

Sept. 2, 1952

W. L. MOORE ET AL

2,608,935

SKI-TOW APPARATUS

Filed Dec. 19, 1947

4 Sheets-Sheet 1

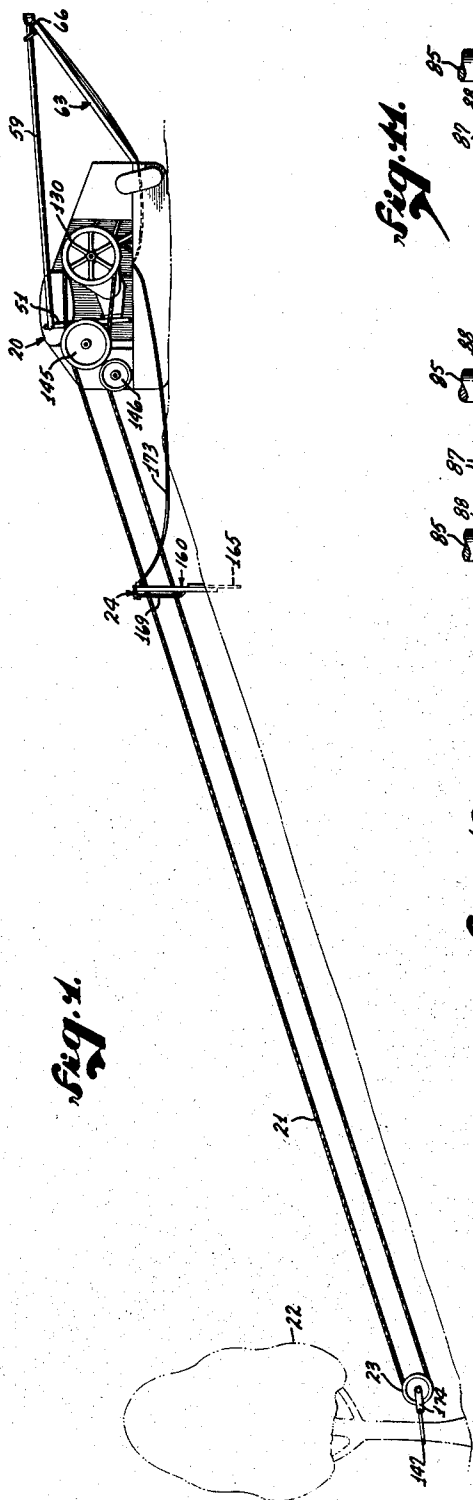


Fig. 1.

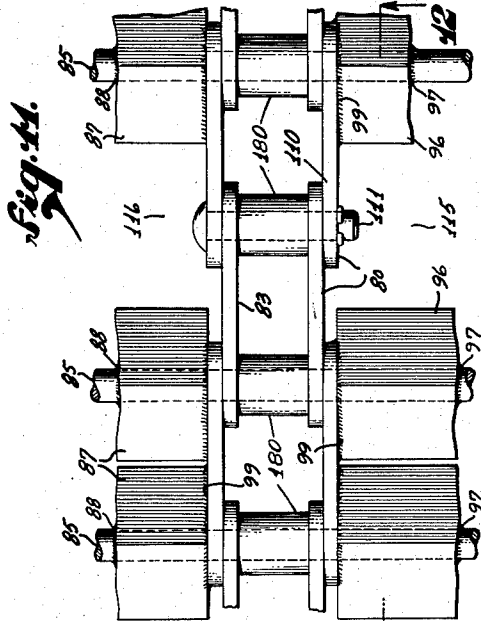
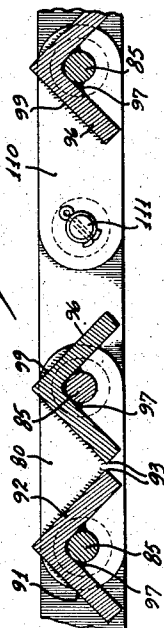


Fig. 11.



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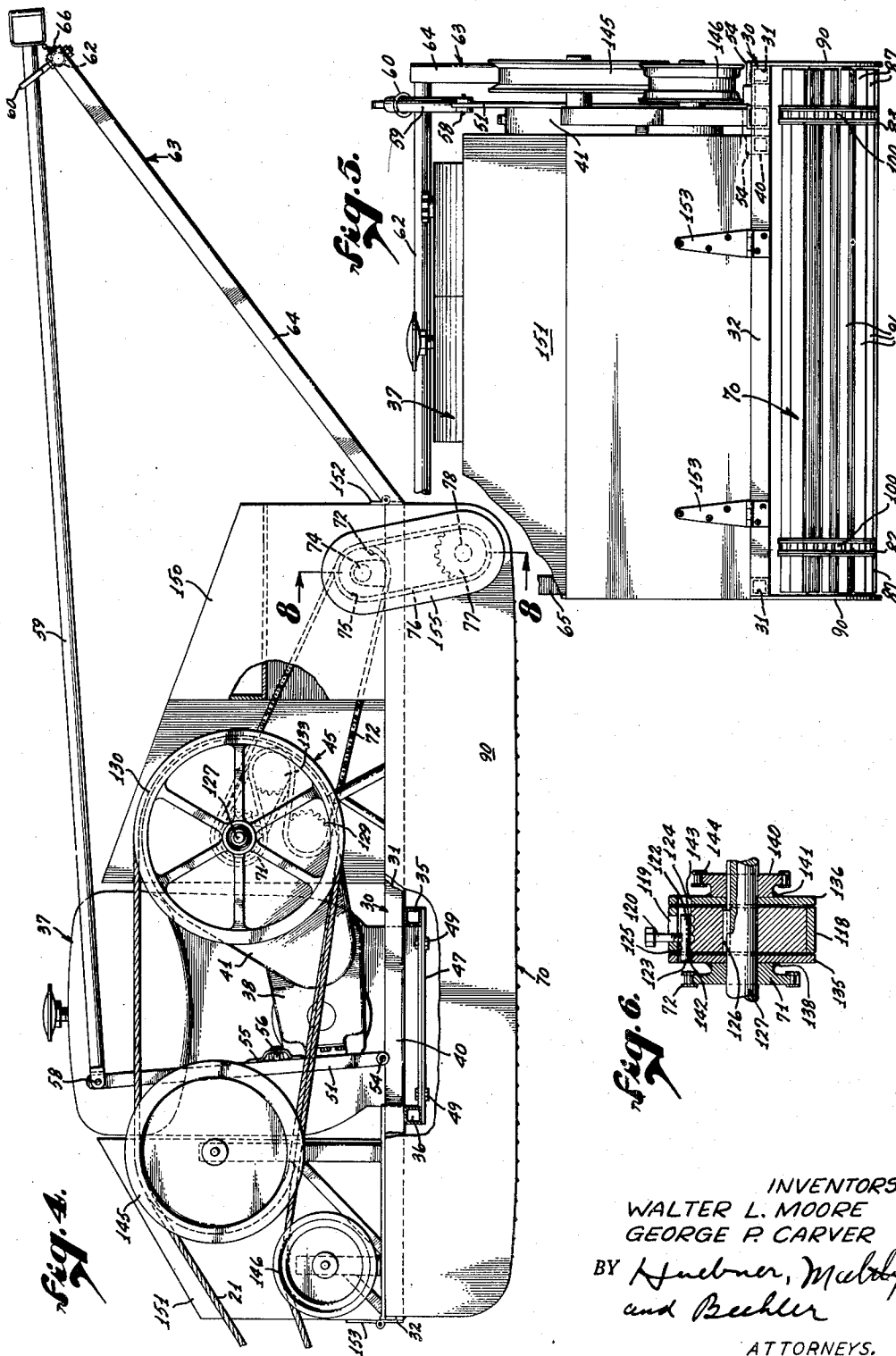
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SKI-TOW APPARATUS

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fig. 7.

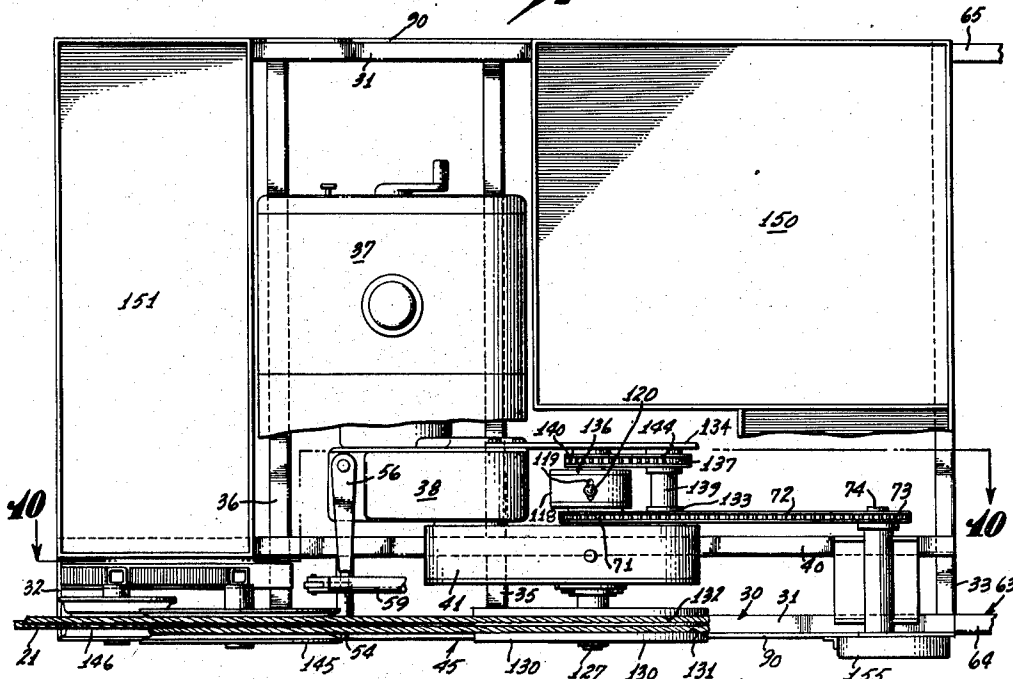


fig. 8.

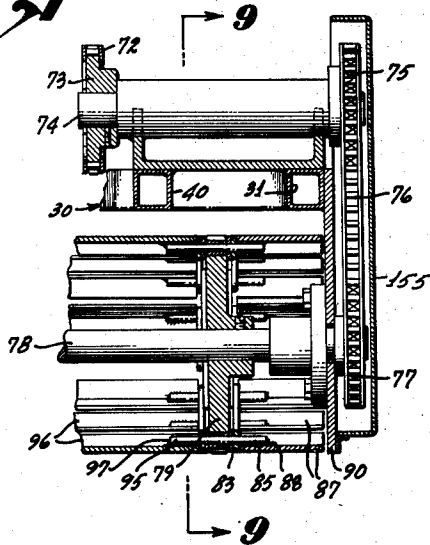
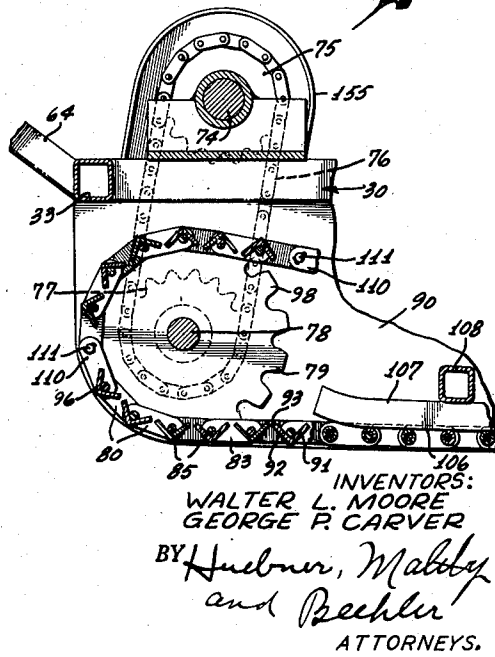


fig. 9.



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Fig. 10.

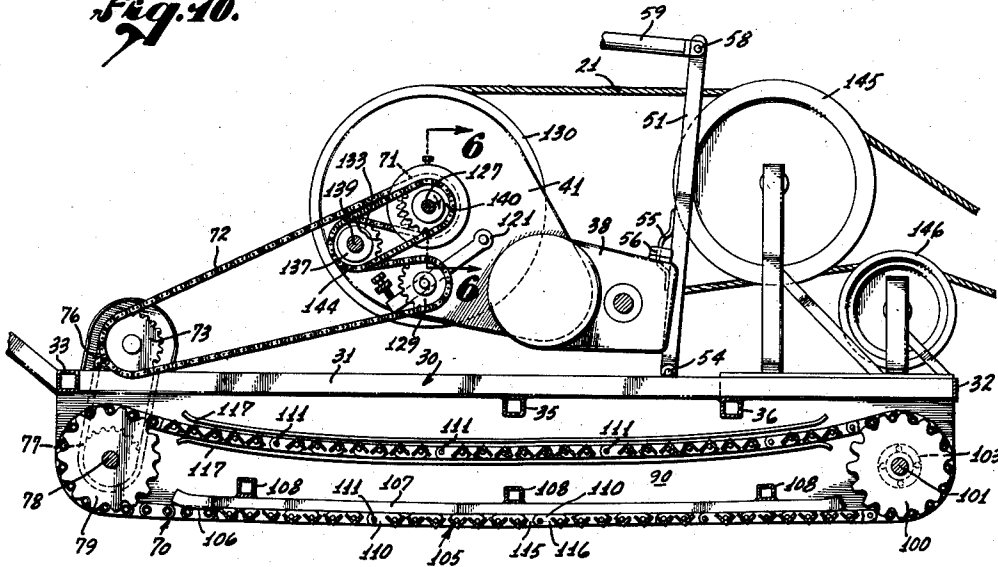


Fig. 13.

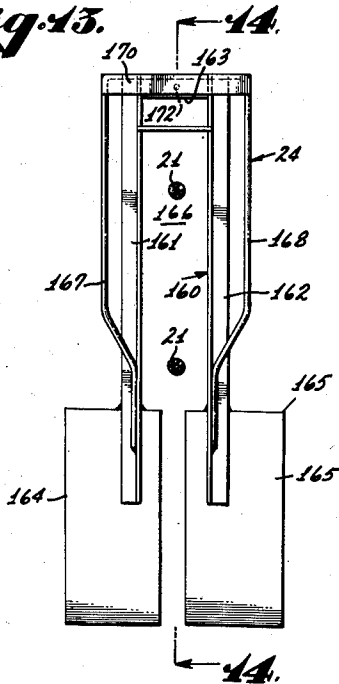


Fig. 15.

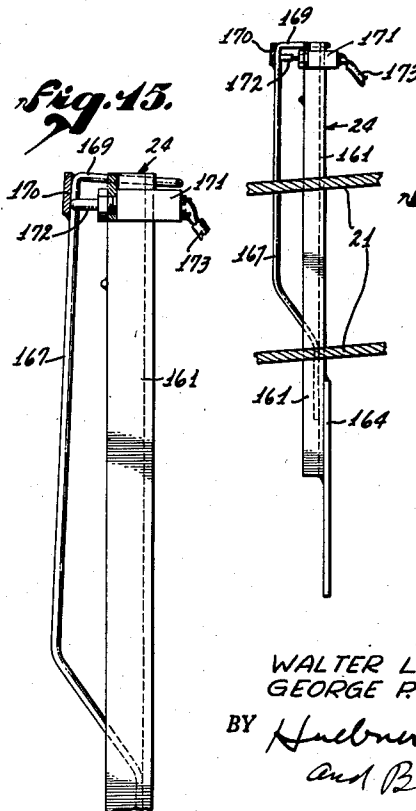


Fig. 14.

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UNITED STATES PATENT OFFICE

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SKI-TOW APPARATUS

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5 Claims. (Cl. 104—173)

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This invention relates to skiing equipment and more particularly to a mobile ski-tow apparatus as preferably embodied in a power tractor of new and improved design intended to be driven to a point at the top of a ski-run and there anchored or temporarily positioned in a manner to assist skiers in their ascent of the slope as by means of an endless conveyor preferably powered by the power plant of the tractor itself.

Skiing equipment is ordinarily usable only during limited periods of the year and to a limited extent in given locations depending upon such elements as the vagaries of the weather and seasonable temperature fluctuations from year to year.

Heretofore ski-tow apparatus which is ordinarily quite bulky, cumbersome and immobile, has been located permanently in a given place at the head of a selected ski-run and it has been largely a matter of luck whether from year to year the particular site chosen proves to be the most desirable for the intended purpose. Quite often snow flurries or drifts occur in different localities than the one upon which the ski-tow has been permanently located, and it is therefore desirable to provide a mobile ski-tow which can be propelled under its own power to any temporarily favorable site, there to be anchored and used pending the location of another more favorable position. Optionally also, the ski-tow may be positioned at the bottom of the hill and by utilizing the idler pulley construction at the top thereof, provide an equally satisfactory and effective operating arrangement.

It is among the objects of this invention, therefore, to provide a mobile ski-tow apparatus utilizing a common motive power to operate the treads of the tractor for transporting the same from place to place, together with its equipment, and likewise to energize an endless tow-rope or the like to which the skiers may cling and be carried from the bottom to the top of the run without the necessity of laboriously returning under their own power.

It is also among the intended objects of this invention to provide a new and improved ski tow apparatus having a minimum of necessary functional parts of relatively great utility to perform a desired maximum of intended result, which is readily and economically manufactured, which can be self-transported easily over heavy or light snow from place to place in the most difficult types of terrain, which is provided further with stowage spaces for necessary auxiliary equipment, and whose parts are readily assembled and disassembled for replacement or repair.

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Among the more specific objects of the invention is the provision of a ski lift apparatus of the desired character described in conjunction with new and improved safety features and accessories.

Another object of the invention is to provide a new and improved snow tractor for the stated desired purposes.

Another further object of the invention is to provide a new and improved track and track supporting structure for said apparatus.

Yet another object of the invention is the provision of a new and improved simplified reversing mechanism for the tractor tread drive.

A still further object is the incorporation in said structure of a new and improved simplified control arrangement.

Other contemplated objects envision the improvement of prior art devices and apparatus intended for a similar purpose.

Other objects and advantages of the invention will become apparent from the accompanying drawings and specifications wherein:

Figure 1 is a side elevational view of a preferred form of ski tow apparatus embodying this invention, as employed.

Figure 2 is a detailed view of a sheave.

Figure 3 is a sectional view as on the line 3—3 of Figure 2.

Figure 4 is an enlarged side elevational view of a ski-mobile or tractor, comprising a portion of this invention.

Figure 5 is a front elevational view of the tractor.

Figure 6 is a detailed sectional view taken as on the line 6—6 of Figure 10.

Figure 7 is a top view of the tractor, parts being cut away.

Figure 8 is a sectional view of a track drive mechanism taken as on a line 8—8 of Figure 4.

Figure 9 is a sectional view taken as on a line 9—9 of Figure 8.

Figure 10 is a sectional view taken as on a line 10—10 of Figure 7.

Figure 11 is an enlarged fragmentary view of the track.

Figure 12 is a sectional view taken as on a line 12—12 of Fig. 11.

Figure 13 is an elevational view of a safety switch and cut-off guard for the lift line.

Figure 14 is a sectional view as on a line 14—14 of Figure 13.

Figure 15 is an enlarged view similar to Figure 14 but showing the parts in a different operative relationship.

Referring more particularly to the drawings,

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a tractor, generally designated by the numeral 20 (Cf. Fig. 1), has operatively secured thereto an endless ski tow or rope 21 which may be operatively secured to the tractor as will appear, and which may be secured at a distant point to a post, anchor or other object, such as a tree 22 as by means of a specially devised pulley wheel 23. A guard 24 is associated with the rope 21 in a manner to disconnect the power in the machine and prevent further movement of the rope 21 when a skier collides with the guard, as will be later set forth.

The tow-mobile or tractor 20 itself generally comprises a frame 30 preferably having any desired number of longitudinal supporting members 31 connected at their forward end to a transverse supporting member 32, at their rearward end by a similar transverse supporting member 33, and connected intermediate their ends by transverse supports 35 and 36 designed to sustain the weight of a motor 37, preferably of a gasoline-fuel type, and associated drive and clutch mechanism 38. Any other type or arrangement of frame may be used. An additional longitudinal supporting member 40 is included to additionally reinforce and support a gear box 41 or the like associated with the drive mechanism.

The motor is secured in any well-known manner to the transverse members 35 and 36 as by means of a plate 47 (Cf. Fig. 4). Any desired auxiliary bracing may also be employed and the motor secured thereto as by means of bolts 49.

The clutch mechanism 38 is operatively connected to the motor 37 through any conventional drive means (not shown) and is remotely controllable from the rear of the tractor as through an upright control rod 51 pivotally secured to the supports 31 and 40 by means of a pin 54 or the like. For this purpose, also, the upright member 51 is provided with a metal band 55 loosely accommodating a clutch lever 56. The upright 51 is, in turn, linked as by pin 58 to a longitudinal control rod 59 extending outwardly beyond the rearmost portion of the towmobile, and there loosely held within an eyelet 60 or the like fixed to the cross-piece 62 of a handle 63. The handle further comprises a pair of side members 64 and 65 which is firmly secured to the rear of the towmobile as by welding to the longitudinal frame members 30 and 31.

The handle 63 is intended for use by an operator walking behind the machine (when not riding therein), who, by applying sidewise pressure, may steer the machine in any desired manner. The operator may also control the current to the motor by a switch 66 mounted on the cross-piece 62.

The motor is operatively connected to an endless tread 70 for forward movement as by means of the clutch mechanism 38, a gear box 41, a sprocket 71, a sprocket chain 72 and a sprocket gear 73. The gear 73 is keyed to a shaft 74 to which is also keyed a sprocket 75 which drives a chain 76 and thereby a sprocket 77 keyed to an axle 78 to which tread gears 79 are also keyed at either side of the tractor.

The tread 70 is supported on links 80 forming spaced endless chains 82 and 83 at opposite sides of the tow-mobile. The pins 85 in said chains extend laterally from either side of the links so that short sections of angle iron 87 may be secured, as by welding 88, to one end of the pins to fill in the space between depending side frame plates 90 and the corresponding chain and drive wheels 79 therefor.

The angle iron is preferably so disposed upon

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the pin that its apex faces downwardly as the chain is in contact with the snow or other ground surface. Its sides 91 and 92 thereby engage the snow at an angle forming an effective gripping surface, the edges 93 of the angles confronting one another at evenly spaced intervals except for the occasional omission of an angle to permit any entrapped snow to be removed and to facilitate replacement of the track in sections.

Also, intermediate the sprocket chains 82 and 83 and similarly secured between opposed pins 85 at their inner ends 95 are preferably longer and continuous angles 96 preferably in line with the end portions 87 and likewise secured as by welding 97 to said pins.

In order to prevent rotation of the angles, these are welded in pairs to the outer members 80 of the link chain on each side thereof, the other or inner links being free to pivot on the pins 85 to avoid rigidity of the tread. By this construction the pins 85 with optional gear engaging collars may be accommodated between the teeth 93 of the drive wheel 79 in a conventional manner.

The forward track drive wheel 100 need not be directly connected to the source of motor power of the tow-mobile but may be journaled freely upon an axle 101 suitably secured to side members as by bearings 103. The sustaining lower part 105 of the tread is braced against upward movement and adapted to be slid along the lower surface 106 of longitudinal guide members 107 which are supported by transverse braces 108 welded at their ends to the side plates 90 below the general frame 30.

Occasional links 110 are secured to cotter-held pins 111 to which no angles are welded and which, therefore, may be disengaged from their corresponding links in order to separate the tread at that point, permitting intervening sections of tread between any pins 111 to be removed for replacement or repair or for altering the over-all length of the tread by interposing units of different lengths in their place. This construction, as heretofore stated, affords a space (cf. Fig. 12) by skipping an angle corresponding to said pins, such as indicated at 115 and 116 (Figs. 10 and 11), through which snow or other debris which may have penetrated between adjacent angles can escape, ordinarily, at the rear of the tractor.

A camber of the tread 70 longitudinally of the tractor is intended to facilitate steering of the tractor. Such camber is seen most clearly in Figure 10, wherein a straight edge under the tread will show that the plane of the tread tapers up from the center of the tractor towards the front and back respectively. Turning of the tractor is thus eased by the fact that the weight of the tractor is borne mainly in the center treads on which the tractor mainly pivots in turning. Also, appropriate guide elements 117 may be supported on the frame and suitably disposed above and optionally below the uppermost portion of the tractor in a similar manner to the guides 107 to assist in keeping the center of gravity of the tractor low.

A reversing mechanism for the tread is contained in a revolvable housing 118 which is axially slotted 119 on its periphery for the lateral slidable accommodation of a pin 120 projecting therethrough and secured to a reversing bolt 122 which is selectively extensible from opposite ends 123 and 124 of a bore 125 formed in the housing. Said housing is preferably solid and secured as by

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a key 126 to a shaft 127 which is in turn driving-ly connected through the gear box 41 to a main sheave 130 provided with two grooves 131 and 132 adapted for the accommodation of corresponding loops of the tow rope 21.

The housing is interposed between plates 135 and 136 secured respectively to the sprocket 71 as by welding 138 and to a sprocket 140 as by similar welding 141. The sprockets 71 and 140 are ordinarily freely rotatable upon the shaft 127, but upon selective projection of the bolt 122 through holes 142 and 143 in the plates 135 and 136, respectively, the sprockets are thereby carried around with the housing 118 and the shaft 127 for the purpose of driving the tread forwardly or for reversing the same.

The forward driving connection of the motor and the tread has heretofore been indicated. The reversing connection thereof may be accomplished by retraction of the bolt 122 from the tread drive hole 142 in the plate 135 and its projection, by manipulation of the bolt 120, through the hole 143 in the plate 136.

The reversing movement of the tractor is thereby accomplished as follows: The shaft 127 is driven in a normal clockwise direction as indicated by an arrow in Figure 10. Therefore, the engagement of the bolt 122 with the plate 136 causes clockwise rotation of the reversing sprocket 140, chain 144, reversing sprocket 137 keyed to the shaft 139, and reversing sprocket 133 likewise keyed to the shaft 139 and in mesh with the chain 72. The clockwise rotation of the reversing sprocket 133 therefore causes the chain 72 to rotate the sprockets 73 and 79 in a counter-clockwise direction to move the tractor rearwardly. The shaft 139 is preferably loosely journaled in a reinforcing plate 134, in which the shaft 127 may likewise terminate, and in the housing 41 by means of any appropriate bearings.

The tow rope 21 may be wound about the drive sheave 130 and an idler sheave 145 as follows: The rope, a continuous loop, is first passed around the drive sheave 130, thence around the idler sheave 145, thence back around the drive sheave 130, then over a guide pulley 146 whence the same may be looped about the pulley 23, which may be secured to a tree 22 as above noted by means of a tie 147 and returned over the idler pulley to the drive pulley as aforesaid. It will thus be seen that a constant desired tension can be maintained upon the tow rope by a hitch which will not slip and which will grip ever more tightly as added restraint is placed up on the tow rope.

Stowage boxes 150 and 151 of appropriate capacity and dimensions to fill in the remaining portion of the frame may be positioned at the rearward and forward ends, respectively, of the tow-mobile, and is fitted with hinges 152 and 153, respectively, by virtue of which they may be tipped up for access to them or to parts of the tractor mechanism. The stowage boxes may thus serve as shields over some of said mechanism. In addition, however, it is desirable to provide suitable shields, as 155 (cf. Fig. 8) at the sides of the tow-mobile over various of the moving parts. A similar shield (not shown) may be removably provided at the sides of and over the tow rope pulleys 146, 145 and 130.

The guard (Figs. 1, 13, 14, and 15) heretofore mentioned and designated generally by the numeral 24 preferably comprises a U-shaped frame member 160 having legs 161 and 162 and a transverse top member 163. Spades 164 and 165 are

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welded to the lower ends of the frame members 161 and 162 and are provided with shoulders 165 whereby they may be readily sunk into the snow in a position such that the tow rope 21 passes through the space 166 between the legs 161 and 162. The arms 167 and 168 of a spring 169 are welded to the frame members 161 and 162 and fitted with a transverse piece 170 which serves to operate the switch 171 correspondingly mounted on the frame member 163. A relative movement of the spring arms 167 and 168 towards the frame members 161 and 162 as by collision thereagainst by the body of a skier shuts off current to the motor, stopping further movement of tow rope to avoid any possibility of serious accident if the skier fails to make a timely disengagement from the rope.

The switch 171 can be reset to supply current to the motor as by the manual withdrawal of the actuating pin 172. Current to the switch 171 is obtained as by any wire 173 connected in a conventional manner to the ignition system (not shown) of the motor.

The pulley wheel (Figs. 1, 2, and 3) 23 is made with a split yoke 174 loosely pivoted on a bolt or the like 175. The arms 176 and 177 of the yoke can be separated by relative rotation on the bolt 175 and the endless rope 21 easily passed between them and over the wheel 23. The pulley assembly can then be readily secured to the tree 23 or the like as by means of any tie 147.

In the use of the preferred form of ski-tow apparatus heretofore described, any necessary equipment, including skis, tow-rope 21, guard 160, pulley 23, etc., may be stored in compartments 150 and 151 provided on the tractor for such purpose.

If it is desired to drive the tractor forward, the bolt 122 is inserted through the hole 143 in the forward driving plate 136 by means of the finger bolt 120. The motor is then started by any usual means, and upon engagement of the clutch 38 by means of the handle 59 the machine moves forward powered by the motor. The forward drive is through the clutch 38, gear box 41, shaft 127, sprocket 71, chain 72, sprocket 73, chain 76, and sprocket 79 connected with the chains 82 and 83 of the tread 70. The sprocket 71 is thus driven in a clockwise direction, as illustrated in Figure 10, and thereby drives, without effect, the freely turning, disengaged reversing sprockets 140, 133, and 137, and also the idler tensioning sprocket 129. But the chain 72, and the sprockets 73 and 79 are driven in a clockwise direction (cf. Fig. 10) to move the tractor forwardly.

The main sheave 130 which is keyed to the shaft 127 will function as a fly wheel whether the machine is moving forwardly or rearwardly, thereby assisting the same over difficult terrain and otherwise conserving momentum and preserving stability of operation in the moving parts.

The machine is guided over the snow by an operator walking behind the same and gripping the transverse handle 62 by which the tractor may be turned from side to side.

When a desired site is reached, the tractor may be anchored or positioned as desired, either with or without chocks or the like (not shown), and with the forward end preferably facing the run. The rope equipment is then set up and the guard 160 positioned over the rope 21. The rope is passed around the sheave 23 by which it is secured as to a tree 22 at the lower end of the run and also around the sheaves 130, 145, and 146, as heretofore described. Prior to wind-

ing the rope around the sheaves, the clutch 38 is disengaged as by the handle 59 or the motor stopped so as to halt the rotation of the powered sheave 130. Thereafter, when the clutch is again engaged the rope 21 will be continuously passed around the sheaves and the pulley 23 so that it may be grasped by an ascending skier to return him from a point in the run adjacent the lower end of the rope to a higher point adjacent the tractor.

In the event that the skier should neglect to let go of the rope he will collide with the guard 160, thereby flexing the spring-like arms 167 and 168 to actuate the switch 171 and shut off the motor to prevent his being drawn into the sheaves and other operating parts.

If it is desired to reverse the movement of the tractor, the clutch should be disengaged by the arm 59 and the reversing housing 118 rotated into a position such that the hole 143 is in alignment (either as evidenced by suitable mark or by bare observation) with the reversing plate 136. In such a position the bolt 122 may be extended through the hole 143 to lock the housing to the reversing plate 136 and its associated reversing gear 140.

The rotation of the housing 118 for the alignment of its bolt 122 with the reverse drive hole 143 may be readily accomplished by the operator's grasping and rotating the powered sheave 130 in any required direction so as to turn the shaft 127. A similar procedure is obviously called for when it is desired to change the power for a forward drive by retracting the bolt 122 from the hole 143 in the plate 136 and locking the same, by the hole 142, to the plate 135 associated with the forward drive sprocket 71.

If, as when the tractor is temporarily stationed for use, it is desired to immobilize the tread and cause only the powered rotation of the sheave 130 for driving the rope 21, the bolt 122 should be centered wholly within the housing 118, thereby withdrawing it both from the hole 143 in the plate 136 and the hole 142 in the plate 135. Thereby the housing 118 which is keyed to the shaft 127 will rotate independently of the forwardly and rearwardly driven sprockets 71 and 140, respectively. Thus the same motive power for moving the tractor is selectively utilizable not merely to drive the same forwardly and rearwardly, but also, independently, to power the sheave 130 operating the rope 21 when the tractor is anchored at the top of the ski-run.

It will be apparent that those skilled in the mechanical art of tractor and equipment manufacture will be able to vary the frame construction and the arrangement of the several operating parts to a considerable extent while retaining essential operative and other desired conditions within the spirit of the invention.

Nevertheless, the embodiment illustrated features a tread 70 extending substantially continuously from side to side of the tractor and from the forward to the rearward end thereof with the exception of optional gaps to permit entrant snow and other debris to be ejected or removed. At the same time, the instant embodiment provides a tread having high traction qualities remarkably fitted to the purpose intended and capable of sustaining a considerable weight while maintaining a desired power and maneuverability over mountainous terrain and snow drifts, whether the latter be firmly packed or not.

The guides 107 at the sides of the tractor ride freely and easily over the rollers 180 or the like surrounding the pins 85 and 111 providing both a simple and highly effective track support. Depending side plates 90, moreover, provide a finished appearance, a sturdy foundation, a safely enclosed track mechanism and lateral guards effective, where necessary, to retain the track in a position of alignment with the track drive sprockets 79 and 100 employed at the side of the machine or otherwise as desired.

While other reversing mechanisms are contemplated, as will readily occur to those skilled in the art, it is desired to retain the essentially simple features of the illustrated and described mechanism or its counterpart to afford a preferred ease of operation combined with structural simplicity and economy of production.

The completed unit is therefore compact and complete and as foolproof as is consistent with the purposes intended so that the same be used on any type of terrain and is readily transportable from place to place under its own motive power which serves the dual function of additionally powering the sheave or winch 130 to pull the tow rope 21.

Although an operator could ride upon the machine itself, it is intended that he rather plod behind driving the same over the snow on snowshoes to avoid adding his weight thereto.

The apparatus comprising the tractor may be made of any material, such as steel, wood, or the like, and if desired, for minimizing its weight, be constructed, where feasible, of the lighter metals, such as aluminum.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred method and embodiment, it is recognized that departures may be made therefrom within the scope of the invention which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent structures and methods.

Having herein described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In a mobile ski-tow of the character described, comprising a power tractor mounted upon a continuous endless tread extending from the front to the rear ends and from side to side thereunder, and including tow means selectively powerable by the motor of the tractor mounted on the tractor; front and rear axles supporting the tractor, sprocket wheels mounted on the axles respectively, the feature of novelty comprising: said tread being solely mounted on said front and rear sprocket wheels in the general form of a flat loop including an upper run and a lower run, guide means depressing the center of said upper run between and below upper portions of the sprocket wheels whereby the upper and lower tread runs are closer together near the center of the tractor than at its ends, to prevent upward movement thereof and to prevent said run from striking superadjacent parts of the tractor, superadjacent parts of the tractor extending below a horizontal plane, common to the tops of sprocket wheels whereby the center of gravity of the tractor is lowered.

2. In the ski-tow apparatus of claim 1, vertical plate means depending from the tractor for the journaled securement of said axles, and means extending between said plate means for supporting the main body of the tractor nested

downwardly between said sprockets and relative to the upper run of said tread.

3. In the apparatus of claim 1, said tread comprising a plurality of slats of V-shaped cross-section, and extending transversely across the tread in spaced parallel relationship to one another, said slats having their angles facing downwardly in the lower run for surface engagement.

4. The apparatus of claim 3, said tread further comprising sprocket chain members on and extending circumferentially of the tread, said chain members defining openings through the tread, sprocket teeth in the sprocket wheels extending consecutively through said openings during movement of tractor.

5. The apparatus of claim 3, said source of power being directly connected to and powering said rear sprockets for moving said tread.

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