

Jan. 25, 1927.

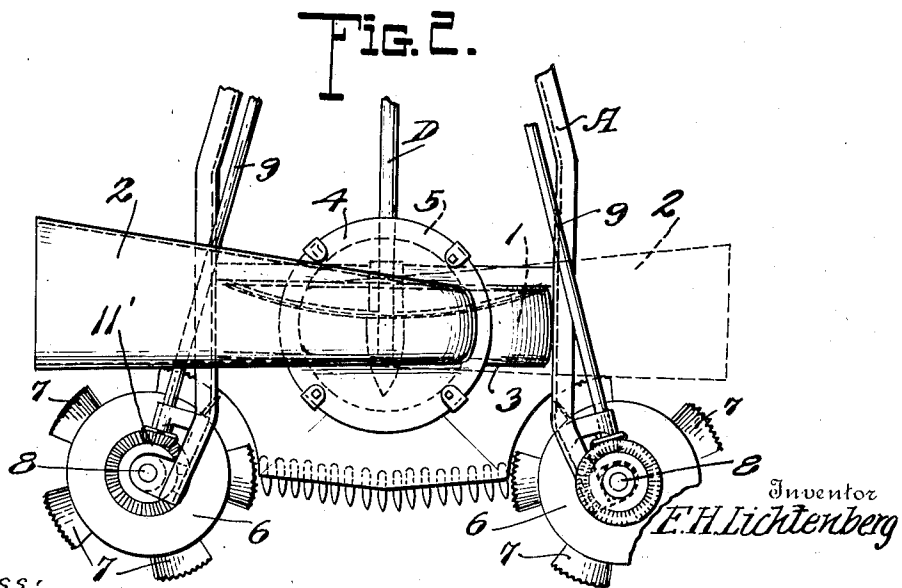
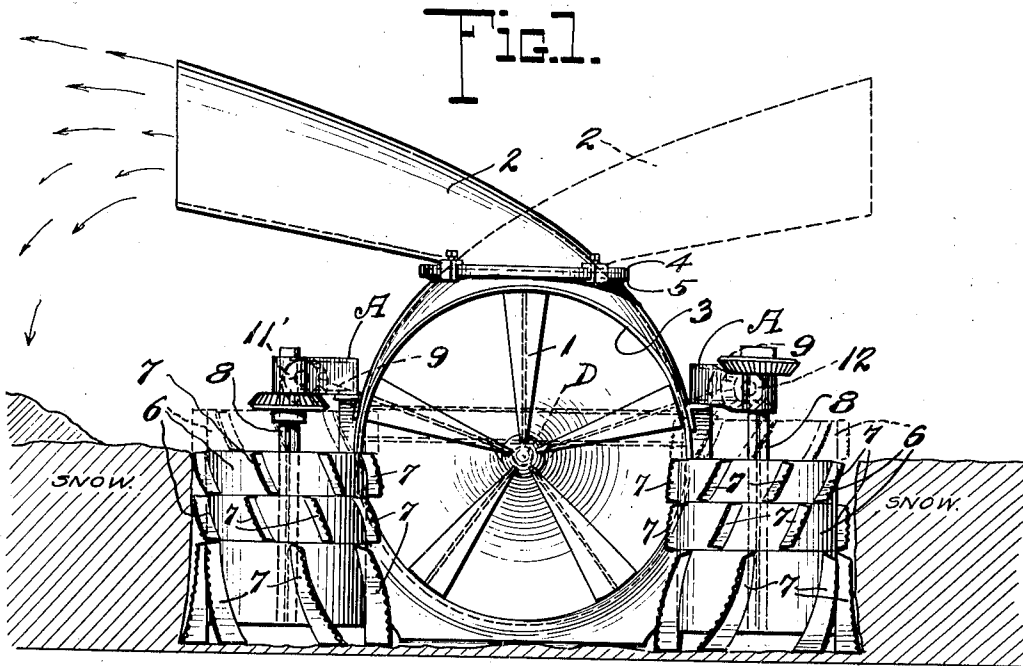
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1,615,461

SNOW REMOVING MACHINE

Filed April 3, 1924

3 Sheets-Sheet 1



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FIG. 3.

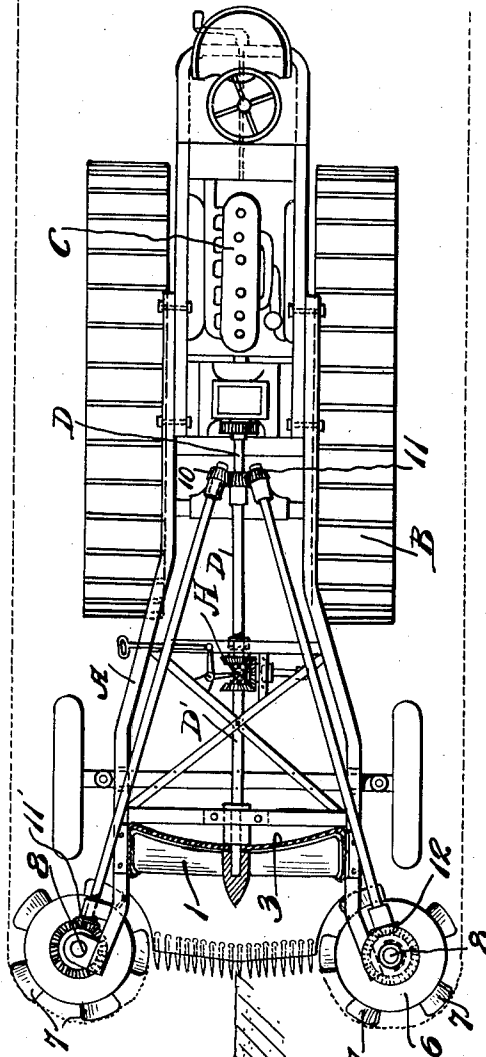


FIG. 4.

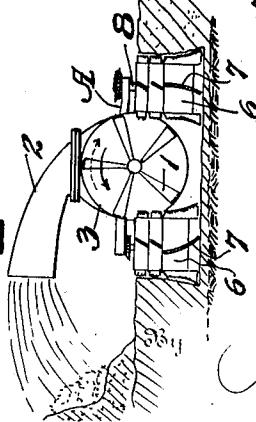
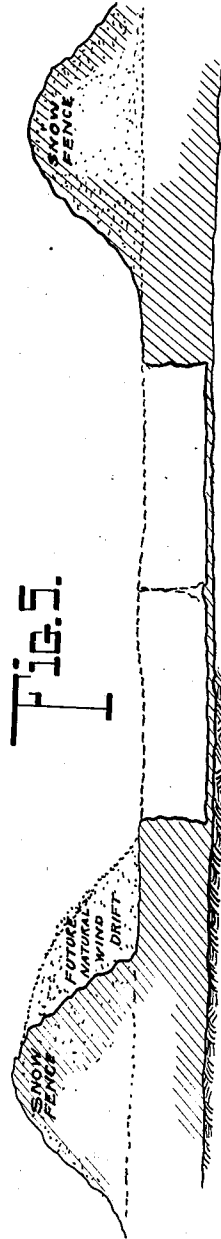


FIG. 5.



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3 Sheets-Sheet 3

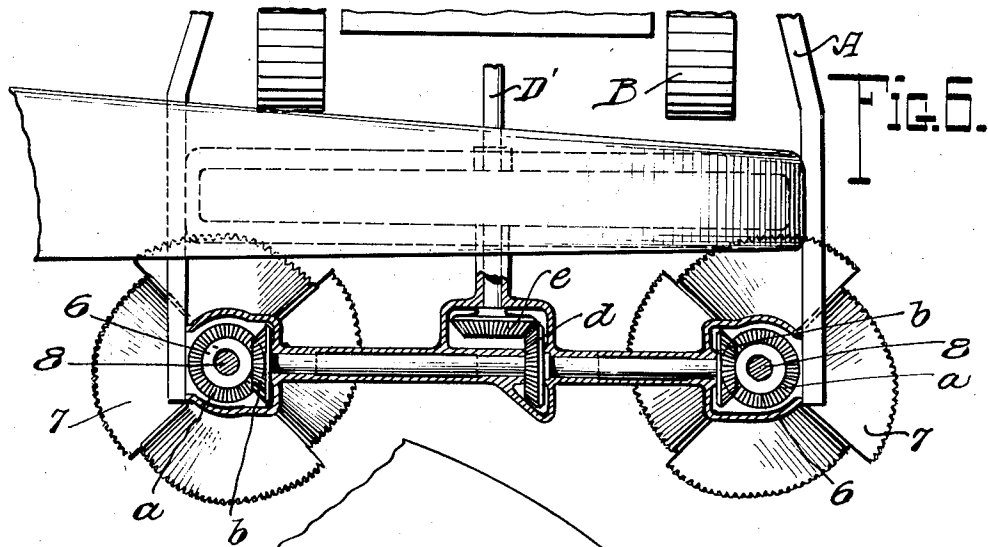


Fig. 6.

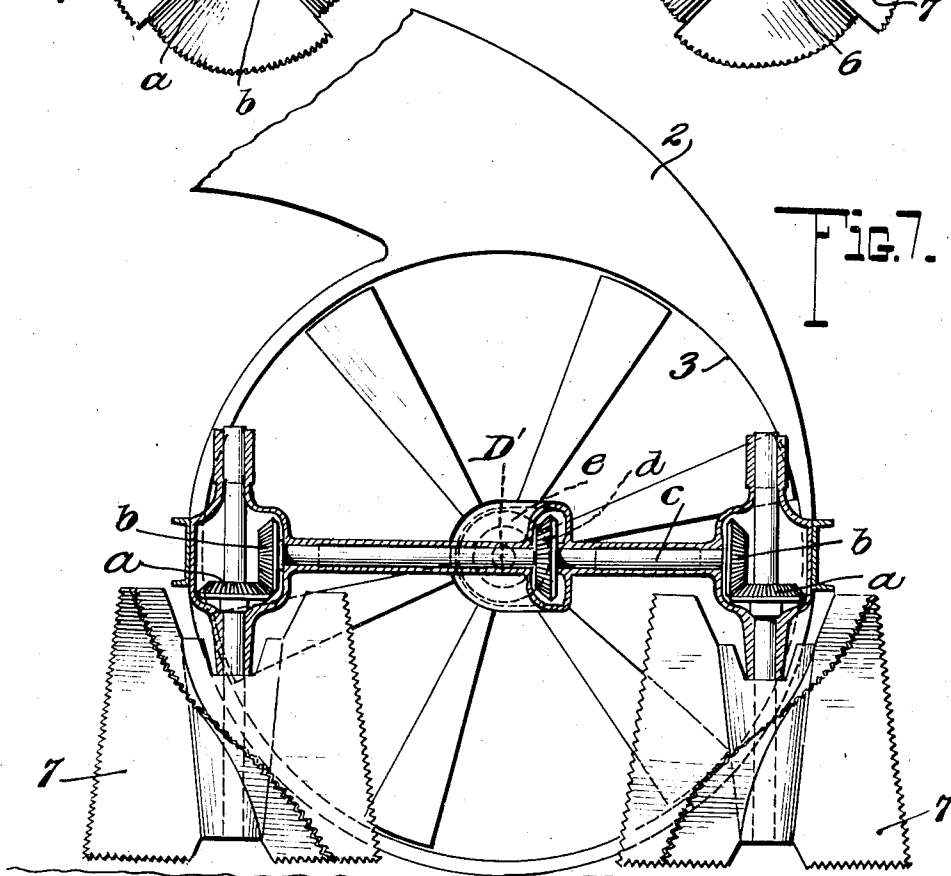


Fig. 7.

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UNITED STATES PATENT OFFICE.

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SNOW-REMOVING MACHINE.

Application filed April 3, 1924. Serial No. 704,051.

The enormous outlays expended in this country in the construction of permanent roads of concrete, brick or like construction, has created the problem of maintaining such roads in use during the winter season in territories where heavy snows are frequent, giving rise to snow-bound conditions. The common method of removing snow in opening up roads today is the use of the V-shaped plows mounted in advance of traction machines. This method of snow removal has been found to be impracticable in districts where heavy snows take place, the efficiency of the V-shaped plow being limited largely to comparatively shallow snow depths. Even with the shallow snow depths the V-shaped type plow remover is difficult to maintain in a fixed line of travel because variation in the resistance to the advance of the plow, due to variation in the depth of the snow in front of the same, tends to shift the plow from its proper line of travel.

There has been also proposed a type of rotary plow for road snow removal purposes, somewhat analogous to the well known snow plows employed in railroad track opening under heavy snow conditions. So far as I am aware, however, the rotary type of plow has not been perfected to the point of effective utility.

The particular object of the present invention has been to develop a novel construction of snow removing machine designed to overcome the difficulties at present experienced with the V-shaped plow remover, and especially to improve upon the rotary plow type of machine which, of course, provides a circular cut through the snow.

An essential feature of my present design of snow removing machine is involved in the equipment employed for cutting away and removing the snow by a cut having sharp vertical side angles with respect to the road surface, such cut being made for a two-fold purpose. In the first place, the sharp side angled cut is desirable and really required in order to eliminate the accumulation of snow at the opposite sides of a cut such as will be made by an ordinary rotary plow. Secondly, the peculiar cut which is made by the machine of my invention, is designed to remove snow in advance of the traction means of the machine, which traction means will comprise preferably caterpillars or endless traction devices by which the main power plant and various parts of my machine are

supported and advanced to work. Necessarily, the removal of snow in advance of these traction devices provides for greater effective traction of the same in respect to the road surface over which they operate.

An essential feature of possibly greater importance in the carrying out of my invention is the utilization of vertical cutters or snow excavators disposed at opposite sides of the machine and operated in advance of the endless traction members for the purpose previously described, but for the additional purpose of cutting away and moving the snow to a point centrally in advance of the machine. In the rear of these vertical cutters or excavators operates a rotary remover or precipitator which elevates and precipitates laterally some distance beside the side of a machine the snow which is carried thereto by the vertical cutters or excavators as well as the snow which is in the path of said rotary remover or precipitator.

I contemplate special provisions whereby a carry-off conduit or spout is located above the rotary precipitator and has a discharge through which the snow is precipitated and conveyed to one side of the road or cut being made by the machine, and beyond a point vertically aligned with the outer side of the cut as made by the outermost operating vertical cutter or excavator previously mentioned.

By carrying off the snow considerably beyond one side of the cut made by the machine in this manner, the liability of caving in of the side banks sharply cut by the outermost excavator or cutter, is rendered unlikely, and furthermore the liability of early back-fill by drifting snows is reduced materially.

My vertical cutters or excavators operating at opposite sides and in advance of the rotary precipitator are essentially advantageous furthermore in order to break up the snow preliminary to carrying it in advance of the intermediate carry-off remover or precipitator and the blades of the said vertical cutters may be so pitched as to tend to flake the snow in the cutting action of these devices reducing therefore the amount of work to be performed by the precipitator and correspondingly reducing the amount of power required to maintain the advance of the machine over the road.

My final object in the development of my particular design of snow removing machine

is to maintain a relative simplicity of construction in that I use as few main operating devices as possible, drive them by substantial and simple driving connections, and dispose them so that by virtue of the relative arrangement and action of the snow cutting and removing elements there is practically no tendency of the machine to shift from a fixed course of movement, directionally speaking, thereby avoiding the disadvantages of the tendencies of most machines of this type to be shifted from their proper course of travel, with reduced efficiency of operation for obvious reasons.

In the accompanying drawings I have illustrated a preferred embodiment of my invention which, however, I do not desire to limit to the particular construction hereinafter described because material detailed modifications of the exact formation of the parts, especially the cutting elements, and their arrangements, might well be made within the purview of the invention for the accomplishment of the desired results.

Figure 1 of the drawings is a front elevation of a snow removing machine embodying my invention in a preferred form.

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

Figure 3 is a top plan view of the same showing more fully, but somewhat diagrammatically, the type of traction mechanism by which the snow removing apparatus is advanced to its work.

Figure 4 is a diagrammatic view of my machine as arranged in a snow cut in practical operation.

Figure 5 is another diagrammatic view of a road cleared of snow by my machine, bringing out more clearly the method of piling of removed snow at opposite sides.

Figure 6 is a top plan view, partly in section, showing a modified form of driving means for the vertical cutters to drive the same oppositely.

Figure 7 is a view in elevation, partly in section, of the driving means of Figure 6.

Describing the invention specifically in conjunction with the drawings, the frame of my machine is generally designated at A, being of sturdy construction and supported by means of caterpillars or endless traction devices B. On the plan view, partly in section, showing a modified form of driving means for the vertical cutters to drive the same oppositely.

Figure 7 is a view in elevation, partly in section, of the driving means of Figure 6.

Describing the invention specifically in conjunction with the drawings, the frame of my machine is generally designated at A, being of sturdy construction and supported by means of caterpillars or endless traction devices B. On the body frame A of the machine is carried a power plant C preferably consisting of a high power explosive engine or any equivalent motor, the same embodying a main driving shaft D. At the front end of the driving shaft D is fixed for rotation therewith a high speed rotary remover and precipitator 1, comprising a number of blades so set as to have the dual function of cutting into snow in advance of the machine and elevating and precipitating the snow operated on thereby to carry the latter upwardly and laterally into the spout

or conduit 2. The remover and precipitator 1 is, of course, mounted in a casing 3, which largely houses the same, and on this casing is mounted the spout 2, previously mentioned, by means of a sort of turntable comprising superposed ring plates 4 and 5.

The plate 5 is stationary on the casing 3 and the plate 4 rotates on the plate 5 to enable the spout 2 to swing from one side of the machine to a position at the other side. The said plates 4 and 5 may be swivelly connected by any suitable means and interposed therebetween will be anti-friction bearings not shown, and suitable locking contrivances will be employed to hold the spout 2 in either of its positions projecting laterally from the opposite sides of the machine.

With a spout 2, such as above described, extending laterally beyond the sides of my entire machine, snow removed by the machine may be precipitated laterally therefrom so as to be carried beyond the vertical walls created by the cutting action of my machine in a manner to be hereinafter described. The adjustment of the spout 2 will always be such that the snow is delivered by the machine to the outer side of the road which is being operated upon when the machine is working to remove the snow on half of the road at a single cut. For larger roads my machine will preferably be designed to be of a width about half that of the road. When used on a road of about the same width as the machine, it will be immaterial which side the spout 2 is adjusted to deliver to, excepting that it will be preferably directed toward the side from which drifting snow would be unlikely to be carried back to the road.

In a vertical plane somewhat in advance of the vertical plane in which the rotary remover or precipitator 1 operates, and at opposite sides of the machine in advance of the path of movement of the traction base B, I provide the vertical rotary cutters or excavators 6. These excavators 6 may be of any general efficient construction, the bodies of the excavators carrying somewhat spirally arranged vertically staggered cutting blades 7. The disposal of the blades 7 is such that as the cutters 6 are operated by rotation in directions toward one another, the blades 7 will cut the snow and tend to leave it in broken up or flaked condition as it is carried thereby to and in front of the rotary remover and precipitator 1.

If desired, the cutter 6 may be made in sections, and for deeper drifts an additional section or more, dependent upon the size of each section, may be superposed upon the sections of the cutters already carried by the axes or vertical driving shafts 8, by which the cutters are supported in positions relative to the member 1.

The driving shafts 8 will preferably be

driven by horizontal shafts 9 leading forwardly from the main shaft D and inclining outwardly towards opposite sides of the machine as viewed from above. Suitable driving gearing comprising bevel gears 10 and 11, connect the rear ends of the shaft 9 with the main shaft D and the front ends of said shafts 9 are connected by bevel gears 11' and 12 with the shafts 8. To enable an additional section or sections of the cutter 6 to be used, the frame members supporting the upper ends of the shafts 8 may be susceptible of slight lifting action to permit the emplacement of additional sections of the cutters 6 in the manner above set forth.

The operation of my machine will be obvious from the foregoing. The machine is simply advanced under proper power delivered to the traction members B from the power plant C. Suitable clutch devices are installed to establish driving connections between the shaft D and the rotary remover and precipitator 1, and similar connections may be provided intermediate the shafts 9 and the cutters 6 if desired. As such clutch features are well known in the art, they are not illustrated and any suitable type of the same may be employed.

Necessarily with a machine of the type above proposed, as the machine progresses forwardly the cutters 6 cut clean, vertical side cuts in the snow in advance of the machine. The snow operated on by the cutters 6 is carried inwardly and upwardly between the same and delivered to the rotary device 1. The device 1 operates upon all snow in advance thereof and delivered thereto by the cutters 6 which act as deflectors to some extent, and the snow is elevated and precipitated laterally through the spout or conduit 2 by the device 1. As the snow is cleared away by the means of the invention, in advance of the traction devices B, the said traction members B are not interfered with as regards their tractive effort by snow banking in front of the same.

Figure 4 of the drawings illustrates in a rough diagrammatical way my machine arranged on a road with the snow cut away and being delivered by a machine, in accordance with the invention. The manner in which the snow was banked at the sides of the cut is therein depicted. It is obvious, of course, that the cutters 6 might be arranged at slight vertical angles within the purview of the invention, the main intent being, however, that they shall be substantially vertical to conform with the requirements of my invention. In effect I obtain from my arrangement of the parts 1 and 6 a complete and effective cutting mechanism entirely across the road space over which the machine directly operates.

The remover 1 must of course be reversed in order to reverse the direction of throw,

precipitation or impelling of snow fed thereto and struck thereby. For this purpose I provide a conventional form of clutch which is generally shown at H and which includes a clutch element that may be thrown in one direction to clutch in the shaft D direct. If moved in the opposite direction it will clutch in the shaft D' indirectly through the beveled pinions thereby causing a reversal of the impeller 1.

In Figure 5 I have shown more clearly the method by which the snow is piled at opposite sides of the road when operated on by my machine, the manner in which back felling by drifting snows is prevented, being emphasized.

Figures 6 and 7 include a simple modified embodiment of driving mechanism for the vertical cutters 7^a. The cutters 7^a are mounted on the vertical shafts 8^a having the gears *a* meshing with like gears *b* on a transverse driven shaft *c*. The shaft *c* is operated by the gearing *d-e* connecting it with the main drive shaft D'. Preferably the shaft *c* and gears *a, b, d, e* are inclosed by a housing and run in oil because the cutters 7^a must be driven at high speed. This drive is quite simple and effective and offers certain advantages as compared with the drive means previously described, especially as the rotator or remover 1 is carried directly by the shaft D'. The blades of the cutters 7^a may be saw tooth edged if desired and of single spiral fin formation.

Practically speaking I have evolved a new method of snow removal, and my machine is one instrument by which it may be practiced. This method is to cut the snow into small flaky particles, as by the means 7 or 7^a; feeding it to the remover or impeller at one side of the cutting means if one is used, or between them when two are used; and throwing the snow laterally from the machine by the remover. I wish therefore that it be understood that my invention includes both the machine construction and the novel method of snow removal mentioned.

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

1. Snow removing apparatus of the class described, comprising a vehicular support, a rotary impeller at the front of said support, a lateral cutter member disposed at each side and in advance of said impeller, said lateral cutters being spaced apart a sufficient distance to permit operation of the impeller and cutters in independent adjacent paths, the lateral cutters being formed to operate in a path substantially overlapping the path of the impeller whereby to remove that portion of the snow adjacent the ground lying without the radius of the impeller.

2. Snow removing apparatus of the class

described, comprising a vehicular support, a rotary impeller at the front of said support, a lateral cutter member disposed at each side and in advance of said impeller, said
5 lateral cutters being spaced apart a sufficient distance to permit operation of the impeller and cutters in independent adjacent paths, the lateral cutters having undercutting blades adjacent the ground operative upon
10 the snow lying between vertical planes passing through the periphery of the impeller.
3. Snow removing apparatus of the class described, comprising a vehicular support, a rotary impeller at the front of said support,
15 a lateral cutter member disposed at each side and in advance of said impeller, said lateral cutters being spaced apart a sufficient distance to permit operation of the impeller and cutters in independent adjacent paths,
20 the lateral cutters being formed to operate in a path substantially overlapping the path of the impeller whereby to remove that portion of the snow adjacent the ground lying without the radius of the impeller, and
25 a scoop disposed between the impeller and

cutters to direct the snow into the path of movement of the impeller.

4. Snow removing apparatus of the class described, comprising a vehicular support, a rotary impeller at the front of said sup- 30 port, a lateral cutter member disposed at each side and in advance of said impeller, said lateral cutters being spaced apart a sufficient distance to permit operation of the impeller and cutters in independent adjacent 35 paths, the lateral cutters being formed to operate in a path substantially overlapping the path of the impeller whereby to remove that portion of the snow adjacent the ground lying without the radius of the impeller, a 40 casing for the said rotary impeller open at its front end providing a scoop arranged between the cutting members and extending in advance of the impeller so as to direct snow which is not removed by the impeller 45 and cutting members into the casing of the impeller for operation thereon by the impeller.

In testimony whereof I affix my signature.
ERICH H. LICHTENBERG.