends of the vertical supporting portions 87, of the beams 82 and 83, are provided horizontally extending arms 88 and 89, respectively pivoted to said beams 82 and 83 by means of pivot shafts or connections 90.

At their outer ends the arms 88 and 89 rotatably support the brush shaft 92, in any approved manner. Anti-friction means may be provided for so supporting the shaft 92 upon the arms 88 and 89 if desired, and it is readily obvious that the shaft 92 horizontally extends forwardly of the vehicle A. Keyed upon the shaft 92 is the cylindrical shaped hollow brush drum 94, suitably provided with spirally arranged spaced rows of bristles 95 thereon. The drum 94 is provided with end walls 95 which are keyed on the shaft 92 in a manner well understood. Keyed upon the shaft 92 at the outer sides of the walls 95 of drum 94 are sprocket wheels 96, about which side chains 97 are trained; the side chains 97 extending rearwardly along the sides of the vehicle B and upwardly inclined, and at their rear ends being trained over suitable sprocket wheels 98 mounted at the outer ends of a shaft 99 which bears in the frame of the vehicle B; said shaft 99 being provided with a suitable pulley wheel 100 about which a belt 101 is trained; the belt 101 being driven by the prime mover F.

Referring to the conduit or tube D, for conveying the snow from the brush construction C to the tank B', the same is rigid and in cross section is substantially rectangular, providing a relatively wide but shallow compartment or duct 105 longitudinally therethrough. At its forward end 106 the conduit D is laterally enlarged to the width of the brush. This tube construction D includes the top and bottom walls 107 and 108 in a conforming curved relation, between which the compartment 105 is disposed, and the wall D also includes side walls 109 enclosing the compartment 105. Rearwardly of the brush the lower wall 108 extends downwardly at 110 behind the brush, in order to guard the snow from between the rows of bristles of the brush upwardly into the compartment 105. At the lower end of the wall 107, immediately over the brush is hinged a segmental shaped guard lid 115; the same being arcuately bent at substantially the same radius as the brush, and being hinged at 116 so that the same may swing upwardly as the brush is elevated or lowered by means of the pivoting of the arms 88 and 89, to correspond with the contour of the ground being operated upon. The duct 105 is arranged tangentially to the brush, and the lid or hinged cover C extends over the top and forwardly of the brush and about the same to more properly guide the snow into the duct 105, as is readily apparent from Figure 1 of the drawings.

In order to limit the amplitude of move-

ment of the pivot arms 88 and 89, each of the same is provided with a lower forward stop block 117 and an upper rear stop block 118, which are adapted to contact respectively against the front and rear edges of the depending supporting ends 87 of the respective beams 82 and 83, as is illustrated in Figure 1 of the drawings, to limit the lowermost hanging relation of the said pivot arms 88 and 89, to permit the brush to engage on a ground surface for brushing up relatively light snows. From the positions of the arms 88 and 89 as limited by the stop blocks 117 and 118, said pivot arms 88 and 89 may swing upwardly until the stop blocks 120 carried by each of the arms 88 and 89 engage against the front edges of the depending ends 87 of the supporting beams, and in this relation the brush head has an amplitude of vertical swinging movement which may vary according to the weight of the snow and the thickness of the fall thereof, and may also compensate for irregularities in ground surface, without injury to the brush construction C.

The conduit or tube D extends upwardly in substantially a reverse curve, on a relatively large radius, and then flattens out and drops at 121 intermediate its ends, and then elevates again and has an upper connection in the opening 50 of the tank B′ as above mentioned. Below the drop 121 is mounted the fan construction for pneumatically conveying the snow thru the duct 105.

Referring to the blower or fan construction E, the same comprises a casing construction 125, supported beneath the conduit D by means of substantially vertical braces 126; said casing 125 having an apertured top wall 128 and preferably imperforate bottom wall 129. Leading off from the casing 125 is a conduit 130 which has a duct 131 therein communicating with the compartment 133 in the casing 125; the conduit 130 at its rear end extending upwardly for communication thru an opening 134 in the duct 105 of the tube D, immediately adjacent the connection of the latter with the tank B′.

In the top and bottom walls 128 and 129 of the casing 125, is rotatably supported a shaft 135, upon which is keyed a fan construction 136, comprising a plurality of blades 137 which bear the relation illustrated in Figures 1 and 15 to the top and bottom walls of the casing 125; said blades 137 being connected upon the lower spider wall 140, so that upon rotation the air will be drawn thru the openings in the top wall 128 and forced downwardly and along the tube duct 131 and into the conduit D for drawing the snow therealong incident to a suction created therein, to deposit the same in the tank department 30. For driving the fan shaft 135, the same extends downwardly below the casing wall 129, and is there supported by means of a bearing 142 which in turn is supported by bracket means 143 connected in any approved manner to the chassis of the vehicle. On the shaft 135 above the bearing 142 is provided a pulley wheel 147, which has a belt 148 trained thereabout; the belt being suitably trained over pulleys 150 to give the same the proper turn; the pulleys 150 being mounted upon upper and lower shafts, and the lower shaft being suitably rotated by means of a belt and pulley connection 152 operating from the prime mover F, as is illustrated in Figure 14 of the drawings.

From the foregoing description of this invention the operation is apparent. The snow is swept from the brush construction C upwardly into the tube D, where the same will be subject to a suction incident to the fan operation and the snow will be drawn into the compartment 30, where the same, subject to the intense heat therein, will melt and be converted into water or steam. The air and steam will exit through the tubular means L and the water will be controlled by the valve means K as above mentioned. To prevent large pieces of ice and other foreign material from entering the duct 105 it is preferred to provide spaced projections 160 in the duct 105, immediately at the entrance thereto adjacent the brush C, as illustrated in Figure 1 of the drawings.

Various changes in the shape, size, and arrangement of parts may be made to the form of invention herein shown and described, without departing from the spirit of the same or the scope of the claims.

We claim:

1. In a snow removing machine the combination of a portable frame, a receiving tank mounted at the rear end of the portable frame, brush means mounted at the forward end of the portable frame, conduit means extending from the brush means to the tank for receiving snow from the brush means and conveying it to the tank, means for forcing a draft of air into the conduit means for propelling snow therealong into the receiving tank, heater means in the receiving tank for melting snow as it is received therein, valve means connected with the receiving tank for venting liquid therefrom in selective manner, and means connected with the receiving tank for venting air and steam pressure therefrom to adjacent said valve means.

2. In a snow removing machine the combination of a frame, a receiving tank carried on the frame, conduit means connected with the receiving tank, rotary brush means for forcing snow from the ground into the conduit means, pneumatic means communicating with the conduit means to force the snow therethrough into the receiving tank, a heater within the receiving tank for melting

snow therein as it is received, valve means in the lower portion of the tank for drain of liquid therefrom, a drain pan cooperating with the valve means and providing a drain opening below the valve means, and air and steam exhaust means communicating with the upper portion of the tank and extending therealong and having outlet nozzles in adjacent facing relation in the opening above mentioned to facilitate drain of liquid thru said opening.

3. In a snow removing machine the combination of a snow receiving tank, means for depositing snow therein, heater means in the tank, said tank having means at the lower portion thereof providing a drain opening, and conduits communicating with the upper portion of the tank and extending therealong and having outlet nozzles in facing adjacent relation with the drain opening whereby steam in the upper portion of the tank may exhaust thru said conduit and thru said outlet to facilitate quick flow of liquid from said drain opening.

4. In a snow removing machine the combination of a snow receiving tank, means for depositing snow therein, heater means in the tank, said tank having means at the lower portion thereof providing a drain opening, conduits communicating with the upper portion of the tank and extending therealong and having outlet nozzles in facing adjacent relation with the drain opening whereby steam in the upper portion of the tank may exhaust thru said conduits and thru said nozzles to facilitate quick flow of liquid from said drain opening, and valve means cooperating in the tank for drain of liquid to the drain opening.

5. In a snow removing machine the combination of a snow receiving tank, means for feeding snow to the snow receiving tank, valve means at the bottom of the tank to control drain of liquid therefrom, a pan below the tank connected therewith having a drain opening, and conduit means connected with the upper end of the tank for receiving steam from the tank and having outlet openings facing adjacent said drain opening whereby incident to the blast of steam therethrough the liquid may be drained with facility thru said drain opening and kept from freezing at the opening.

6. In a snow removing machine the combination of a snow receiving tank, means for feeding snow to the receiving tank, said receiving tank including a bottom wall having openings therein, a pan supported below the tank having a bottom wall provided with an opening therein, a perforated disc, means supported by the pan for supporting and resiliently urging the disc against the tank bottom wall, means for rotating the disc whereby to place said perforations thereof in or out of alignment with the openings of the first mentioned bottom wall.

7. In a snow removing machine the combination of a snow receiving tank, means for feeding snow to the receiving tank, said receiving tank including a bottom wall having openings therein, a pan supported below the tank having a bottom wall provided with an opening therein, a perforated disc, means supported by the pan for supporting and resiliently urging the disc against the tank bottom wall, means for rotating the disc whereby to place said perforations thereof in or out of alignment with the openings of the first mentioned bottom wall, and heater means supported by the bottom wall of the tank within the tank for heating and melting snow as it is received therein.

8. In a snow removing machine the combination of a snow receiving tank, means for feeding snow to the receiving tank, said receiving tank including a bottom wall having openings therein, a pan supported below the tank having a bottom wall provided with an opening therein, a perforated disc, means supported by the pan for supporting and resiliently urging the disc against the tank bottom wall, means for rotating the disc whereby to place said perforations thereof in or out of alignment with the openings of the first mentioned bottom wall, heater means supported by the bottom wall of the tank within the tank for heating and melting snow as it is received therein, said heater having outlet flues extending to exteriorly of the tank for exhaust of the products of combustion from the heater means.

9. In a snow remover the combination of a snow receiving tank, means for feeding snow thereinto, a heater in the tank, valve means for drain of liquid from the tank, and means for exhaust of steam and gases from the tank at a point adjacent the valve means.

10. In a snow removing machine the combination of a frame, a receiving tank, a conduit connected with the receiving tank, said conduit having an inlet end, a brush, means swingably mounting the brush adjacent the inlet end of the conduit for limited movement towards or away from said inlet end, said brush being positioned whereby the same may sweep snow into the conduit, and means in the conduit adjacent the brush for preventing ice and large foreign articles from entering the conduit.

11. In a snow remover machine the combination of a portable frame, arms, means pivotally mounting the arms on the frame in spaced relation for substantially horizontal disposition. means to limit the amplitude of movement of said arms for movement in substantially a vertical plane, a rotary brush supported at the outer ends of said arms remote from their pivot whereby to give the

brush an arcuate swing incident to pivotal movement of the arms, a receiving tank, and conduit means connected with the receiving tank and extending to said brush where the same has an inlet for disposition of snow as it is swept by said brush.

12. In a snow remover machine the combination of a portable frame, arms, means pivotally mounting the arms on the frame in spaced relation for substantially horizontal disposition, means to limit the amplitude of movement of said arms for movement in substantially a vertical plane, a rotary brush supported at the outer ends of said arms remote from their pivots whereby to give the brush an arcuate swing incident to pivotal movement of the arms, a receiving tank, conduit means connected with the receiving tank and extending to said brush where the same has an inlet for disposition of snow as it is swept by said brush, a prime mover, and means connecting the brush with the prime mover for rotation thereof.

13. In a snow removing machine the combination of a snow receiving tank, said tank having a bottom wall provided with a series of perforations remote from its center, a heater centrally disposed in said tank mounted upon the imperforate portion of the bottom thereof, and valve means for said perforations

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