May 12, 1964 R. E. ETNYRE 3,132,429

SNOW REMOVING DEVICE

Filed Dec. 21, 1961

2 Sheets-Sheet 1

Fig. 1

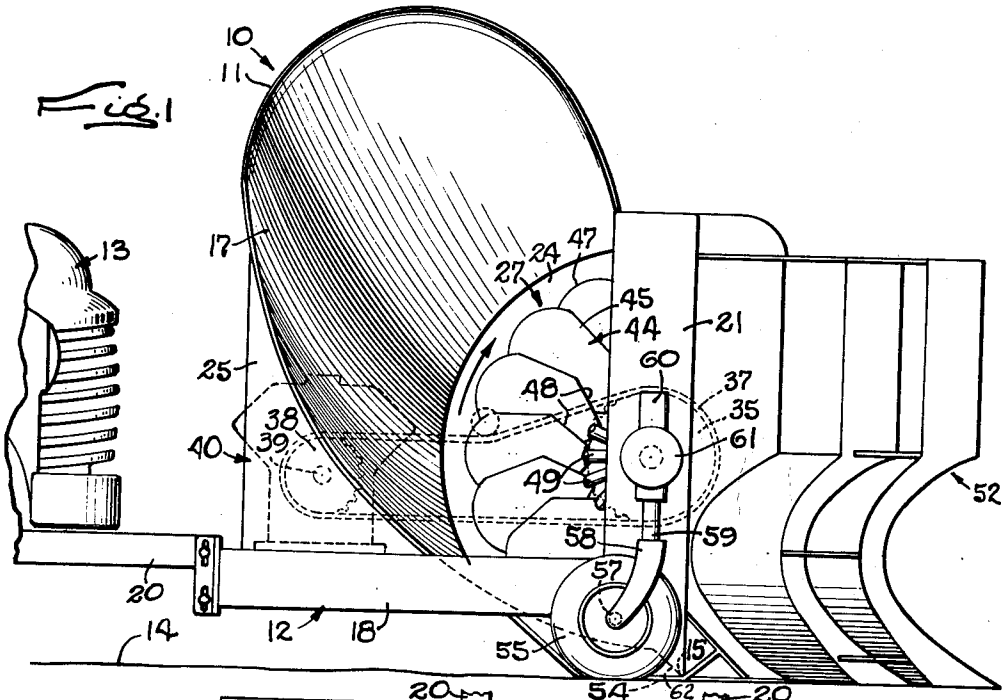
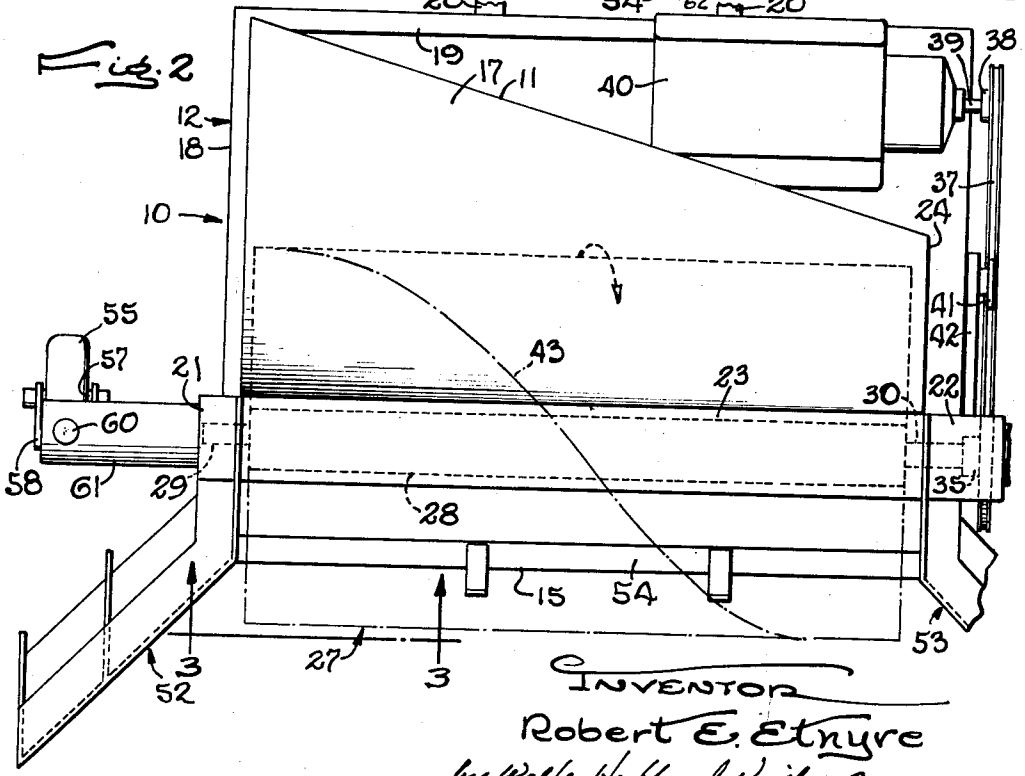



Fig. 2




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2 Sheets-Sheet 2

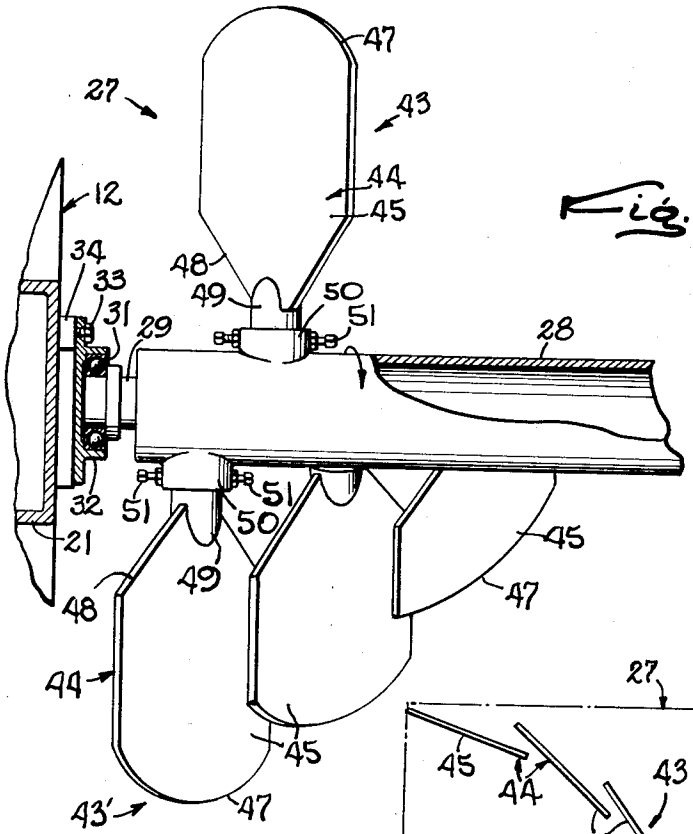



Fig. 3

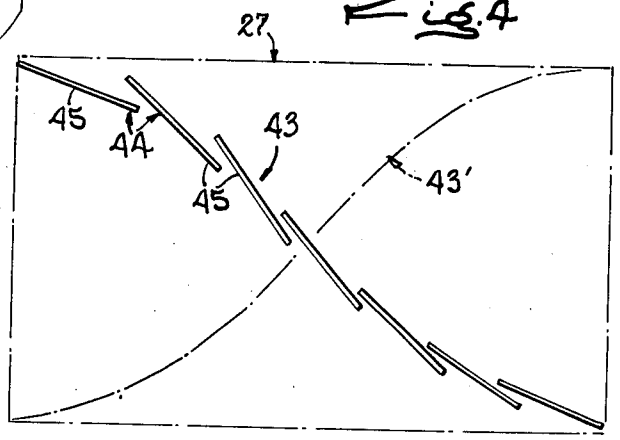



Fig. 4

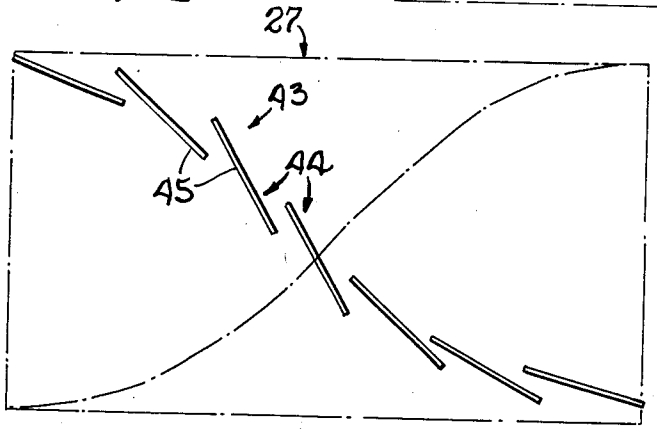



Fig. 5

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3,132,429

# SNOW REMOVING DEVICE

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5 Claims. (Cl. 37—45)

This invention relates to snow removing devices and more particularly to devices of the type including an inclined plow scoop mounted on the front of a vehicle to be pushed by the latter along a path such as a roadway to be cleared so that the scoop scrapes the snow from the road and throws it to an out-of-the-way position along the side of the path.

The primary object of the present invention is to provide a novel device of the above character which is capable of throwing the cleared snow a substantial distance from the path regardless of the speed at which the scoop is advanced along the road and under all snow conditions encountered in service use.

Another object is to provide a device of the above character which, as compared to prior snow removal devices of this type, is simple and inexpensive in construction.

A further object is to provide a snow removal device capable of maintaining a relatively high road speed even in deep snow and requiring less power to move the cleared snow off the road.

Another object is to utilize an impeller cooperating in a novel manner with a conventional plow scoop to clear a path through the snow and throw the cleared snow off the road.

A more specific object is to provide a snow removing device including an auger-type impeller mounted in advance of the scoop and having helically arranged flights for shearing away the snow in advance of the scoop and throwing the snow rearwardly toward the scoop for deflection by the latter to an out-of-the-way position off the road.

A further object is to adjust the shear angle of the impeller flights for different snow conditions and thereby obtain optimum effectiveness of the power delivered to the impeller.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which

FIGURE 1 is a fragmentary elevational view of a snow removal device embodying the novel features of the invention, the device being mounted on the front of a vehicle which is partially broken away.

FIG. 2 is a fragmentary plan view of a portion of FIG. 1.

FIG. 3 is an enlarged fragmentary view taken substantially along the line 3—3 of FIG. 2 with parts broken away and shown in section.

FIG. 4 is a schematic view illustrating one position of the impeller flights.

FIG. 5 is a schematic view illustrating another position of the flights.

As shown in the drawings for purposes of illustration, the invention is embodied in a snow removing device 10 including a plow scoop 11 carried on a frame 12 on the front of a vehicle 13 in position to be pushed by the latter along a path such as a roadway 14 to be cleared of snow. Conventionally, plow scoops of this type are formed with a lower, scraping edge 15 supported adjacent the surface to be cleared and a body portion 17 inclined rearwardly and to one side at a suitable angle such that the snow



entering the scoop as the latter is pushed along the road strikes the inclined body portion 17 and is deflected thereby to the side and out of the scoop, the distance the snow is thrown depending primarily upon the relative velocity at which the snow strikes the scoop.

In the present instance, the frame 12 includes horizontal side bars 18 disposed along opposite sides of the scoop and connected across the rear of the scoop by a cross bar 19. Intermediate its ends, the cross bar 19 is secured to the forward ends of rails 20 which extend under and are fastened to the vehicle. Fastened to the side bars adjacent the forward ends of the latter are upright posts 21 and 22 connected across their upper ends by a horizontal cross bar 23. The upper edge of the scoop is connected to this cross bar 23 and the lower edge 15 extends between the lower ends of the posts adjacent the road surface. While the lower edge may be inclined rearwardly relative to the path, herein, it is substantially perpendicular to the path and the incline of the body portion 17 is obtained by varying the curvature of the scoop across its width. The curvature of the lower portion of the scoop adjacent the left-hand end as viewed in FIG. 2 is more gradual than the curvature adjacent the right end so that the scoop is generally conical in shape. Adjacent the top of the scoop, the radius of the curvature at the left increases sharply to close on the cross bar 23.

In this manner, the body portion of the scoop is inclined both upwardly and to the left rear (FIG. 2) at a suitable angle, for example, an angle of approximately twenty degrees with the scraping edge. Consequently, when the scoop is pushed along the road and into the snow, the latter is lifted into the scoop, strikes and slides along the inclined portion, and is thrown upwardly and to the left (FIG. 2) to an out-of-the-way position along the side of the road. The right end of the scoop may be closed by a plate 24 and the left end braced by a plate 25 upstanding from the side bar and bearing against the body of the scoop.

The present invention contemplates a novel snow removing device which is capable of throwing the cleared snow a substantial distance from the path regardless of the speed at which the scoop is advanced along the road and under all snow conditions encountered in service use and, as compared to prior devices of this character, is of simple and inexpensive construction, is capable of maintaining a relatively high road speed even in deep and heavy snow, and requires less power to move the cleared snow off the road. To achieve these ends, an impeller 27 is mounted on the frame 12 in advance of the scoop 11 and across the path to be cleared to cooperate with the scoop in breaking away the snow and throwing the snow off the road. The impeller includes a shaft 28 (see FIG. 3) journaled on the frame to rotate about an axis extending transversely of the path and a member fast on the shaft for rotation therewith to shear away snow in front of the scoop and throw the snow rearwardly against the scoop as the device is advanced along the road.

As a result, the snow entering the scoop strikes the inclined body portion 17 at a high relative velocity regardless of the speed of the vehicle and, therefore, is thrown a substantial distance from the road. Because of the cooperation between the impeller and the scoop, the vehicle is able to advance the device at relatively high road speeds under adverse conditions thus enabling the device to cover substantially greater distances in a given amount of time than has been possible with prior devices operating under comparable conditions.

As the vehicle speed increases, the velocity differential

between the stationary snow and the rearwardly moving shearing member decreases thereby reducing the load on the impeller and its power requirement despite the increasing volume of snow entering the plow. At the same time, the increasing velocity of the scoop maintains the high relative velocity at which the snow strikes the scoop and is thrown laterally.

Herein, the shaft 28 comprises the shank of an auger-type impeller and is journaled on the frame 12 to extend across the forward end of the scoop and rotate about an axis substantially perpendicular to the path. As shown in FIGS. 2 and 3, the shaft 28 is formed with trunnions 29 and 30 projecting axially from its ends and journaled in anti-friction bearings 31 supported in sleeves 32 fast on discs bolted at 33 to plates 34 fast on the inner sides of the posts 21 and 22. Preferably, these bearings are supported midway between the lower edge portion of the scoop and the cross bar 23 to center the auger in the forward end of the scoop with the axis of the shaft 28 paralleling the lower edge portion.

On one side, the trunnion 30 projects through the posts 22 and outwardly therefrom with a sprocket wheel 35 fast on the outer end as shown in phantom in FIGS. 1 and 2. Wrapped around this sprocket wheel is an endless chain 37 extending rearwardly and around a drive sprocket 38 on the shaft 39 of a gasoline engine 40 which, therefore, constitutes the means for rotating the auger. The engine 40 may be mounted on the frame behind the scoop. To tighten the drive chain, an idler sprocket 41 riding on the chain is journaled on an arm 42 for vertical adjustment relative to the chain.

In the present instance, the shearing member is formed by an auger flight 43 wrapped helically around the shaft to extend between the posts 21 and 22 with a major or outer diameter slightly less than the height of the opening. In the present instance, a double-flight auger is used with a second flight 43' beginning diametrically opposite the flight 43 at one end of the shaft (see FIG. 3), each flight turning through one-half pitch along the shaft to the other end of the latter (see FIG. 4). With the right-hand end (FIG. 2) of the scoop spaced slightly behind the auger and the body of the scoop inclined rearwardly to the left relative to the auger axis, the other end of the scoop is spaced a substantial distance from the auger and the frame is open both to the front and rear of the auger.

When the device is being pushed along the path to be cleared, the engine 40 is energized in a direction to rotate the shaft 28 clockwise as viewed in FIG. 1 and at a relatively high speed. Thus, the auger flights approach the snow while moving downwardly and each flight shears away a layer of snow, carries the snow under the shaft, and throws the layer rearwardly against the inclined portion 17 of the scoop 11 at a velocity determined by the speed of rotation of the auger. Because of the helical arrangement of the flights, each portion of the leading radial face of each flight approaches and passes through the snow in front of the device at a predetermined angle determined by the helix angle of the flight, that is, the angle formed between the shaft axis and a tangent to the leading face. Thus, instead of approaching the snow flatly, the shearing face cuts through the snow at an advantageous angle with a resultant reduction in the power required to shear the snow. Further, with the frame open both in front of and behind the auger, the sheared snow is thrown generally rearwardly rather than carried axially as in many prior snow removal devices utilizing augers to move the snow. As a result, a relatively low horsepower and consequently, less expensive engine may be used to drive the auger.

In addition to determining the amount of power required in shearing away a layer of snow, the angle of flights imparts a lateral as well as a rearward direction of snow. Herein, the flights are formed to incline the snow toward the trailing open end of the scoop so that



the auger cooperates with the scoop not only by shearing and impelling the snow but also by changing the direction of the snow relative to the path. Thus, the snow strikes the scoop at a more advantageous angle with the result that less of the force of the snow is absorbed by the scoop in deflecting the snow to the side and a greater amount remains to carry the snow beyond the cleared path.

In accordance with another aspect of the invention, the auger flights 43, 43' are angularly adjustable relative to the shaft axes to vary the shear angle for different snow conditions and thereby to obtain optimum effectiveness of the power delivered to the auger. For this purpose, each flight is formed by a plurality of radially extending paddles 44 arranged in a helical series around the shaft 28, and each paddle may be positioned selectively about an axis extending transversely of the shaft axis to vary the angle at which the paddle passes through the snow.

When the device is to be operated in relatively light, loosely packed snow where a small proportion of the available power is required to shear the snow, the paddles may be set at an angle selected to direct the snow more sharply to the side. On the other hand, when the device is to be operated in heavier, so-called wet snow which requires a proportionately greater amount of shearing power, the paddles may be set at a more advantageous shearing angle so that less power is used in shearing the snow and accordingly, the rate of advance of the vehicle need not be materially reduced to maintain a high speed of auger rotation.

In the present instance, each paddle comprises a flat metal blade portion 45 which may be formed with an arcuate outer end 47 and side edges which converge inwardly at 48 toward the shaft, the inner end of each blade being fastened as by welding to a cylindrical shank 49. The shanks are journaled in radially opening holes in the shaft, preferably perpendicular to the shaft axis, and herein formed in radial bosses 50 on the shaft. To secure the shanks in selected angular positions relative to the shaft axis, suitable means is provided such as a pair of set screws 51 threaded into each boss and tightened against opposite sides of the shank. The spacing of the bosses and the width of the paddle blades preferably are correlated so that the blades overlap and the flat faces thereof form a substantially continuous and generally helical surface.

For lightweight snow, the paddles may be positioned with the blades disposed at angles of approximately forty-five degrees with the shaft axis as illustrated schematically in FIG. 4. With this arrangement, each blade moves through the snow at a corresponding shear angle and throws the snow rearwardly and sharply to the side. The preferred blade setting for heavier snow is illustrated schematically in FIG. 5 in which the blades are shown at angles of approximately sixty degrees with the shaft axis. The blades may be changed to this setting simply by loosening one or both set screws 51, turning the blade to the desired position, and then retightening the screws. In this position, the blades cut through the snow at a sharper angle and, therefore, with a substantially lower power requirement than would be necessary with the flatter setting. As a result, a relatively high road speed may be maintained without overloading the impeller. The snow is directed more to the rear but still at a high velocity relative to the scoop and is deflected by the latter to an out-of-the-way position off the road.

To increase the width of the path cleared, forwardly diverging vertical side plates 52 and 53 may be mounted on the posts 21 and 22 to cam snow inwardly from each side and into the impeller 27. Further, the lower curved portion of the scoop may be spaced above the surface with a flat plate 54 extending downwardly and forwardly therefrom with one side of the plate forming the scraping edge 15. When the device is used to clear the road of snow only a few inches deep, this plate pushes the snow

ahead of the scoop until it builds up sufficiently to flow over the plate. Then, the impeller, which idles until the snow builds up to a sufficient depth, throws the snow rearwardly against the scoop.

As shown in FIGS. 1 and 2, the forward end of the frame may be supported on wheels **55** carried on each side of the frame on the upright posts **21** and **22**. Herein, the wheels are rotatably supported on axles **57** journaled on the legs of yokes **58** journaled on the lower ends of vertical rods **59**, the upper ends of the rods being slidable up and down in hydraulic cylinders **60** fast on stub-shafts **61** projecting laterally from the posts **21** and **22**. Thus, the frame may be elevated by the cylinders **60** to a transport position or lowered until the scraping edge **15** is adjacent the surface. A skid **62** is formed under each post to carry the frame smoothly over the surface being plowed.

It will be apparent that the impeller may be adapted for use with a generally V-shaped plow scoop (not shown) merely by forming the auger with an oppositely directed flight on each side of the center of the plow. As a further modification, the paddles may be arranged other than is helical series around the shaft but without the mechanical advantage resulting from the screw-like flights.

From the foregoing, it will be seen that the novel snow removing device described herein is capable of clearing a path through relatively deep and heavy snow and throwing the snow a substantial distance from the road without regard to the road speed of the vehicle, thus insuring that the snow is deposited in an out-of-the-way position and is distributed over a large area along the roadside, thereby avoiding the formation of high, steep banks on each side of the cleared path. Further, by utilizing an auger-type impeller to shear away the snow and throw the snow generally rearwardly rather than axially, and by making the shearing members on the impeller angularly adjustable for different snow conditions, the power required to operate the impeller and, consequently, the size and cost of the engine are reduced, and the entire device is much simpler and less expensive to manufacture than prior blower-type snow removal devices.

In addition, because of the novel cooperation between the impeller and the plow scoop in moving the snow, these important advantages are obtained in a device which is capable of operating at relatively high road speeds even in deep and heavy snow. The impeller insures that the snow strikes the scoop at a velocity high enough to carry the snow a substantial distance, and, when high road speeds may be maintained, the power required to drive the impeller decreases. Thus, it will be seen that the scoop cooperates with the impeller in moving the snow and carries a large portion of the load in the higher speed ranges where the speed of the vehicle approaches the peripheral speed of the auger.

I claim as my invention:

1. In a snow removing device, the combination of, a frame adapted to be mounted on a vehicle and pushed by the latter along a path to be cleared, a scoop carried by said frame and extending transversely of said path with the lower edge of said scoop adjacent the surface to be cleared, the body portion of said scoop being inclined upwardly and rearwardly to one side relative to the path, a shaft journaled on said frame in advance of said scoop to rotate about an axis extending transversely of the path, a series of radially extending blades arranged in a helical series around said shaft, each of said blades being journaled on said shaft to turn about an axis extending transversely of said shaft axis and for bodily rotation about the axis of said shaft, means for selectively positioning each of said blades in a predetermined angular position about its axis, and means for rotating said shaft at high speed as the device is advanced along said path whereby said blades shear away snow in front of said scoop, said frame being open both in front of and behind said shaft and the body portion of said scoop being spaced a substantial distance behind said blades whereby said blades throw the snow generally axially of said shaft and rearwardly toward the scoop.



2. In a snow removing device, the combination of, a frame adapted to be mounted on a vehicle and pushed by the latter along a path to be cleared, a scoop carried by said frame and extending transversely of said path with the lower edge of said scoop adjacent the surface to be cleared, the body portion of said scoop being inclined rearwardly and to one side relative to said path, a shaft journaled on said frame in advance of said scoop to rotate about an axis extending transversely of said path, a series of radially extending blades spaced along said shaft, each of said blades being journaled in said shaft for rotation about an axis extending transversely of said shaft axis and also for bodily rotation around the axis of the shaft, means for selectively positioning each of said blades in a predetermined angular position about its axis, and means for rotating said shaft at high speed as the device is advanced along said path whereby said blades shear away snow along the path and throw the snow generally axially of the shaft and rearwardly against the scoop.

3. In a snow removing device, the combination of, a frame adapted to be mounted on a vehicle and pushed by the latter along a path to be cleared, a scoop carried by said frame and extending transversely of said path with the lower edge of said scoop adjacent the surface to be cleared, the body portion of said scoop being inclined upwardly and rearwardly to one side relative to said path, a shaft journaled on said frame in advance of said scoop to rotate about an axis extending transversely of said path, a helical auger flight wrapped around said shaft for rotation therewith, and means for rotating said shaft at high speed as the device is advanced along the path whereby said flight shears away snow along the path, said frame being open both in front of and behind said shaft and the trailing side of the body portion of said scoop being spaced a substantial distance behind said flight whereby said flight throws the snow generally rearwardly toward the scoop and cooperates with the scoop in inclining the snow toward said one side.

4. In a snow removing device, the combination of, a frame adapted to be mounted on a vehicle and pushed by the latter along a path to be cleared, a scoop carried by said frame and extending transversely of said path with the lower edge of said scoop adjacent the surface to be cleared, an impeller including a shaft journaled on said frame in advance of said scoop to rotate about an axis generally perpendicular to said path, a member fast on said shaft for rotation therewith, and means for rotating said shaft at high speed in a direction to move said member downwardly through the snow in front of said device to shear away a layer of snow, carry the sheared snow under the shaft, and throw the snow generally axially and rearwardly toward said scoop, the latter having a body portion disposed behind said impeller and inclined rearwardly to one side relative to said shaft axis with the trailing side of said body portion spaced a substantial distance behind the impeller whereby the sheared snow strikes said inclined portion at a high velocity and is deflected to said one side thereby.

5. In a snow removing device, the combination of a frame adapted to be mounted on a vehicle and pushed by the latter along a path to be cleared, a scoop carried by said frame and extending transversely of said path with the lower edge of said scoop adjacent the surface to be cleared, the body portion of said scoop being inclined upwardly and rearwardly to one side relative to said path, an impeller journaled on said frame in advance of said body portion to rotate about an axis extending transversely of the path, said frame being open both in front of and behind said impeller and said body portion being spaced a substantial distance behind the impeller, and means for rotating said impeller at high speed as the device is advanced along said path whereby the

impeller shears away snow along the path and throws the snow rearwardly against the inclined body portion of the scoop.

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