March 30, 1937. E. T. STEWART 2,075,673

SNOW REMOVAL MACHINE

Filed Oct. 30, 1935 3 Sheets-Sheet 1

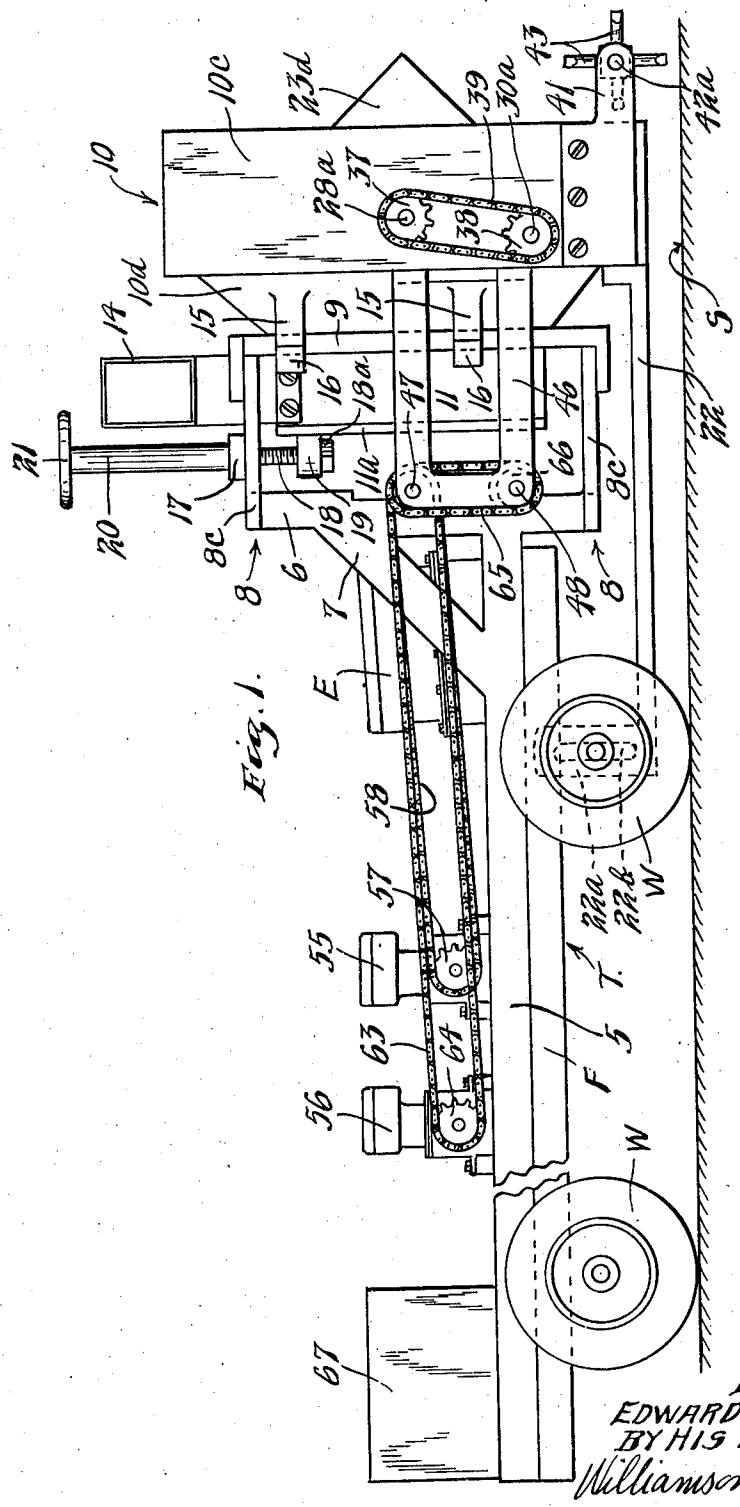

Fig. 1.

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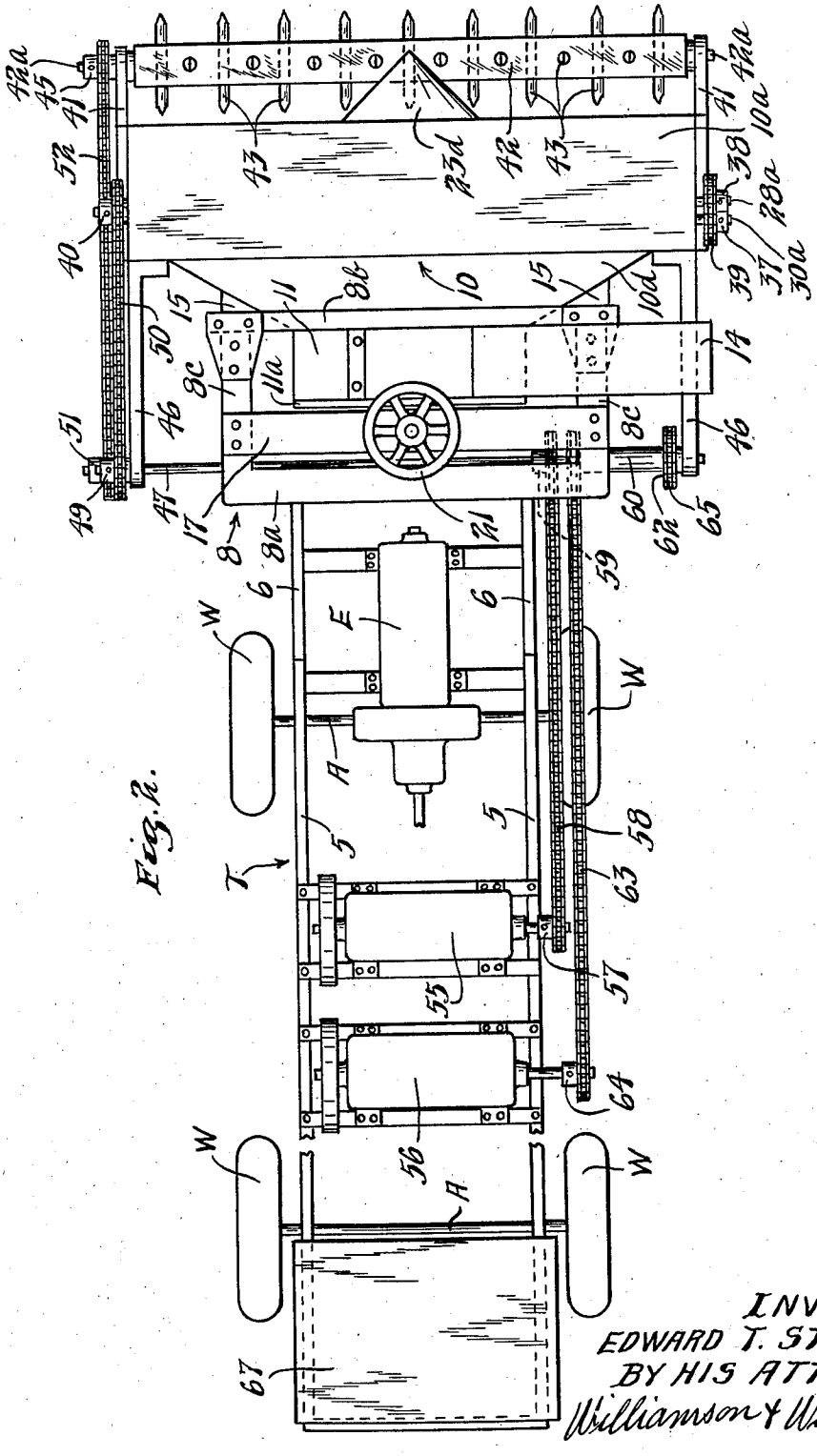

Fig. 2.

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Fig. 3.

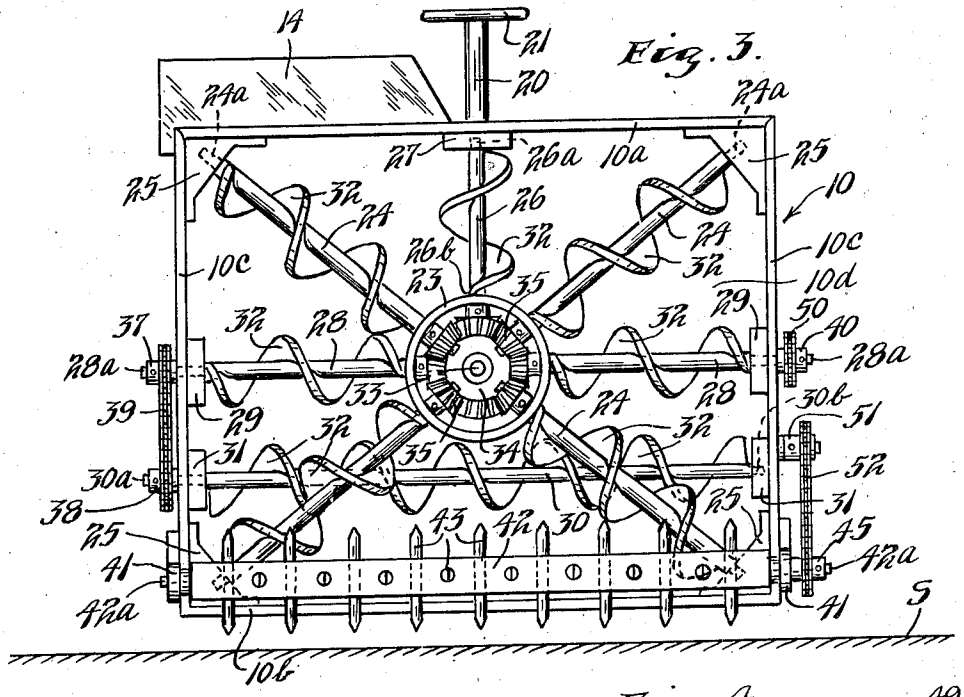
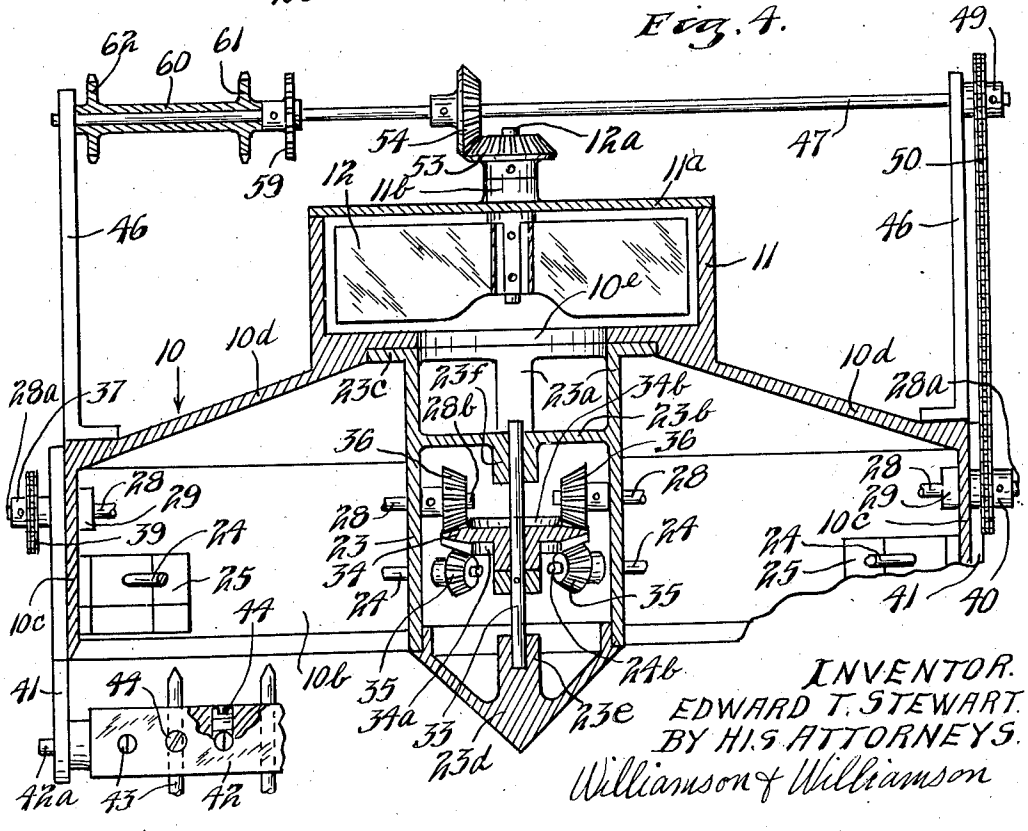


Fig. 4.



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UNITED STATES PATENT OFFICE

2,075,673

SNOW REMOVAL MACHINE

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Application October 30, 1935, Serial No. 47,419

1 Claim. (Cl. 37—43)

My invention relates to snow removal machinery.

In removal of snow from streets, highways and other surfaces, it is highly desirable to have snow removal machinery capable of quickly and efficiently removing ice from such surfaces as well as removing firmly packed drifts of snow from above such surfaces.

An object of my invention is to provide a snow removal machine having novel, rapid and efficient means for digging snow from drifts thereof.

Another object is to provide such a machine having means for breaking and removing ice from a surface over which the machine is propelled.

These and other objects and advantages of the invention will be more fully set forth in the following description made in connection with the accompanying drawings, in which like reference characters refer to similar parts throughout the several views, and in which:—

Fig. 1 is a side view of an embodiment of my invention;

Fig. 2 is a plan view;

Fig. 3 is a front view, and

Fig. 4 is a horizontal sectional view.

Referring to the drawings, my snow removal machine is preferably associated with and carried by a motor truck chassis T including a frame F, axles A, wheels W and engine E, all of conventional construction.

For attachment of certain parts of my machine to the truck chassis T, a frame is provided having longitudinal side members 5 resting upon and secured to the side members of the truck frame F. A vertical frame member 6 is secured to the forward end of each side member 5 to extend a moderate distance therebelow and a somewhat greater distance thereabove. A diagonal brace member 7 connects points respectively on the vertical frame member 6 and the side member 5 so as to insure a rigid relation between the vertical frame members 6 and the side members 5.

Rectangular horizontally disposed upper and lower auxiliary frames 8, each comprising a rear member 8*a*, front member 8*b* and side members 8*c*, are respectively rigidly secured at their rear members 8*a* to the upper and lower ends of the vertical frame members 6 so that the frames 8 extend forwardly from the vertical frame members 6 in parallel vertically spaced relation to each other. Vertically disposed bars or slideways 9, spaced apart transversely of the machine, extend between the upper and lower auxiliary frames 8 in parallel relation to each other and are secured at their respective ends to corresponding forward corner portions of the auxiliary frames 8.

Means is provided for receiving snow, as the machine is propelled into bodies thereof, comprising a large box 10 open at its forward side and having a relatively small dimension longitudinally of the machine. The top, bottom and sidewardly facing sides 10*a*, 10*b* and 10*c* of the box 10 are beveled at their inner forward corners to provide sharp forwardly directed edges for cutting into bodies of snow.

The rear side 10*d* of the box 10 is shaped to slope somewhat rearwardly from its edges toward and part way to its center, as shown, so as to form a rearwardly converging duct or passage for snow. At its central portion, the rear side 10*d* of the box 10 is provided with an aperture 10*e* for use as an outlet or exit for discharge of snow from the interior of the box 10.

Means is provided for exhausting snow from the interior of the box 10. To this end a blower casing 11 is formed immediately rearwardly of and integrally with the rear wall 10*d* of the box 10. The exit 10*e* of the box 10 serves as the intake or inlet of the blower casing 11. The rear side of the blower casing is closed by a plate 11*a*. A centrifugal blower rotor 12, disposed within the casing 11, includes a rotor shaft 12*a* which is journaled in the central portion of the rear closure plate 11*a* of the blower casing 11. The central portion of the plate 11*a* is provided with a boss 11*b* to provide ample support and bearing surface for the shaft 12*a*. The blower casing 11 is apertured in its upper portion to form an outlet and an outlet pipe 14, extending to one side of the machine, is connected to the casing 11 in position to receive material from the outlet aperture of the blower and exhaust the same in a direction away from one side of the machine.

The box 10 is connected to the slide-ways 9 for vertical sliding movement relative thereto. Arms 15 extending rearwardly from the rear wall 10*d* of the box 10 carry guide members 16 on their outer ends mounted on the slide-ways 9 for sliding movement longitudinally thereof.

Means is provided for raising and lowering the box 10 relative to the truck chassis T. A crossbar 17 extends between and is secured at its respective ends to the respective ones of the side members 8*e* of the auxiliary frame 8. The cross bar 17 has an aperture in its middle portion

through which the medial portion of a bolt 18 extends. The neck portion of the bolt 18 is screw-threadedly engaged in an internally screw-threaded apertured lug 19 projecting rearwardly from the rear closure plate 11a of the blower casing 11 and the head 18a of the bolt 18 is drawn up tightly against the lower side of the lug 19 to render the bolt 18 normally non-revoluble relative to the lug 19. An internally screw-threaded tubular element 20, having a hand wheel 21 on its upper end and bearing at its lower end on the cross bar 17, is screw-threadedly mounted on the bolt 18. Rotation of the tubular element 20 will obviously raise and lower the box 10 relative to the truck chassis T to vary the clearance between the lower side of the box 10 and a surface S upon which the truck is supported.

A pair of horizontally disposed brace bars 22 are secured at their forward ends to the lower portion of the rear side of the box 10 and extend rearwardly therefrom. Each of the bars 22 is provided at its rear end with an upwardly projecting element 22a having a vertically extending slot 22b therein through which a suitable member, such as the front axle A of the truck T, extending transversely of the truck T extends.

Snow digging and throwing means is provided within the snow receiving box 10. A forwardly and rearwardly extending cylindrical gear case 23 is centrally located within the box 10 and is supported by support arms 23a extending rearwardly from the rear wall 23b of the case to an annular frame 23c secured to the rear wall 10d of the box 10 in encircling relation to the outlet aperture 10e of the box 10. The forward end of the gear case 23 is closed by a forwardly tapering conical closure cap 23d suitably secured to the gear case 23.

A system of rotary snow digging and throwing paddles is constructed and arranged as follows:

Elongated revoluble elements 24 extend respectively from the forward portions of the upper and lower right and left corners of the box 10 to the forward portion of the gear case 23. The outer ends of the respective revoluble elements 24 are provided with portions 24a reduced in diameter to form journals, the journals 24a being journaled in blocks 25 secured in the corners of the box 10 and apertured to form bearings receiving the journals 24a. The inner ends of the revoluble elements are reduced in diameter to form shaft stubs 24b which are journaled in suitable apertures in the gear case 23 and which project into the interior of the gear case 23.

A vertically disposed elongated revoluble element 26 is similarly journaled at its lower end 26b in the upper side of the rear portion of the gear case and at its upper end 26a in a bearing block 27 secured to the upper side 10a of the box 10. A pair of elongated revoluble elements 28 disposed in the same vertical plane as the vertical revoluble element 26 extend horizontally from respectively opposite vertical sides 10c of the box 10. The inner ends 28a of the revoluble elements 28 are journaled in suitable apertures in the gear case 23 and the outer ends are journaled in bearing blocks 29 secured to the vertical sides 10c of the box 10. The reduced diameter outer ends 28a of the revoluble elements 28 project outwardly of the vertical sides 10c of the box 10.

A horizontally disposed elongated revoluble element 30 extends across the box 10 between the revoluble elements 28 and the bottom side 10b of the box 10. Reduced diameter end portions 30a and 30b of the revoluble element 30 are journaled in bearing blocks 31 secured to the respective vertical sides 10c of the box. The reduced diameter end portion 30a at the right hand end (left hand as viewed in Fig. 3) of the revoluble element 30 extends outwardly through and beyond the corresponding one of the vertical sides 10c of the box 10.

Each of the above described elongated revoluble elements 24, 26, 28 and 30 is provided with a radially projecting, helically extending flange 32 forming in conjunction therewith a series of helical paddles or impellers for digging and centrifugally throwing snow.

A shaft 33, disposed within and coaxially of the gear case 23 is journaled at its respective ends in bosses 23e and 23f formed respectively on the inner sides of the closure cap 23d and the rear wall 23b of the gear case 23. A wheel 34, mounted on the medial portion of the shaft 33, has bevel gear teeth 34a and 34b formed respectively on the front and rear sides thereof. Bevel pinions 35, mounted on the respective stub shafts 24b of the diagonally disposed revoluble elements 24, are all meshed with the front side bevel gear teeth 34a of the wheel 34. Other bevel pinions 36, mounted on the respective inner ends of the horizontal revoluble elements 28 and the vertical revoluble element 26, are all meshed with the rear side bevel gear teeth 34b of the wheel 34. It should be apparent that the revoluble elements 24, 26 and 28 are all rotatively connected together through the wheel 34. Sprockets 37 and 38, connected together through a sprocket chain 39, are mounted respectively on the right hand (left hand as viewed in Fig. 3) ends 28a and 30a of the right hand (left hand as viewed in Fig. 3) revoluble element 28 and the revoluble element 30. Another sprocket 40, by means of which all of the revoluble elements 24, 26, 28 and 30 may be simultaneously driven, is mounted on the left hand (right hand as viewed in Fig. 3) end of the left hand (right hand as viewed in Fig. 3) revoluble element 28.

Scarifying means for breaking up ice on the surface S is provided immediately forward of and projecting slightly below the forward edge of the lower side 10b of the box 10. Brackets 41 are secured to the outer sides of the lowermost portions of the respective vertical sides 10c of the box 10 and extend forwardly from the front of the box 10. The outer ends of the brackets are apertured for use as bearings. A rotatable member 42, of square cross section, extends between the respective brackets 41 and carries cylindrical extensions 42a at its ends journaled in the apertured outer end portions of the respective brackets 41. A series of rods 43 are disposed at their medial portions in diametrical apertures formed in the square rotatable member 42 and are secured therein by means of set-screws 44. The free ends of the rods 43 are suitably ground or beveled for use as ice breaking tooth elements. A sprocket 45 is mounted on the left hand (right hand as viewed in Fig. 3) cylindrical extension 42a of the revoluble square member 42.

A pair of U-shaped shaft supporting brackets 46, disposed at opposite sides of the machine in parallel vertical planes extending longitudinally of the machine, are rigidly secured at their forwardly facing free ends to the rear side of the box 10 so as to extend rearwardly therefrom. An upper line shaft 47 is journaled adjacent its respective ends in apertures in the upper rear portions of the respective brackets 46 and a lower

line shaft 48 is journaled adjacent its respective ends in apertures in the lower rear portions of the respective brackets 46.

A sprocket 49 on the left hand (right hand as viewed in Fig. 4) end of the upper line shaft 47 is connected to the sprocket 40 by means of a sprocket chain 50, and a sprocket 51 on the left hand end of the lower line shaft 48 is connected to the scarifier drive sprocket 45 by means of a sprocket chain 52.

A bevel gear 53, mounted on the rear end of the blower shaft 12a is meshed with a bevel gear 54 mounted on the medial portion of the upper line shaft 47.

Power supply means is provided for driving the upper and lower line shafts 47 and 48. For this purpose two power sources such as the gasoline engines 55 and 56, each preferably, but not necessarily, including a clutch and multi-speed transmission in its structure, are mounted on the frame members 5 with their rotational axes extending transversely of the truck chassis T. A sprocket 57, mounted on the power take-off shaft of the engine 55 is connected by means of a sprocket chain 58 to a sprocket 59 non-revolubly mounted on the upper line shaft 47. A sleeve 60 rotatably carried on the upper line shaft 47 is provided with sprockets 61 and 62 on its respective ends. The sprocket 61 is connected by means of a sprocket chain 63 to a sprocket 64 mounted on the power take-off shaft of the engine 56. The second sprocket 62 on the sleeve 60 is connected by means of a sprocket chain 65 to a sprocket 66 mounted on the lower line shaft 48.

A weight 67 may be mounted on the rearmost portion of the truck chassis T to counterweight the box 10 and associated parts.

While, as described above, the mechanical power transmission system is normally so arranged that the engine 55 drives the helical snow handling impellers and the blower and the engine 56 drives the scarifier or ice stripping means, it should be apparent that it is readily possible, when the scarifier is not required to be in service, to arrange for driving of the blower by the engine 55 and of the helical impellers by the engine 56. The scarifier and impeller drive chains 52 and 50 are removed and a similar chain of suitable length is placed on the lower line shaft sprocket 51 and the impeller drive sprocket 40 so that the impellers are driven from the lower line shaft and only the blower is left connected to the upper line shaft.

It should be noted that the helical impellers are driven at a relatively high speed and function in the manner of paddle wheels rather than as screw conveyors. As my snow handling machine is propelled into a body or bank of snow the rapidly whirling helical impellers dig snow from the face of the drift or bank and by virtue of centrifugal force hurl this snow rearwardly whereupon the snow is sucked into the blower and discharged through the outlet thereof.

When a pavement or other surface to be cleared of snow and ice has a layer of ice thereon the scarifier functions in an obvious manner to break up the layer of ice whereupon the broken ice is carried into the box 10 with the snow and is discharged from the blower with the snow.

Although my machine has been described as applied to snow removal, it should be apparent that it may be readily adapted for handling of various other materials which are in the form of powder, granules or small pieces.

While my snow removal apparatus has been illustrated and described as being associated with a motor truck chassis, it should be obvious that the apparatus could equally well be associated with many other types of vehicles, such as, for example, railway or street railway cars.

It is apparent that I have invented novel, efficient and rugged apparatus for rapidly and effectively removing large quantities of snow and ice from highways and the like.

It will, of course, be understood that various changes may be made in the form, details, proportions and arrangement of the parts without departing from the scope of my invention, which, generally stated, consists in a device capable of carrying out the objects above set forth, and in the novel parts and combinations of parts disclosed and defined in the appended claim.

What is claimed is:—

In a snow removal machine, a forwardly opening snow receiving box adapted for mounting on the forward end of a vehicle and having a snow discharge opening in the rear side thereof, means for removing snow from said box through said opening, a pair of shafts extending transversely of and revolubly mounted in said box, one of said shafts being disposed rearwardly of and at a substantial angle to the other, a pair of flanges formed on the respective shafts, each of said flanges projecting radially from the corresponding one of said shafts and winding helically thereabout through at least one convolution, and means for rotating said shafts at relatively high speed whereby each of said flanges will function as a centrifugal snow-hurling impeller and will impose a constant torque load on said rotating means when acting upon a body of snow.

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