The present invention relates to a rotary snow plough adapted to be operated by power means and to be mounted in front of a motor vehicle, such as a tractor, or the like, for collecting and discharging snow and other material from a surface.

The general object of the present invention is the provision of a snow plough of the character described which requires a minimum of power for its operation for a given rate of removal of the snow.

An important object of the present invention is the provision of a rotary snow plough of the character described and of the type having a snow ejecting rotor, said snow plough incorporating means to engage the snow well ahead of the rotor of the advancing plough and scoop and feed said snow to the rotor to be engaged and ejected by the latter so that the snow is positively moved in a direction contrary to the direction of movement of the snow plough, whereby the snow cannot become packed in the plough casing to block and jam the rotor especially when working in wet snow.

Another important object of the present invention is the provision of a snow plough having a casing housing adapted to engage snow over a greater width than the actual diameter of the rotor, said scoop members adapted to direct the snow laterally, inwardly towards the rotor, said rotor being characterized by the adjunction of forwardly extending and forwardly inclined peripheral snow engaging members, so designed as to engage the snow directly ahead of the rotor together with the snow scooped by said wing members at points well in advance of the rotor itself, and to positively move said snow towards the rotor to be engaged and ejected by the latter.

Another important object of the present invention is the provision of a snow plough of the character described, wherein said forwardly extending and inclined snow engaging members preferably have a limited radial extent and extend substantially at the periphery of the rotor itself, whereby when said members engage the snow, they produce a snow core directly opposite the central part of the rotor, said snow core easily crumbling when engaged by the rotor itself.

Another important object of the present invention is the provision of a snow plough of the character described in which, due to the fact that the snow is constantly positively moved rearwardly towards the rotor to be ejected thereby, the pushing action exerted by the plough on the snow is greatly diminished and much less power is required for advancing the plough in a snow bank than for conventional snow ploughs.

Still another important object of the present invention is the provision, in a snow plough of the character described, of a rotor which has radial arms adapted to exert a shovelling action on the snow, whereby the snow is ejected through the snow plough chute as discrete masses whereby, due to their greater inertia than powdered snow, will be ejected at greater distances.

Still another important object of the present invention is the provision of a snow plough of the character described, wherein said snow engaging members have relatively sharp, forward edges acting as axes for breaking up thin ice or crusted snow.

Yet another important object of the present invention is the provision of a snow plough of the character described in which the casing is so designed as to prevent the snow clouds, normally set up by such rotary snow ploughs, from moving upwardly in front of the casing and masking the view of the driver.

Another important object of the present invention is the provision of a simple chute for discharging the snow ejected by the blower at any desired horizontal and/or vertical angle, said chute being conveniently operated from the driver's seat of the vehicle on which the snow plough is mounted.

The foregoing and other important objects of the present invention will become more apparent during the following disclosure and by referring to the drawings in which:

Fig. 1 is a perspective view of the snow plough mounted in front of a tractor;

Fig. 2 is a perspective view of the rotor of the snow plough;

Fig. 3 is a front elevation of the rotor;

Fig. 4 is a rear elevation of the snow plough casing;

Fig. 5 is a side elevation of the casing and of the chute;

Fig. 6 is a cross-section along line 6-6 of Fig. 4;

Fig. 7 is a perspective view of the chute showing the deflector in a position for ejecting the snow upwardly;

Fig. 8 is a similar perspective view showing the deflector in the position for ejecting the snow downwardly;

Fig. 9 is a longitudinal section of the chute at the portion thereof connected with the ejector tube of the casing and extending along the longitudinal centre plane of the apparatus.
The housing 10 is preferably provided with runners 21 secured directly underneath the snow cutting members 20. The front edges of the snow cutting members 20 and of the top wall extension 15 lie in a common vertical plane. The extension wall 15 is connected to the wall portion 17 and to the cutting members 20 by means of horizontal top wall portions 22.

The snow removing and ejecting device is mounted for rotation about an axis coaxial with the axis of the cylindrical wall 13 of the housing 10. The device 12 comprises a hub 23 forming a square block which is hollowed out at its front face 24 and which provides four right-angularly disposed outer lateral walls 24 and a back wall 25. Four radially extending arms or shovels 26 are each welded or otherwise rigidly secured to the respective outer lateral walls 24 of the hub 23. Each arm 26 consists of an elongated straight member of channel-shaped cross-section defined by a web 27 and diverging lateral flanges 28 depending from the web 27.

As shown in Fig. 6, only the forward flange 28 and a small part of the web 27 are secured to the lateral walls 24 of the hub 23, while the remaining part of the cross-section of the arm 26 extends rearwardly of said hub as indicated by the inner edge 29 of said arm 26. Each arm 26 has a width substantially equal to the width of the cylindrical wall 13 of the housing 10 and the tip or outer edge 30 of each arm 26 extends close to the inside face of said cylindrical wall 13. Similarly, the back lateral edges 31 of each arm 26 also extends close to the back wall 14 of the housing 10. The front edge 32 of each arm 26, together with the front edges 33 of the hub 23, lie in a substantially common plane which is substantially perpendicular to the axis of rotation of the rotor or snow ejecting device 12.

Elongated snow engaging members 34, preferably made of sheet metal, are secured to the outer ends of the radial arms 26 and each such member 34 lies in a plane which forms a dihedral angle with the common plane containing the front edges 32 and 33 of the arms 26 and hub 23 respectively.

Each elongated member 34 consists of a narrow rectangular plate which is bent along a diagonal 34' thereof to provide two triangular portions 35 and 36 defining an obtuse angle therebetween, as shown at 37 in Fig. 3. The base end of the triangular portion 36 is directly welded or otherwise secured, at the outer end of a radial arm 26, to the outer face of the front flange 28 of said arm, as shown at 38 in Fig. 2. Each elongated member 34 extends from the outer end of one radial arm to the outer end of an adjacent radial arm. The end of each elongated member 34 opposite its forward end 38 is spaced forwardly of the associated arm 26 and is rigidly connected thereto by means of a brace member 40 which has one end secured to the triangular portion 35 and the other end directly secured on top of the portion 36 of the adjacent elongated member 34 as shown at 41. The forward end 42 of each elongated member 34, forms a sharp edge and lies in a common plane which is only slightly rearwardly distant from the plane containing the forward edges of the top extension 15 and the side cutting members 20, as clearly shown in Fig. 6. Thus, the forward extent of the elongated members 34 is much greater than the width of the radial arms 26.

When seen in front elevation, as shown in Fig. 3, the rotor, in accordance with the present invention, forms a cross having equal arms, the outer ends of which are interconnected by eight members forming a square. It will be noted, referring again to Fig. 3, that the elongated members 34 extend in an annular space which has a limited radial extent as compared to the cylindrical space occupied by the entire rotor.

When said rotor is rotated in the direction indicated by the arrow 43 in Figs. 1, 2 and 3 and engages a mass of snow, the snow will first be engaged by the elongated members 34 at the forward edge 42 thereof. The engaged snow will be caused to slide along the back face of the elongated members 34 rearwardly with respect to the rotor and finally will be discharged within the channel-shaped radial arms 26 which will eject said snow under centrifugal force.

Referring to Figs. 4 and 6, the rotor 12 is driven and is rotatably supported within the housing 10, by the following means. The hub 23 is rotatably supported on a stationary support shaft 44 by means of a flanged ball bearing 45. The shaft 44 is secured in cantilever fashion by having its rear end passing through and secured to a transverse tubular member 46 which is horizontally disposed at the back of the housing 10 in spaced relationship with the back wall 14 and which is rigidly secured by brackets 47 to two upright bracing members 48, themselves secured to the back wall 14.

A large diameter sprocket gear plate 49 is journaled on the shaft 44 by means of a flanged ball bearing 50 and is directly secured to the radial arms 26 of the rotor 12 by means of short angle members 51.

The angle members 51 and the shaft 44 extend freely through a circular opening 52 made in the center of the back wall 14 of the housing 10. The sprocket gear 49 is disposed between the back wall 14 and the tubular member 46 and is driven by a sprocket pinion 53 through the intermediary of the sprocket chain 54. The pinion 53 is mounted at the bottom, central portion of the housing at the back thereof and is adapted to be driven by the conventional power take-off (not shown) at the back of the tractor T through the means of a transmission shaft 55 extending underneath said tractor and connected by means of universal joints to the shaft of the pinion 53, which shaft is journaled within flanged bearings 56 secured to the channel member 57 transversely extending at the bottom of the housing and secured to the upright brace members 48.

The universal joints connected between the pinion 53 and the power take-off of the tractor allow for vertical adjustment of the housing 10 with respect to the tractor.

The chute 11 of the snow plough consists of an elongated tubular member 60 which is upwardly inclined and is longitudinally open along the inside portion of the tube, as shown at 61, except for the lower portion 62 of the tube 60 which is completely closed and circular.

The lower end of the tube 60 is terminated by a beveled edge which is surrounded by an annular channel member 63 disposed exteriorly of the tube 60 and having its side flanges radially, outwardly directed. The annular channel member 63 is adapted to be supported on the upper end of a circular section 64 which is in communication with the housing 10 and is tangent with the cylindrical wall 13 of said housing as clearly shown in Fig. 4.

The vertically, upwardly directed duct 64 is provided at its upper edge with four brackets 65 disposed substantially at the corners of a square, as shown in Fig. 10, and on which are mounted upright flanged rollers 66 which are freely rotatable about vertical stud shafts 67, secured to the brackets 65.

The end flanges 66 of rollers 66 engage the outside faces of the flanges of the channel-shaped annular member 63. Thus the chute 60 is fastened to the duct 64 and is rotatable about the longitudinal axis of said duct 64. The horizontal angle made by the tube 60 with respect to the snow plough is adjustably controlled by means of an endless cable 68 which surrounds the tube 60 and is engaged with the channel-shaped annular member 63 and is trained over two of the upright flanged rollers 66, as shown in Fig. 10. The cable 68 is trained on a pulley 69 mounted at a position close to the driver of the tractor T so that the driver may displace the cable 68 to rotate the chute in the desired direction.

The chute 60 is provided with means to vary the vertical angle of the snow ejected thereby. Said means comprise a deflector baffle 71 which consists of a curved...
sheet member pivotally connected at one end thereof at 72 to the outer, inclined portion 73 of the chute 60. The deflector member 71 is provided with a rearwardly directed bar 74 which is rigidly secured thereto and has its outer free end pivotally connected at 75 to a push rod 76. The lower end of the push rod 76 is loosely guided within a sleeve member 77 secured to the tube 60.

A pulley 78 is mounted at the lower end of the push rod 76, while a pulley 79 is secured to the guiding sleeve 77. A cable 80 has its end 81 attached to the guide sleeve 77, is trained over pulleys 78 and 79 and is extended to the driver's seat of the tractor T to be accessible to the driver.

The deflector member 71 normally takes an upwardly, inclined position under the action of a spring 82, as shown in Fig. 7, and also under the action of the ejected snow when the device is operating; upon pulling of the cable 80, the push rod 76 is pushed upwardly thereby lowering the deflector 71 to any desired angle, as shown in Fig. 8.

The snow plough according to the present invention operates as follows:

The rotor is preferably rotated at a speed of from 150 to 250 r.p.m., more especially at about 200 r.p.m. This is a relatively slow rotational speed and, therefore, the snow engaged by the limited number of radial arms 26 is discharged through the chute 60, not as a continuous snow and air stream but rather as substantially compacted discrete masses of snow. Thus, for a given expenditure of power for ejecting the snow, the snow will be thrown by the snow plough to a considerably greater distance because said discrete masses of snow will better overcome the air resistance than powdered snow.

As an example it has been found, for a rotor speed of about 150 r.p.m., that snow can be ejected up to a distance of about 50 ft.

If the forwardly projecting, elongated members 34 were absent, the snow engaged by the lateral scoop members 16 of the advancing snow plough would be laterally, inwardly directed towards the rotor and, especially when the snow is wet, will tend to become packed to a hard consistency together with the snow directly ahead of the rotor, thereby jamming and blocking said rotor.

With the elongated members 34, the lateral inward movement of the snow engaged by the scoop members 16 is greatly facilitated because the snow ahead of the rotor is continuously and positively moved rearwardly towards the rotor to be immediately taken up by the same and discharged through the chute 60. Thus, the snow cannot become pressed and packed against the curved walls 17 of the scoop members 16.

The members 34 could have a greater width extending towards the center hub 23, but this construction has not been found more efficient, although more expensive, than the construction illustrated.

Actually, the limited radial extent of the members 34, as illustrated in the drawings, results in the formation of a snow core within the snow engaging members 34, said snow core finally crumbling when engaged by the centre portion of the radial arms 26.

The chute, in accordance with the present invention, is adapted to eject the snow at any desired vertical or horizontal angle. The manual means to actuate said chute are very simple in construction and easily manipulated, but obviously they could be changed for hydraulic or other power means.

Tests carried out with the snow plough in accordance with the present invention have shown that, for rotation of the rotor at about 200 r.p.m., a snow bank of a depth of 6 inches can be efficiently removed with a tractor speed of up to 10 miles per hour.

A depth of snow of up to 4 or 5 feet, that is the whole height of the snow casing 10, can be removed at a speed of about one and a half miles per hour.

Tests have also been carried out in wet snow, or slush, and the snow plough, in accordance with the present invention, was never blocked or jammed.

Tests have also been carried out with crusted snow and it has been found that the outer edges 42 of the elongated members 34 act as axes or hammers to break up the crust. Similarly, thin ice was easily broken up by the edges 42.

The provision of the horizontal top wall portions 22 connecting the top extension 15 of the cylindrical wall 13 with the scoop members 16 serves as abutment members for the cloud of snow produced by the rotating rotor, whereby no snow is projected upwardly of the casing at the front thereof to mask the view of the driver of the tractor on which the plough is mounted.

The snow plough illustrated and described is a relatively small size model adapted to be mounted on a farm tractor and quickly dismounted therefrom, and adapted to derive power from the conventional power take-off of said tractor. Obviously, larger size and more powerful rotary snow ploughs could be designed in accordance with the present invention and incorporating their own power units.

While a preferred embodiment according to the present invention has been illustrated and described, it is understood that various modifications may be resorted to without departing from the spirit and scope of the appended claims.

1. In a snow plough having a cylindrical casing with a tangential snow ejection duct; a rotary snow-cutting and throwing assembly mounted in said casing and comprising: a hub centrally located in said casing for rotation, a plurality of vanes radially extending from said hub, a snow-cutting edge on the forward face of each said vane and a radially extending snow-throwing surface rearwardly thereof; a corresponding number of snow-core cutting blades, each connected to and projecting forwardly of each said vane at their radial extremity therefrom, and connected to the radial extremity of the vane next adjacent in the direction of rotation, said hub being otherwise unobstructed.

2. A snow plough as claimed in claim 1, wherein each said blade is inclined in the direction of the vane adjacent thereto in the direction of rotation, a bracing member between each said blade and said vane adjacent thereto.

References Cited in the file of this patent

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Inventor</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>338,759</td>
<td>Leslie</td>
<td>Mar. 30, 1886</td>
</tr>
<tr>
<td>1,770,587</td>
<td>Carpenter</td>
<td>July 15, 1930</td>
</tr>
<tr>
<td>2,152,840</td>
<td>Drake</td>
<td>Apr. 4, 1939</td>
</tr>
<tr>
<td>2,603,007</td>
<td>Fiacco</td>
<td>July 15, 1922</td>
</tr>
<tr>
<td>2,642,680</td>
<td>Curtis et al.</td>
<td>June 23, 1953</td>
</tr>
<tr>
<td>2,709,311</td>
<td>Cady</td>
<td>May 31, 1955</td>
</tr>
<tr>
<td>2,743,538</td>
<td>Linzy</td>
<td>May 1, 1956</td>
</tr>
<tr>
<td>2,785,482</td>
<td>Groce et al.</td>
<td>Mar. 19, 1957</td>
</tr>
<tr>
<td>2,802,287</td>
<td>Bevan</td>
<td>Aug. 13, 1957</td>
</tr>
<tr>
<td>2,815,590</td>
<td>Fiacco</td>
<td>Dec. 10, 1957</td>
</tr>
</tbody>
</table>

FOREIGN PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Country</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>459,760</td>
<td>Canada</td>
<td>Sept. 20, 1949</td>
</tr>
</tbody>
</table>