

March 26, 1957

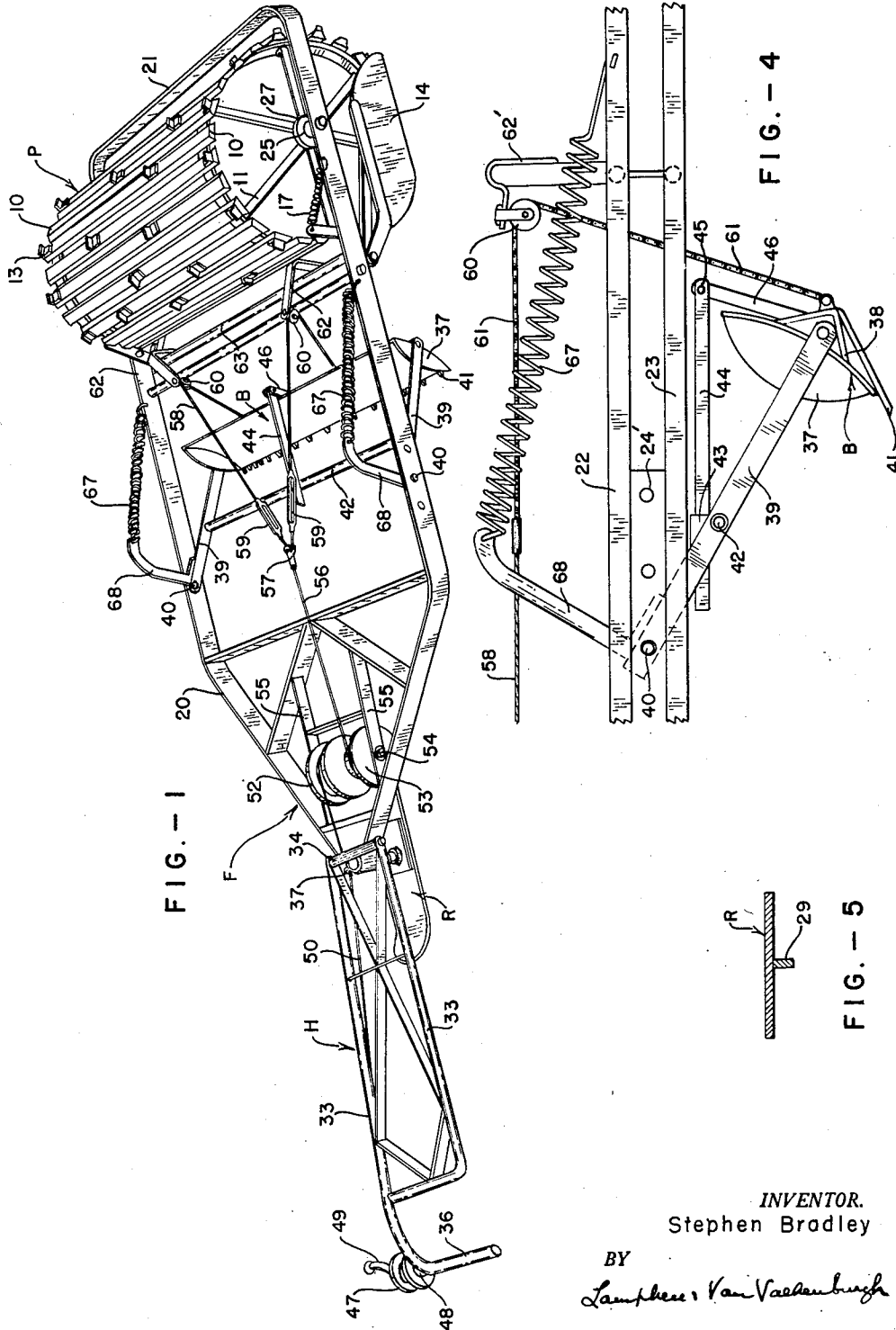
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2,786,283

APPARATUS FOR GRADING AND PACKING SNOW

Filed Dec. 17, 1951

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

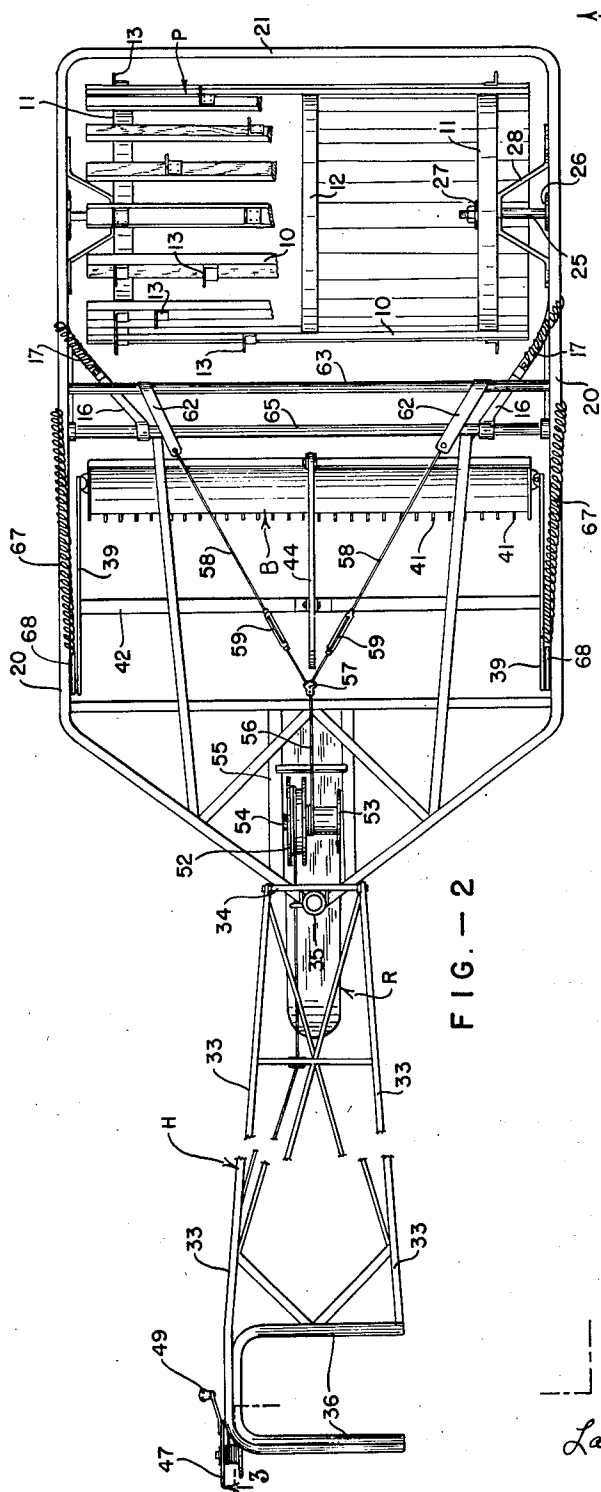


FIG. - 2

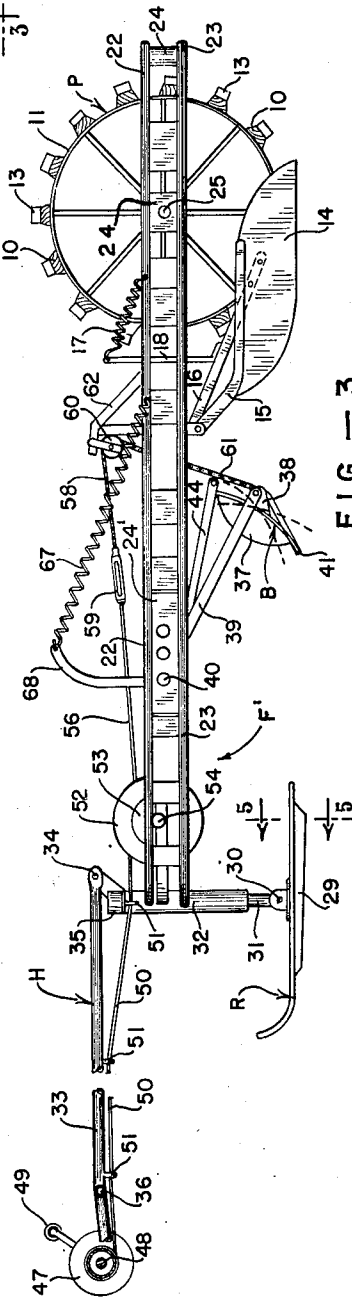


FIG. - 3

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3 Sheets-Sheet 3

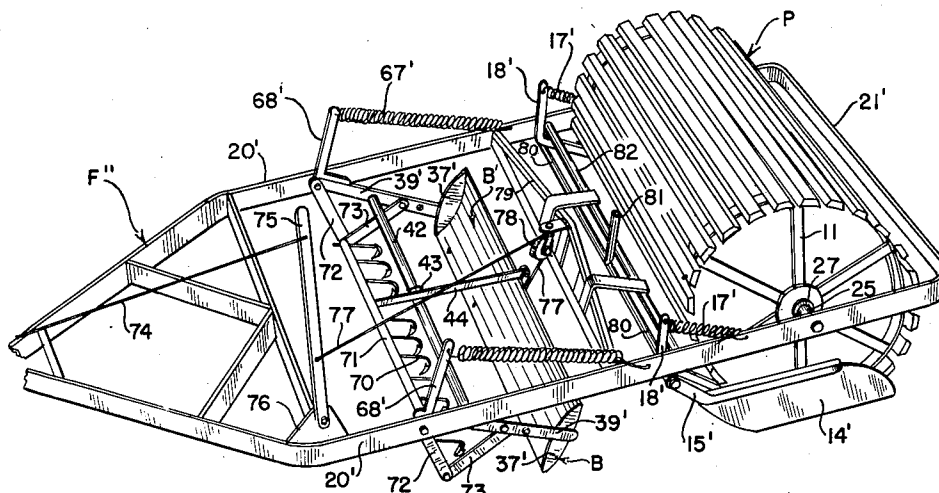


FIG. - 8

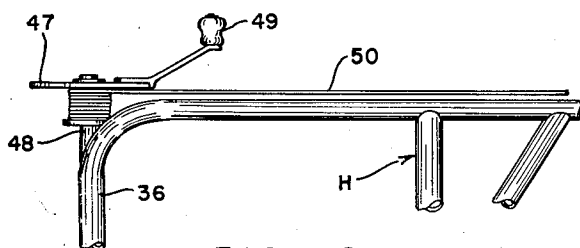


FIG. - 6

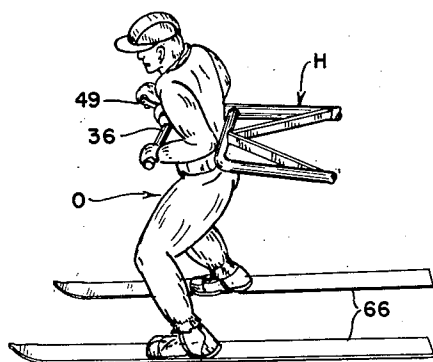


FIG. - 7

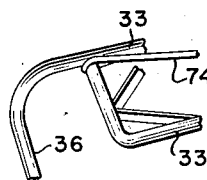


FIG. - 9

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2,786,283

APPARATUS FOR GRADING AND PACKING SNOW

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Application December 17, 1951, Serial No. 261,993

14 Claims. (Cl. 37—10)

This invention relates to apparatus for packing and grading snow, which apparatus is particularly useful in snow packing and maintenance operations on a ski course.

Prior to the present invention, the customary method of packing ski courses has been to send a number of skiers down a course, using a "snow-plow" technique, in order to smooth down any fallen snow, or to send a number of skiers up the hill, using the "side-step" technique, in order to pack down newly fallen snow. After the snow has been packed down, and skiers have used the course for a time, hummocks and valleys tend to develop in the course, these hummocks and valleys being sometime sufficiently high or deep to cause difficulty to less experienced skiers, and also tend to cause the skiers to follow the same route down. In addition, between snow falls, the depth of the snow tends to be diminished during use, so that irregularities in the land, such as caused by grass hummocks, rocks and the like, may be uncovered and thereby contribute a hazard to use of the course.

Prior to the present invention, the customary method of maintaining the ski course, between periods of new snow, has been to send out maintenance men with shovels, who cut off the tops of snow hummocks and shovel snow in the snow valleys, as well as shovel snow onto thin or bare spots in the course. Needless to say, these hand operations with shovels are not only time consuming and require an undue number of maintenance personnel, but also interfere unduly with use of the course.

Among the objects of the present invention are to provide a novel apparatus for packing snow on a ski course or the like; to provide suitable apparatus for grading a ski course, i. e. removing high points or hummocks of snow and moving such removed snow into lower points or valleys; to provide such grading apparatus which will simultaneously tend to pack the removed snow into the previous valleys; to provide such apparatus which requires a minimum of personnel for operations; to provide such apparatus whose use tends to produce a minimum of interference with normal use of a ski course; to provide such apparatus which is safe to use on a steep slope; to provide such apparatus which may be adjusted to accommodate different conditions of use; to provide such apparatus which is sufficiently simple in construction that it may be made economically; to provide such apparatus which is particularly effective in operation; and to provide such apparatus which may exist in any one of several embodiments.

Additional objects and the novel features of this invention will become apparent from the description which follows, taken in connection with the accompanying drawings, in which:

Fig. 1 is a perspective view of a snow packer and grader constructed in accordance with this invention;

Fig. 2 is a top plan view of the apparatus of Fig. 1, on a slightly enlarged scale;

Fig. 3 is a side elevation of apparatus substantially

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identical with that of Fig. 1, but having a different framework construction, said view being partly in section as along line 3—3 of Fig. 2;

Fig. 4 is a fragmentary side elevation, on a slightly enlarged scale in comparison with Fig. 1, showing particularly a grading blade and certain parts associated therewith;

Fig. 5 is an enlarged vertical section taken along line 5—5 of Fig. 3, illustrating more particularly a preferred construction of a front runner of the apparatus, of Figs. 1—3;

Fig. 6 is an enlarged fragmentary top plan view, showing particularly a cable reel for blade control and mounted at the front end of the apparatus;

Fig. 7 is a perspective sketch illustrating an operator on skis using the apparatus;

Fig. 8 is a perspective view, with certain parts omitted, of an alternative construction forming an additional embodiment of this invention; and

Fig. 9 is a fragmentary perspective view of the forward portion of a handle, illustrating a variation of the embodiment of Fig. 8.

As illustrated in Figs. 1—3, apparatus for packing and grading snow, constructed in accordance with this invention, may include a grading blade B and a rotatable packer P or packing wheel, each mounted on a framework F which may be supported at the front end by a runner R and at the rear end by the packer P. The apparatus may also be provided with a handle H, pivotally connected to the framework F at the front end thereof, and also connected with the runner R, the handle H being adapted to be used to turn the runner R for guiding the apparatus, while suitable means, described later, for regulating the elevation of blade B may be mounted partly on the handle H and partly on the framework F. As illustrated in Figs. 1 and 2, the packer P may comprise a series of slats 10, mounted in spaced circumferential relation on the periphery of two or more wheels, such as end wheels 11, and if desired attached also to a center reinforcing ring 12. The slats 10 are preferably made of wood, although they may be made of metal, if desired. The spaces between the slats 10 may be approximately the same, or greater or less than, the width of the respective slats, so that as the packer P turns, the snow will not only tend to become compacted by the slats, but also a churning effect will be produced. In addition, any snow passing between the slats will fall through as the packer rotates. For skiing, of course, the snow need not be packed solid, since a comparatively solid base with several inches of snow into which the skis will sink is deemed preferable by many skiers. The slats 10 may be rectangular or any other desired shape in cross section, although a trapezoidal cross section, as shown, is advantageous, with the narrower face on top. As will be evident from Fig. 3, snow tends to fall away from the slats. The packer P may have any desired width, such as from four to six feet, and the diameter of the wheels 11 may be in the neighborhood of 30 inches, with the slats 10 between three and four inches in median width, although all of these dimensions may be varied considerably.

Each of the slats 10 may further be provided with one or more cleats 13, such as formed by angles attached to the slats, one convenient arrangement thereof comprising cleats in staggered relation over the central portion of the packer with a row of cleats adjacent each end. The cleats 13 are particularly adapted to minimize side slippage, of particular importance when the apparatus is moving down a portion of a ski course which slopes off to one side, and additional provision may be made to minimize side slippage, such as the floating guides 14, illustrated more clearly in Figs. 1 and 3. Guides 14 may be made

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of either wood or metal and curve upwardly at the front end, each guide 14 being conveniently mounted on or attached to a supporting bar 15, in turn pivotally mounted at its forward end on the framework F, while an angularly extending reinforcing bar 16 also may be provided if desired, the latter also being pivoted to the framework F at its upper end and attached at its lower end to the guide 14. In addition, each guide 14 may be urged downwardly into the snow, as by a spring 17 attached at its rear end to the framework F and at its forward end to a bracket 18 which in turn is mounted or suitably attached to bar 16 (as shown), or to the guide support bar 15. As will be evident, spring 17 will tend to maintain the guides 14 in the snow, even though the packer P may engage the snow over a small portion of its width, as when passing over a large hummock. Thus, one or both of the guides 14 may be moved downwardly below the position shown in Figs. 1 and 3, as when one or both ends of the packer P are above the snow level at that point.

The framework F may be made of plates, bars, tubes, or the like, suitably shaped and attached together in a suitable manner, as by welding. Thus, the side bars 20 and rear bar 21 of Fig. 1 may be formed from plates or bars, although certain frame parts may have a composite structure, as in Fig. 3, provided by upper and lower tubes 22 and 23, respectively, which are bent to shape to form the periphery of frame F' and are connected together at spaced points by plates 24 and 24', which may be welded to the upper and lower tubes 22 and 23. The composite or truss construction of the principal frame parts, illustrated in Fig. 3, tends to be somewhat lighter than the solid plate construction of Fig. 1, although other cross sectional shapes, such as channels, may be utilized for the parts of the framework F. The packer P is mounted for rotation on the framework F, and may conveniently rotate about a single shaft, but to conserve weight and material may rotate about a pair of short shafts 25 each of which, as in Fig. 2, may extend from a mounting plate 26 on the side bar 20, adjacent the rear end of framework F, or from a plate 24 of framework F' of Fig. 3, and through a bearing 27 at the center of a wheel 11. Each shaft 25 may be suitably reinforced, as by a bracket 28 attached to the shaft adjacent the bearing 27 and extending angularly, both forwardly and rearwardly, to the side bar 20. Any other suitable manner of mounting the packer P for rotation on the framework F may, of course, be utilized.

Runner R, which may be made of either wood or metal and is preferably upturned at the front end in the same manner as a ski or toboggan, may be provided with a keel 29, as shown in Figs. 3 and 5, to minimize side slippage, and also may be pivotally mounted, as on a pin 30 at the lower end of a shaft 31. Shaft 31 extends upwardly through a bearing or housing 32, the latter being disposed vertically and conveniently forming a front point of connection for the side bars or tubes of the framework F. The handle H, which may be made in any desired manner, such as from tubular parts attached together in the form of a light truss structure, includes side tubes 33 pivotally mounted at their rear ends on a pin 34, which in turn is attached centrally to a collar 35 at the upper end of shaft 31, which also prevents shaft 31 from slipping out of housing 32. The handle H also preferably includes a U-shaped tube 36, open at one side, in which the operator may be positioned, with the tube 36 at about the level of the operator's waist, as shown in Fig. 7. The operator may normally grasp the front part of U-tube 36, and move the front end of handle H from side to side to produce a corresponding turning movement of the runner R, in guiding the apparatus down the slope.

The blade B, as in Figs. 1-3, is preferably made of metal and may be a slightly dished or arcuate blade, provided at each end with a reinforcing plate 37 and also adjacent each end with a rearwardly extending bracket 38, the blade being pivotally mounted on the rear ends of a

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pair of supporting bars 39, the latter of which may be pivoted at their front ends on pins 40 attached to the sides of the framework F.

The blade may further be provided with a plurality of teeth 41, preferably formed of metal and welded or otherwise suitably attached to the blade, so that hard hummocks may be more readily cut down or shaved off, although the blade may have a smooth lower edge, if desired.

As will be evident, the blade B may be adjusted vertically, through pivotal movement of its supporting bars 39, and the angularity of the blade also may be adjusted by pivotal movement of the blade about the rear ends of the supporting bars. For the latter purpose, a rod 42 may be attached, as by welding, between the supporting bars 39 at a position forward of the blade B, and provided at its center with a bracket 43 to which an adjusting bar 44 may be connected, such as by a clamp, or by a removable pin adapted to be inserted in one of a number of spaced holes (not shown) or other suitable means to hold the adjusting bar 44 in a desired position. The rear end of the adjusting bar 42 may be pivotally attached, as by a pin 45, to the center of the upper edge of the blade B at a bar 46 in turn attached to the blade B, so that movement of the adjusting bar 44 to different positions will cause the blade to pivot about the rear end of the supporting bars 39, thus changing the inclination or angle of the blade B, i. e. such as to and from the dotted positions of Fig. 3, and cause the blade to be more nearly vertical or more nearly horizontal, and thereby to act merely to push snow ahead of it or to slice into hummocks or the like on an angle. The pivotal adjustment of the blade B about its own longitudinal axis, will of course depend upon snow conditions and the use to which the blade is being put, i. e. such as whether the snow is hard and a greater shearing action by the blade is required or desired, or whether the snow is relatively soft and may merely be pushed ahead by the blade. Ordinarily, the pivotal position of the blade will be substantially unchanged during use on the course until the snow conditions themselves change.

As indicated previously, the elevation of the blade B may also be changed while the apparatus is in use, to accommodate variations in snow depth, of sizes of hummocks, of the amount of snow to be moved to cover bare or thin spots, and the like. Large hummocks may be cut down in two or more passes or runs down the slope, rather than attempting to cut them down completely at one time, which latter might require a greater force than that produced by the momentum of the apparatus moving down the slope, coupled with the push of the operator, when thrust forward against the handle H. Also, it may be desirable to interfere as little as possible with use of ski course, in which event runs as rapid as is safe may be desired, so that even though it might be possible to cut down hummocks or otherwise grade the slope in a single or a lesser number of runs, but at a much slower speed, the number of runs may be increased.

The vertical adjustment of the blade B may be accomplished through suitable raising and lowering mechanism, such as including a reel 47 mounted on a pin 48 at the forward end of the handle H, in a position convenient for access by the operator, as in Figs. 2 and 6, and the reel is also provided with a handle 49 which the operator may utilize in turning the reel in a desired direction. A wire or cable 50 is wound about the reel 47, and extends rearwardly along the handle H, such as through guide eyelets 51 attached to the underside of the handle, as in Fig. 3, and the opposite end of the cable is wound about a drum 52, which is preferably attached directly to a second drum 53. The diameter of drum 52 may be greater than the diameter of drum 53, to provide sufficient mechanical advantage to enable the operator to lift the blade B more readily. The drums 52 and 53

may be mounted on a drum shaft 54, shown in Fig. 1, which in turn is mounted between a pair of parallel bars 55 forming a part of the structure of the framework F. One end of a cable 56 is wound about drum 53, cable 56 leading to a cable joint 57 for a pair of cables 58, in which turnbuckles 59 for cable adjustment may be incorporated. Cables 58 diverge and are connected at their rear ends to blade B, as in Fig. 1 by passing over pulleys 60 to suitable points of connection to the blade B, such as at brackets 38, or each may be connected to a chain 61, with the latter passing over a pulley 60 and attached at its lower end to the blade B, as in Figs. 3 and 4. The point of attachment to the blade may be on the rear side and at a point in substantially horizontal alignment with the point of pivotal attachment of the blade to the supporting bars 39, so that pivotal adjustment of the blade by adjusting bar 44 may be more readily made with the blade in lifted position. Two points of connection of the blade adjustment cables tend to insure that the blade will be raised or lowered more evenly, and also that the blade will have less tendency to twist at one end or the other during use, since often a hummock which is being cut down will extend over only a portion of the blade. The pulleys 60 may be supported by a pair of brackets 62 which are mounted on a cross bar or tube 63, extending between the sides of the framework, while the brackets 62 may be reinforced by upright bars which, as in Fig. 3, extend upwardly from another cross bar or tube, such as tube 65 of Fig. 2. Or, the brackets may be constructed in the manner of brackets 62' of Fig. 4. The upper ends of the reinforcing bars 16 for the guides 14 also may encircle the tube 65, as in Fig. 2, extending angularly inwardly there-to so as to give additional lateral stability to the guides 14.

As will be evident, when the operator turns the front reel 47 in one direction, the drums 52 and 53 will be rotated in the same direction, and rotation of the second drum 53 will be transmitted through the cables 56 and 58 and thence to the blade B, to raise or lower the same. During use of the apparatus, the operator, being ahead of the same, can observe irregularities in the snow surface, and with a little experience, can adjust the blade B upwardly or downwardly, in accordance with snow conditions. As in Fig. 7, the operator O may keep one hand on the reel handle 49, and the other hand on the front of U-tube 36 of the handle H, as he moves down the slope on his skis 66. The blade height may be adjusted by turning the reel, and the apparatus may be guided, as indicated previously, by moving the handle H to one side or the other, the operator of course guiding himself by his skis.

In the event that the device tends to run down the slope at too great a speed, the operator can also lower the blade B, for use as a brake, and in the event that the operator finds himself in difficulty, either through mismanagement of his skis, or through encountering extremely difficult or unexpected snow or terrain conditions, it is desirable that the operator be able to stop the apparatus quickly. For this purpose, and as a safety feature of the apparatus of this invention, a pair of comparatively heavy springs 67 may each be attached at its rear end to the side of the framework F or F', and at its forward end to a bar 68. Each bar 68 is attached at its lower end to the supporting bars 39 for the blade, so that the blade is always urged downwardly by the springs 67, and further so that if the operator should release the reel handle, the blade will automatically be pushed into the snow, thus stopping the apparatus. As will be evident, this safety feature will prevent the operator from being run over by the apparatus, in the event that he stumbles or falls, or in the event he has to stop suddenly, because of terrain conditions or other emergency, such as a skier ahead of the operator falling suddenly.

It will of course be evident that the apparatus of this invention may be utilized while other skiers are moving down the course, although it is generally preferable to hold skiers at the top of the course a few minutes after the apparatus is started down, since while the apparatus may be moving down the course at a reasonable speed, the skiers will normally be moving down at a considerably faster rate. Nevertheless, a delay of only a few minutes in taking the apparatus down the course does not interfere unduly with skiing, and even when the apparatus is taken down the course several times, the skiers can still proceed down the course between the downward passes of the apparatus. The apparatus may be power driven if desired, but for the normal ski course, the slope is sufficiently great that the pull of gravity and the consequent tendency of the apparatus to move down the slope will enable the desired grading and packing to be accomplished without the necessity for adding a power unit to the apparatus.

The apparatus of this invention is also particularly adapted to be moved up hill by a ski tow or lift; in the case of a T-bar tow, the bar may merely be hooked behind the operator, or the tow stopped and the handle H tied to one of the T-bars. When moving up hill, unless the apparatus is to be utilized to grade the up hill path, it is preferable to lift the blade B and maintain it in an upper position, and this is readily accomplished merely by turning the reel until the blade is in an upper position, then lashing or clamping the reel handle to the handle H, or other provision for locking may be utilized, such as a suitable hole provided in one of the drums 52 or 53 and a hole also provided in one of the bars 55, so that a pin may be inserted therein to lock the drum in position.

The apparatus may also be used merely to pack down newly fallen snow, in which event the blade will normally be maintained in an upper position by the operator holding the handle of the reel or locking the blade up, while guiding the apparatus down the course. In use, it has been found that only a few trips down the course are sufficient to pack even comparatively deep, fresh snow. Also, in order to maintain the ski course in condition, the apparatus may be pulled to the top of the course, and then guided down the course periodically, such as two or more times per day. Of course, if the ski course is relatively wide, then several trips down the course may be necessary to cover the entire width, or two or more apparatus may be kept on hand, and moved down the course one behind the other, either over the same route to cut down large hummocks or pack freshly fallen snow, or over side by side routes to cover the entire width of a relatively wide course.

Since for packing new snow, the blade B is not necessarily utilized, it may be desirable to have on hand at a ski course a minimum number of graders, also adapted to act as packers, and perhaps one or more snow packers, utilized for use only when new snow is to be packed. In general, the number of passes down the slope, in packing new snow, may be greater than the number of passes necessary to maintain the course, once it has been packed down. Also, with several graders and/or packers, the new snow on a course can be packed more quickly. In a snow packer, the packer or packing wheel P is included, and also sufficient of the framework to provide a pivotal mounting for the packer P. The front runner may be utilized or omitted, as desired, while if the front runner is omitted, then the handle may be formed merely as a continuation of the framework, to enable the operator to guide the apparatus down the course. Thus, by duplication of the packer P, and the use of a much simplified framework, additional snow packing equipment may be provided at only a fraction of the cost of the complete grader and packer. Of course, it will be understood that for a normal ski course, at least one combined grader and packer will be desirable, since the packer apparatus alone is adapted primarily to handle new snow.

While a variation in the construction of framework F is illustrated in Fig. 3, it will be evident that other variations in the construction of the apparatus of this invention may be made. Thus, in the modification shown in Fig. 8, the framework F' may be formed of bars, or may be a truss-type construction of the type shown in Fig. 3, and the packer P may be similar to that shown in Fig. 1. However, the blade B' may have a smooth lower edge, i. e. without teeth, and the teeth, such as harrow-type teeth 70, may be disposed forwardly of the blade and adjustable independently thereof. Thus, the teeth 70 may be mounted on a supporting rod 71, through which the teeth may extend or may otherwise be suitably attached thereto, as for adjustment of the distance to which the ends of the teeth extend from the rod 71. Also, the rod 71 may be pivotable to different positions to change the angle at which the teeth extend, rod 71 being suitably mounted between the intersections of each of two pairs of supporting bars 72 and 73, bar 72 being pivotally attached to the supporting bars 39' for the blade B' and the bar 73, if desired, being adjustable along the supporting bar 39' for the blade, as through a bolt adapted to be placed in different holes therein, or adjustment of the individual teeth on bar 71 may suffice. As before, the blade B' itself is preferably pivotally adjustable, to different angular positions, by an adjusting bar 44', the position of which may be changed at a bracket 43' mounted on reinforcing rod 42'. Also, side springs 67', each acting between the framework F' and a bar 68', attached at its lower end to a supporting bar 39' for the blade B', urge both the plate and the teeth downwardly. As will be evident, since the teeth 70 may be disposed closer to the pivot point or fulcrum for the blade B', any change in elevation of the blade will be reflected in a lesser change in the elevation of the teeth.

For adjusting the vertical position of the blade B', in the apparatus of Fig. 8, a cable 74 may extend rearwardly from a reel mounted on the front end of the handle (corresponding to handle H of Fig. 1, but not shown in Fig. 8), the cable 74 leading to a horizontal lever 75, pivoted at one end on a bracket 76 attached to the framework F', and adapted to produce a mechanical advantage by virtue of the attachment of a blade cable 77 closer to the pivot point on bracket 76 than the point of attachment of handle cable 74. Blade cable 77 may run over a pulley 78, and may be attached to the blade B' at its center, preferably on the rear side, while the pulley 78 may be supported by a suitable bracket structure 79. In addition, each of a pair of springs 17' may be attached at one end to the framework F', one on each side, and at the opposite end to a bar 18' for urging the guides 14' into the snow at all times. The supports 15' for guides 14' may be mounted on a rod 80, in turn mounted for pivotal movement on the frame, while a bar 81 may be attached thereto and to which the operator may attach a lead line extending forwardly to the handle, so that the guides 14' may be lifted, if desired, to facilitate turning a sharp corner or for other reasons. The truss structure 79 may also be braced to a transverse rod or bar 82, as shown.

In the embodiment of Fig. 8, the different positions of horizontal lever 75 produce the corresponding positions of the blade B', and may be achieved by the operator turning the reel at the front end of the handle. However, the cable 74 may merely be attached to the handle, as in Fig. 9, so that the blade position may be changed merely by moving the handle upwardly or downwardly. As will be evident, moving the handle upwardly will permit the springs 67' to move the blade downwardly, while a downward movement of the handle (such as from a position above the horizontal to a position to or at the horizontal) will pull the lever 75 forwardly, thus raising the blade B'. In general, if the cable 74 is merely attached to the handle, the operator probably should be more expert as a skier, since involuntary movement of the handle during skiing may tend to change the blade to a position perhaps

not desired at that time by the operator. Nevertheless, the spring 67' will automatically cause the blade B' to dig into the snow, whenever the operator releases the handle, so that if the operator gets into trouble, all that is necessary for him to do is to release the handle and the apparatus will automatically be stopped.

From the foregoing, it will be evident that the apparatus of this invention fulfills to a marked degree the requirements and objects hereinbefore set forth. Use of a packer comprising a slatted roller, or having slots for the passage of snow, permits fresh snow to be packed with readiness and facility. With the adjustable blade, the apparatus is particularly useful in maintaining a ski course in condition, particularly a ski course subject to heavy use, and to do so irrespective of whether no snow has fallen for some time, or whether fresh snow falls continuously or periodically. The apparatus may be moved down a slope in use at a sufficient speed that a minimum of interference with normal skiing is produced, while the apparatus may also be utilized in packing a slope of new snow in a considerably less period of time, and with the use of considerably less personnel, than the old method of packing by foot, with skis. The apparatus may be accurately guided down the slope, due to the provisions therein for minimizing side slippage, and the apparatus is also safe to use, since a single motion of the operator, as by releasing the reel handle of the embodiment of Fig. 1 or releasing the handle of the modified embodiment of Fig. 8, permits the blade springs to cause the blade to be immediately plunged into the snow, and quickly arrest further progress of the apparatus. The apparatus is readily moved to the top of the ski slope, as by mere attachment to a tow or lift, and also, in the case of a rope or T-bar tow, may be used to grade the upward trail over which the skiers pass, as well as the course down which the skiers move. As will be evident, the apparatus is comparatively simple in construction, and therefore may be made at a comparatively low cost, yet the speed and the facility with which a new snow slope may be packed, and also a course maintained in desirable condition, accompanied by the need for less personnel than perviously necessary, can result in each apparatus paying for itself many times over, even during a single ski season.

It will be understood that various materials other than those described may be utilized, and that the parts may be changed considerably. For instance, various types of springs or other resilient means may be utilized, and various types of mechanical parts or connections to produce a mechanical advantage, where desired. Thus, although different embodiments of this invention have been illustrated and described specifically, and variations therein also shown and described, it will be understood that other embodiments of this invention may exist and that various changes may be made therein, all without departing from the spirit and scope of this invention.

What is claimed is:

1. Apparatus for grading and packing snow comprising a framework; a forwardly extending operator actuated handle pivotally attached to the front end of said framework; a front runner connected with said handle for turning movement thereof through said handle; a packer mounted for rotation about a horizontal axis and adjacent the rear of said framework, said packer being a generally hollow cylinder in form but having spaces in its periphery so that snow may pass into and through said spaces and also may fall out through said spaces; a blade extending substantially transversely and mounted on said framework forwardly of said packer, said blade being movable to different vertical positions; resilient means urging said blade downwardly; and operator-actuated control means associated with said handle for raising and lowering said blade, said resilient means normally tending to cause said blade to drop into snow when said control means is released by said operator.

2. Apparatus for grading and packing snow as defined

in claim 1, wherein said control means includes a cable and a reel mounted in a forward position on said handle.

3. Apparatus for grading and packing snow as defined in claim 1, wherein said control means is responsive to the elevation of said handle.

4. Apparatus for grading and packing snow as defined in claim 1, wherein said packer comprises a wheel provided with circumferentially spaced and transversely extending slats.

5. Apparatus for grading and packing snow as defined in claim 1, wherein said packer comprises a wheel provided with a plurality of circumferentially spaced and transversely extending slats, and outwardly extending cleats on said slats.

6. Apparatus for packing snow comprising a hollow, generally cylindrical wheel having a series of spaces disposed about its periphery so that snow may pass into and through said spaces and also may fall out through said spaces; frame means on which said wheel is mounted for rotation about its axis; means associated with said frame means for guiding said wheel; and a longitudinally extending guide at least at one side of said wheel, said guide being disposed generally vertically and being mounted on said framework for upward and downward movement so as normally to extend into the snow.

7. Apparatus for packing snow as defined in claim 6, including a guide at each side of said wheel and resilient means urging said guides downwardly.

8. Apparatus for grading and packing snow comprising a framework having parallel side members and a transverse rear member disposed horizontally, said side members converging toward each other at the front, a vertical housing to which said converging side members are attached, and at least one intermediate cross member extending between said side members; oppositely disposed shafts extending horizontally from said side members adjacent the rear thereof; a packer mounted for rotation about said horizontal shafts and generally cylindrical in form, said packer including a wheel at each end journaled on one of said shafts, a series of slats disposed in spaced circumferential relation and attached to the periphery of each said wheel, and a series of cleats attached to said slats and extending outwardly therefrom; a vertical shaft journaled in said vertical housing; a front handle pivotally attached to the upper end of said vertical shaft; a front runner pivotally attached to the lower end of said vertical shaft, both said handle and said runner being pivoted about horizontal axes so that turning movement of said handle will be transmitted through said vertical shaft to said runner; a pair of arms pivotally attached to said side members at opposite points forwardly of said intermediate cross member; a blade extending substantially transversely and mounted for pivotal movement on the rear ends of said arms, said blade being movable to different vertical positions; a blade cross member extending between said arms; and adjusting bar pivotally attached at its rear end to said blade and extending forwardly past said blade cross member; means for attaching said adjusting bar to said blade cross member at different positions; an upwardly extending bracket mounted on each said blade arm; a spring extending between each said bracket and said framework for urging said blade downwardly; at least one pulley and a mounting bracket therefor on one of said framework cross members; cable means over said pulley and leading to said blade; a cable reel on said handle adjacent the forward end thereof, said cable extending rearwardly along said handle to said framework; and force multiplying means mounted on said framework and connected respectively to said cable from said reel and to said cable means from said blade.

9. Apparatus for grading and packing snow, as defined in claim 8, wherein said force multiplying means comprises a pair of connected drums of different diameter mounted on said framework adjacent the forward end thereof for rotation about a transverse, horizontal axis,

said reel cable being wound on the larger drum; and wherein said cable means includes a single cable wound on the smaller drum and extends rearwardly to a point of connection with a pair of cables each having a turnbuckle therein and terminating in a chain passing over a pulley and to said blade, said chains being spaced apart laterally.

10. Apparatus for grading and packing snow, as defined in claim 8, wherein said blade is provided with a series of teeth extending below the lower edge thereof.

11. Apparatus for grading and packing snow, as defined in claim 8, wherein said force multiplying means includes a lever pivotally attached at one end to said framework and to which said reel cable is attached at a greater distance from said pivot point than said blade cable means.

12. Apparatus for grading and packing snow, as defined in claim 8, including two pair of arms, each pair connected together at their lower ends and connected in spaced relation at their upper ends to a blade supporting arm; a rod extending between said pairs of arms; and a series of teeth adjustably mounted on said rod.

13. Apparatus for grading and packing snow, as defined in claim 8, wherein said handle comprises a truss-like structure having a transversely extending U-shaped opening at the forward end thereof, said reel being mounted on the closed side of said U.

14. Apparatus for grading and packing snow comprising a framework having parallel side members and a transverse rear member disposed horizontally, said side members converging toward each other at the front; a vertical housing to which said side members are attached, and at least one intermediate cross member extending between said side members; oppositely disposed shafts extending horizontally from said side members adjacent the rear thereof; a packer mounted for rotation about said horizontal shafts and generally cylindrical in form, said packer including a wheel at each end journaled on one of said shafts, a series of slats disposed in spaced circumferential relation and attached to the periphery of each said wheel, and a series of cleats attached to said slats and extending outwardly therefrom; a front runner mounted for pivotal movement at the forward end of said framework; a handle connected with said runner so that turning movement of said handle will be transmitted to said runner; a pair of blade arms pivotally attached to said side members at opposite points forwardly of said intermediate cross member; a blade extending substantially transversely and mounted for pivotal movement on the rear ends of said blade arms, said blade being movable to different vertical positions; a blade cross member extending between said arms; an adjusting bar pivotally attached at its rear end to said blade and extending forwardly past said blade cross member; means for attaching said adjusting bar to said blade cross member at different positions; an upwardly extending bracket mounted on each said blade arm; a spring extending between each said bracket and said framework for urging said blade downwardly; at least one pulley and a mounting bracket therefor on one of said framework cross members; cable means over said pulley and leading to said blade; an operator controlled cable extending rearwardly from said handle; a force multiplying lever mounted on said framework and connected respectively to said handle cable and to said blade cable, said blade cable being attached to said lever at a point closer to its fulcrum than said handle cable; a transverse rod mounted on said blade arms forwardly of said blade and adjustable to different radial positions; a series of harrow-like teeth mounted on said rod for adjustment forwardly and rearwardly with respect to said rod; a pair of longitudinally extending guides disposed at each side of said packer and mounted for pivotal movement on said framework; and resilient means urging said guides downwardly.

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