Jan. 25, 1944. J. R. SHANNON 2,339,886

MOTOR TOBOGGAN

Filed May 12, 1941 3 Sheets-Sheet 1

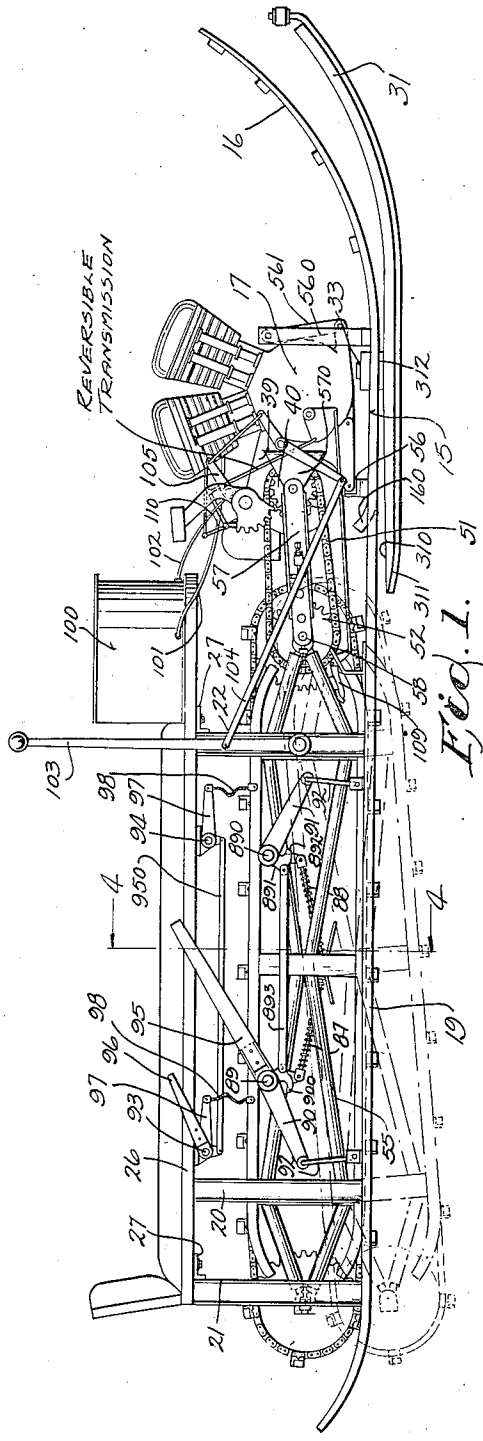


Fig. 1.

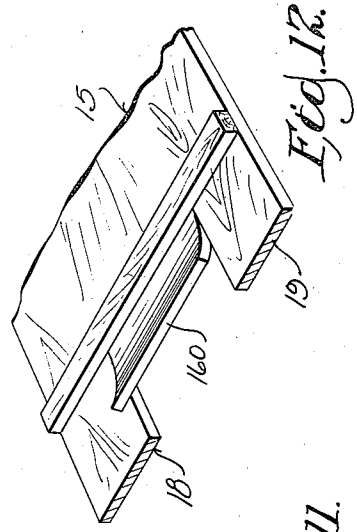


Fig. 12.

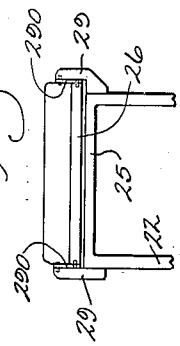


Fig. 10.

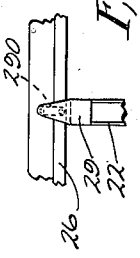


Fig. 11.

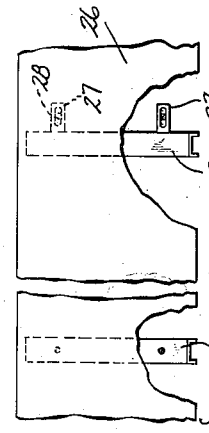


Fig. 9.

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MOTOR TOBOGGAN

Filed May 12, 1941 3 Sheets-Sheet 2

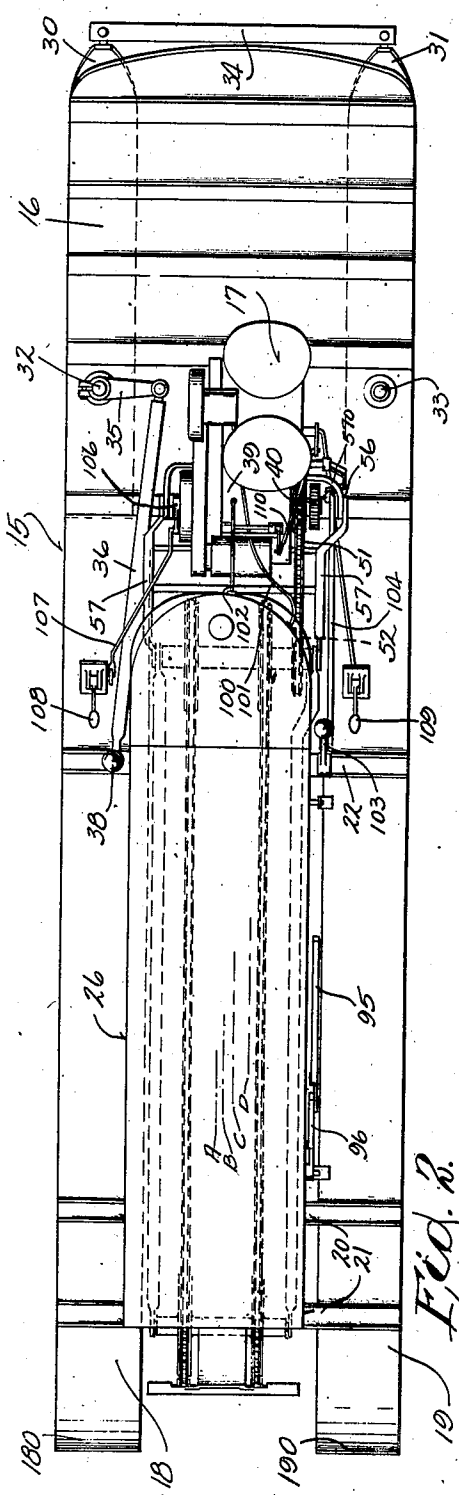


Fig. 2.

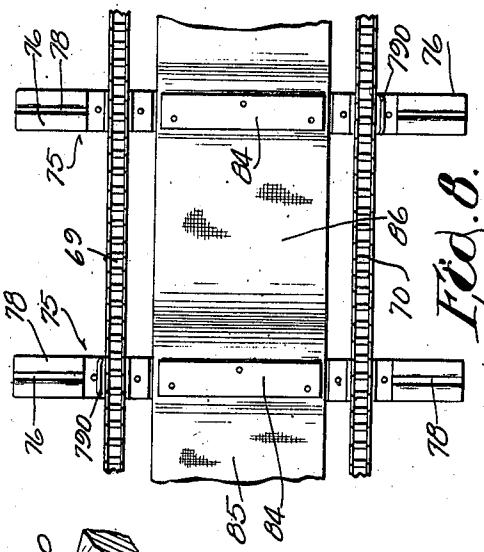


Fig. 8.

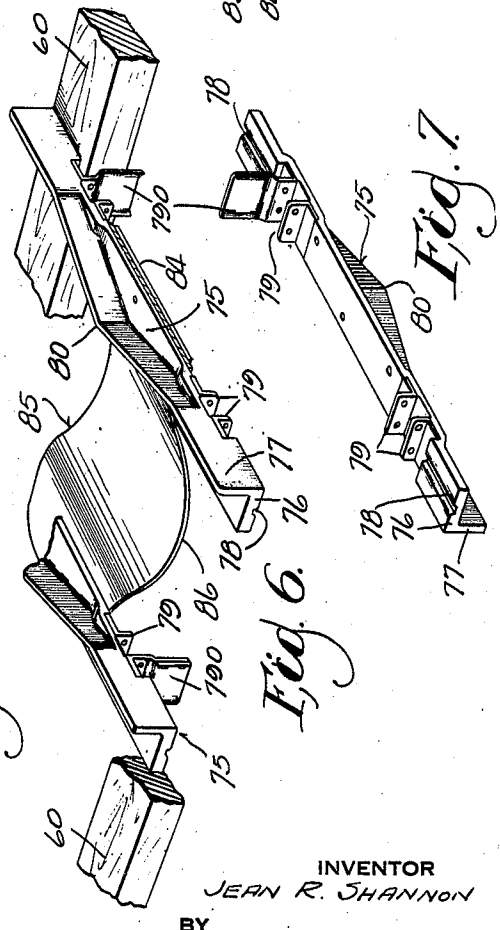


Fig. 6.

Fig. 7.

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Jan. 25, 1944. J. R. SHANNON 2,339,886

MOTOR TOBOGGAN

Filed May 12, 1941 3 Sheets-Sheet 3

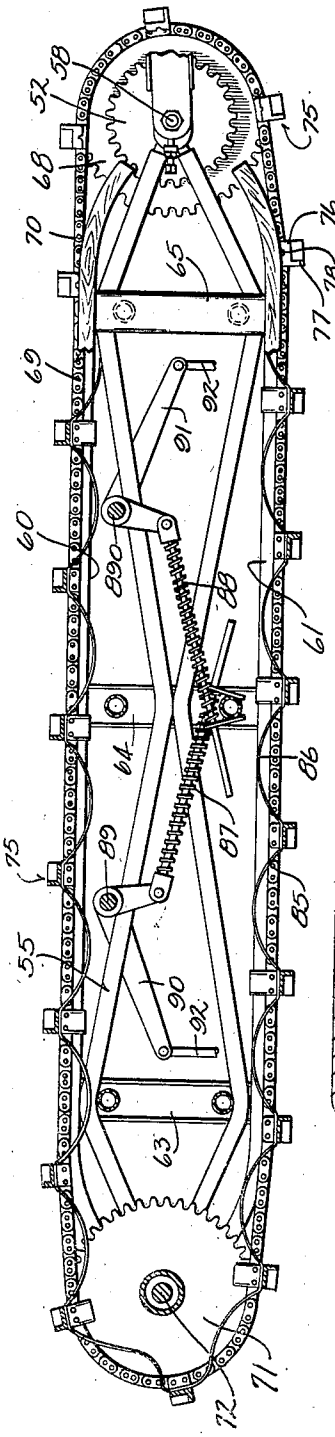


Fig. 3.

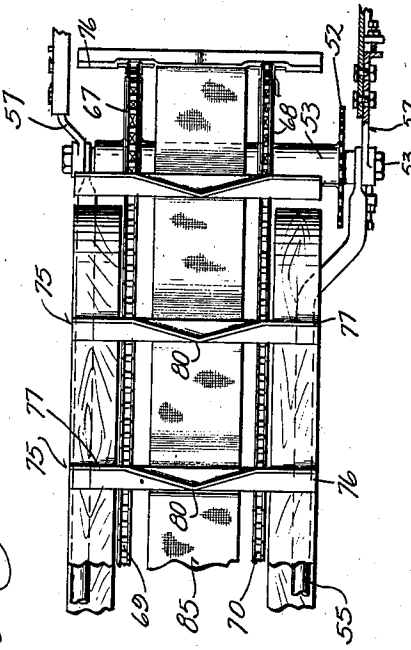


Fig. 5.

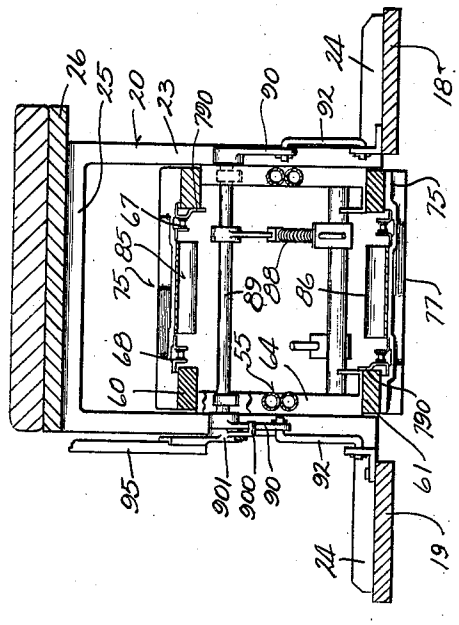


Fig. 4.

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UNITED STATES PATENT OFFICE

2,339,886

MOTOR TOBOGGAN

Jean R. Shannon, Clintonville, Wis., assignor to The Four Wheel Drive Auto Co., Clintonville, Wis., a corporation of Wisconsin

Application May 12, 1941, Serial No. 393,045

21 Claims. (Cl. 180—5)

This invention relates to improvements in motor toboggans.

It is the primary object of the invention to provide a motor toboggan with a propulsion device operating on a new and improved principle to deliver considerably increased traction with much reduced power consumption. In this connection it is my object to substantially relieve the propulsion device of the mere dead weight of the vehicle or its occupants and, instead, to apply to the propulsion device pressure which is concentrated at the rear of the transverse center line thereof so that the propulsion device has a climbing action as distinguished from the mere endless track operation of a conventional tractor or tank. It is further my purpose to provide means whereby the downward pressure on the propulsion device may be concentrated on either end thereof, according to the direction of movement of the vehicle and to provide in conjunction therewith means for reversing the motion of the propulsion device and means whereby the vehicle is enabled to function in reverse.

A further object of the invention is to provide a novel and improved frame structure for a propulsion device, with a novel arrangement for maintaining the propulsion device under nominal pressure and providing for the increase of such pressure at the desired end of the propulsion device by supplemental manual pressure when desired.

It is a further object of the invention to provide a novel and improved supporting runner structure which, instead of being made relatively rigid as heretofore, is made extremely flexible, thereby further improving the efficiency of its operation and minimizing the resistance of obstacles encountered by the vehicle en route. In thus increasing the flexibility of the runner structure it is my purpose incidentally to provide for flexibility of all controls and connections.

Another object of the invention is to provide snow lubrication for the steering ski and the supporting runner and to so locate the pivot of the steering ski as to make the ski self-rectifying to a forward steering position after it has been turned.

A further object is generally to simplify and improve the construction, arrangement and operation for one or more of the purposes mentioned, and still other objects will be apparent from the specification.

This application is a companion to the application of Carl J. E. Eliason for United States Letters Patent on propulsion mechanism for motor toboggans, filed May 12, 1941, Serial No. 393,053, and issued as Patent No. 2,323,526, July 6, 1943, said companion application embodying some of the features hereinafter referred to.

In the drawings:

Fig. 1 is a view in side elevation of a motor toboggan embodying the improvements I claim.

Fig. 2 is a view of the motor toboggan in plan.

Fig. 3 is an enlarged detail view of the propulsion mechanism partially in side elevation and partially in section.

Fig. 4 is an enlarged detail view of the motor toboggan in cross section on the line 4—4 of Fig. 1.

Fig. 5 is a fragmentary detail view in plan of the end of the propulsion mechanism shown in Fig. 3.

Fig. 6 is an enlarged fragmentary detail in perspective showing a portion of the propulsion conveyor and associated track parts.

Fig. 7 is an enlarged detail view in perspective of one of the conveyor cleats shown in a position inverted from the position in which the cleats are illustrated in Fig. 6.

Fig. 8 is an enlarged fragmentary detail view in plan of the interior surface of the propulsion conveyor shown in Fig. 6.

Fig. 9 is a fragmentary detail view in plan of the forward seat support, the seat being partially broken away to expose the support.

Figs. 10 and 11 are views in transverse section on the side elevation of a modified forward seat support.

Fig. 12 is a fragmentary detail in perspective of that portion of the supporting runner structure immediately at the rear of the engine mounting.

Like parts are identified by the same reference characters throughout the several views.

The device has for its fundamental support a sledge or toboggan structure generically designated by reference character 15. At its forward end the sledge or toboggan structure 15 has at 16 a continuous, full-width, toboggan-like portion upwardly curved as shown in Fig. 1. Mounted upon this toboggan-like forward end is the engine 17. Rearwardly of the engine the entire central area of the sledge is open between a pair of laterally spaced ski-like runners 18 and 19 (Fig. 2) which are rearward extensions of the forward toboggan surface 16. Between the runners 18 and 19 the rear margin of the toboggan surface 16 is turned upwardly at 160, while the rear ends of the runners themselves are turned upwardly at 180 and 190. These upward-

ly turned portions at the rear of the supporting surfaces only represent a portion of the arrangements which make it possible for the device to be propelled under power rearwardly as well as forwardly.

The runners 18 and 19 are joined in uniformly spaced relation by a series of brackets 20, 21, and 22, all of which are made as shown in Fig. 4, comprising vertical legs 23 terminating in laterally projecting feet 24 secured to the respective runners 18 and 19 and joined, well above the runners, by a supporting bar 25 upon which the padded seat board 26 is mounted.

The forward toboggan portion 15 of the sledge is provided with cross cleats, across two of which the engine 17 is connected. To avoid rigidifying the sledge the engine is made fast only to the rearmost of the cleats upon which it rests.

Throughout its length, the entire sledge, including the toboggan portion 15 at its front end and the longitudinally extending supporting runners 18 and 19, is extremely flexible. In this regard it differs from previous devices of the type in which the seat and its mounting and the engine and its mounting have somewhat rigidified the runners.

In the present apparatus the seat board 26 (itself flexible if desired) is connected rigidly only with bracket 20. Where it crosses brackets 21 and 22 to receive support therefrom, the connection is such as to permit free movement between the seat and the supporting bracket. This is done either in the manner shown in Fig. 1 and Fig. 9, or in the manner shown in Fig. 10 and Fig. 11. In Fig. 1 and Fig. 9 the brackets 21 and 22 are provided with slotted arms 27 and the bolts 28 connected to the seat board 26 are free to move in the slots of said arms. In the construction shown in Figs. 10 and 11 the bracket 22 has upwardly extending arms at 29 from which pivoted links 290 suspend the seat board. In either case the seat has such free movement with respect to the supporting brackets as to permit of great flexibility in the runners.

This represents a new concept of the function of the runners. Particularly in cross country travel through deep snow, the machine is frequently called upon to traverse fallen logs, stumps, stones, and other obstacles. The sledge, including the front toboggan surface and the runners, carries the weight somewhat as a boat carries its load in water. The softer the supporting snow, the deeper the runner surfaces will sink into the snow until the weight is sustained. However, if the runner surfaces are operating in relatively deep snow and a submerged obstacle is encountered, the functioning of the present device differs from the operation of a boat in that a boat is rigid and must in its entirety rise to clear the submerged obstacle whereas the present device, due to its great flexibility, will yield to the obstacle while only slightly supported by the obstacle and elsewhere supported still by the snow. As a result, the impact is greatly reduced and the power demands are greatly reduced.

Steering is effected through manipulation of a pair of ski-like runners 30 and 31, individually pivoted to the forward section 16 of the supporting sledge by king-pins 32 and 33 respectively. The runners 30 and 31 may be held in parallelism by a link 34 at their forward ends, and they may be steered in any desired manner as by means of the lever 35 connected to king-pin 32 and actuated by link 36 from an upright hand lever 38 (Fig. 2).

The steering skis 30 and 31 taper rearwardly in thickness. Their upper surfaces 310 are inclined slightly downwardly at the rear, while their under surfaces are inclined upwardly at the rear as indicated at 311. Their king-pins 32 and 33 are located forwardly of the center of the effective contact surfaces to make the skis tend to straighten themselves, during forward propulsion, after a turn has been made.

A washer 312 is interposed between each of the skis 31 and the sledge. While this might be thought objectionable, in that any increase in dimensions embeds the steering skis more deeply in the snow, it has been found that the space provided by such a washer, together with the space provided by the rearward tapering of the upper surfaces at 310, greatly facilitates steering by permitting snow to accumulate between the steering skis and the under side of the sledge, such snow acting as a lubricant. Wooden surfaces are very freely movable with respect to each other when snow intervenes. The upward inclination of the under surfaces of the respective skis at 310 permits the vehicle to be operated in reverse, which is a major advantage when it is necessary to turn it around in limited space.

Power from engine 17 passes through a transmission case 39, preferably containing a reverse gear (not shown). Power output is delivered by sprocket 40 to a chain 51 which drives sprocket 52 on tubular shaft 53 at the forward end of a sub-frame 55 for the propelling mechanism hereinafter to be described. The engine supporting means includes a rear bracket 56, to which the engine is pivotally connected, and a forward bracket 560 (Fig. 1 and Fig. 2), from which the engine is flexibly suspended by links 561.

A pair of links 57, adjustable as to length for the purpose of tightening chain 51, and cross connected to move in unison, are pivoted co-axially with pinion 40 to brackets 570 rigidly connected to the transmission case. At their rear ends these links are pivoted to the sub-frame by means of the pintle bolt 58 upon which the tubular shaft 53 is rotatably mounted. The links 57 transmit the thrust of the propulsion device to the toboggan while permitting the propulsion device in its entirety to have freedom of vertical movement with respect to the toboggan.

The sub-frame 55 is preferably a truss-like structure provided at each side with upper and lower guide members 60 and 61 (Figs. 3 and 4) spaced at suitable intervals by vertical posts 63, 64 and 65. Upper and lower guide members 60 and 61 are preferably made of wood, but the posts 63, 64 and 65 are made of metal diagonally braced by metal tubes welded thereto as best shown in Figs. 1 and 3.

The truss-like structure comprising the posts 63, 64 and 65, the diagonal tubular bracing, and the top and bottom guide members of wood, is a novel organization particularly developed for this machine. It is strong and yet has the necessary degree of flexibility and at the same time the metal cleats of the track hereinafter to be described move freely over the wooden guide members 60 and 61 without freezing thereto and with practically no resistance due to a provision of means hereinafter mentioned, whereby snow may be trapped in recesses of the cleats for lubrication between the metal cleats and the wooden guide members. The wooden guide members are readily replaceable, being detachably bolted to

the posts to which the diagonal bracing is welded.

At the forward end of the sub-frame the driving tubular shaft 53 carries a pair of sprockets 67 and 68 over which operate chains 69 and 70 for which sprockets 71 are rotatably mounted on shaft 72 at the rear of the propulsion sub-frame 55.

Adjacent the driving sprockets at the forward end of the sub-frame, and also adjacent the idling sprockets at the rear end of the sub-frame, the wooden guide members 60 and 61 are preferably curved inwardly toward the axes of the several sprockets as best shown in Fig. 3.

Spanning the space between the guide members in the manner best shown in Figs. 4 and 5, are cleats 75, preferably of the form best illustrated in Figs. 6 and 7. At each end, each cleat 75 has the general form of an angle iron with a normally horizontal flange 76 and a normally vertical flange 77. The horizontal flange has a groove or channel 78 in one face, such face having sliding bearing contact with the wooden guide members 60 and 61 of the sub-frame. In practice the groove or channel 78 will catch snow and pack it to form an icy support upon which the cleat will ride upon the wooden guide surface. The ice or packed snow which will collect in such a channel will move over the wooden guide surface with practically no wear whatever.

The cleats have ears 79 spaced to receive the respective chains. The space between the chains is spanned by an intermediate portion of each cleat in which the flange 77 of the cleat is displaced to form an apex rearwardly directed with respect to the path of conveyor movement, such apex being designated by reference character 80 in Fig. 6 and Fig. 7.

At opposite ends of alternate cleats one of the ears 79 is extended to provide a guide shoe 790. The staggered guide shoes bear laterally against the sides of the upper and lower wooden guide members 60 and 61 to maintain the chains in alignment with the sprockets, the staggered arrangement of the shoes permitting accurate alignment without cramping regardless of expansion and contraction of the parts due to temperature or moisture.

Since the sprocket teeth do not have to perform the function of maintaining alignment of the chains with the sprockets, it is possible to make the teeth as disclosed in the companion application of Eliason, fitting sufficiently loosely into the chains to allow snow to be forced out from between the sprocket and the side plates of the chain so that snow will not be trapped beneath the rollers.

Held by clamp plate 84 to the inner surfaces of flanges 76 of the successive cleats, is an endless belt 85 having center slack between successive cleats to form deep pockets as indicated at 86, the depth of which should preferably be two or three times the height of the flange portions 77 of the cleats. When the device is operating in soft snow the snow is penetrated not only by the flanges 77 of the cleats, but also by the entire conveyor system to the full depth permitted by the pockets 86 of the belt 85. As a result, considerably increased traction is afforded and at the same time the propulsion is more efficient, less power being wasted.

As best shown in Fig. 4, there is a guideway between the runners 18 and 19 in which the entire sub-frame 55 and the conveyor system mounted thereon is movable upwardly and downwardly between the legs 23 of the U-shaped bracket which supports the seat 26. The sub-frame and conveyor system are biased downwardly not only by gravity but by the compression of the springs 87 and 88 which act on rock shafts 89 and 890 respectively, these being provided with suitable bearings on the sub-frame and provided with arms 90 and 91 secured by links 92 to the runners 18 and 19. The downward bias provided by the springs 87 and 88 may be supplemented by manual pressure exerted through a hand lever 95 oscillatable about the axis of rock shaft 89.

The arms 90 are fast upon the rock shaft 89 but the hand lever 95 is free of the shaft and does not operate the arms 90 except insofar as motion is transmitted to the shaft and to the arms 90 by means of a finger 900 mounted on the hub 901 to which the hand lever 95 is connected, as best shown in Fig. 4. When the hand lever 95 is pushed manually in a clockwise direction as viewed in Fig. 1, the finger 900 engages the arm 90 which thereupon acts as an extension of hand lever 95. Being fixed by link 92, the compound lever exerts downward pressure on the sub-frame of the propulsive mechanism at rock shaft 89, which is well to the rear of the transverse center line of the sub-frame. This forces the entire propulsion mechanism to an inclined position indicated in dotted lines in Fig. 1, the exact angle at which the sub-frame will depend being conditional upon the nature of the surface traversed. The softer the snow, the greater will be the angle and this is extremely important and desirable, since the relatively unloaded front end of the propulsion mechanism will readily climb onto the snow and gradually compact it without pushing the snow ahead of the conveyor system in the manner previously experienced. It is found that the effectiveness and efficiency of the propulsive mechanism in terms of its traction effort are very markedly increased by this differential application of pressure under manual control to that end of the propulsion system which is at the rear.

However, such manual application of pressure at the point represented by rock shaft 89 would be wholly wrong when the device was being operated in reverse. Accordingly, the rock shaft 890 carries loosely a hub element 891 similar to that upon which hand lever 95 is fixed, such hub element having a finger 892 engageable with one of the arms 91 of rock shaft 890. This hub element is connected by a compression link 893 to the hub element 901 and the arrangement is such that when the hand lever 95 is drawn counter-clockwise by the operator, rock shaft 89 will be left idle but the motion will be transmitted through finger 892 to oscillate the arms 91 about their connections with links 92, thereby exerting pressure downwardly on the sub-frame 55 forwardly of its transverse center line. This is used in reversing to produce a similar effect during reverse movement to that produced by the clockwise actuation of the hand lever during forward movement of the apparatus. In each case the leading end of the propulsion track is left virtually unloaded to ride up onto the snow which is being traversed, while the trailing end of the propulsion track is forced downwardly. Thus the propulsion conveyor or track has a continuous climbing motion.

Unlike the endless propulsion tracks of tractors and tanks, the track of the present device is subject only to sufficient pressure to enable it to have its desired traction effect on the surface

traversed. The weight is carried by the sledge and the runners. As previously noted, this principle is responsible for a great increase in efficiency of propulsion.

Where it is desired to coast, it is possible to lift the entire sub-frame. On the under side of the seat 26 are journaled rock shafts 93 and 94 connected by a link 950 and actuated by a hand lever 96 on rock shaft 93. Each of the rock shafts is provided with an arm 97 and the respective arms are connected by the flexible tension elements 98 with the sub-frame, such elements having adequate slack to permit free downward movement of the sub-frame toward the dotted line position of Fig. 1 for normal propulsion, but nevertheless being so designed that when the lever 96 is pulled counter-clockwise about the axis of rock shaft 93, the entire sub-frame and conveyor system can be lifted clear of the supporting surface, leaving the vehicle free to coast.

Fuel and oil are preferably carried in the tank 100 at the forward end of the vehicle seat, such tanks being connected by suitable flexible pipes 101 and 102 to the engine. A hand lever 103 is connected by link 104 to a bell crank connected with the gear shift lever 105 of the engine, while the clutch lever 106 of the engine is operated by link 107 from clutch pedal 108. A similar pedal at 109 on the runner 19 operates the throttle lever 110 or other speed control of the engine.

As explained above, the whole supporting surface of the sledge is highly flexible. It is this flexibility that makes it necessary to provide flexible pipes for fuel and oil and to accommodate relative movement in all of the various control levers. The pivotal connection of link 104 from hand lever 103 to the bell crank which actuates the gear shift is made in substantial alignment with the axis upon which the engine pivots in the flexing of the runner system, thereby minimizing the effect of such flexing upon the position of hand lever 103. The throttle pedal 109 has less freedom of movement, due to its short length, but the linkage which connects it to the speed control lever on the engine passes approximately through the axis upon which the engine is pivotally mounted, and consequently there is very little displacement of the throttle pedal when the runners flex.

The gear shift or transmission of the engine includes a reverse mechanism which, being conventional, is not illustrated in detail, the present application being concerned only with those features of the device which make it feasible to operate it in reverse, and the particular gearing connections being conventional.

In deep snow it is necessary, or at least desirable, to provide for considerable accuracy of balance. The center of gravity of the motor 17 is conveniently placed materially to the right of the center line of the toboggan. The center line of the toboggan is indicated at C in Fig. 2, while the center line of the engine is located at D.

In order to equalize or balance the load upon the runners 18 and 19, the seat is disposed materially to the left of the center line of the toboggan looking forwardly in Fig. 2, the center line of the seat being indicated at A. The offset to the left is well illustrated in Fig. 4, where it appears at the right hand side and where it will be observed that the foot 24 of one of the supporting legs 23 of bracket 20 is so placed as materially to overhang runner 18, whereas the other foot 24 does not so greatly overhang beyond the edge of runner 19.

This offset of the bracket legs 23 with respect to the runners 18 and 19 brings the propelling conveyor center line to a position where it is slightly offset from the center line of the toboggan as a whole, as indicated at B. The center line of the seat is even farther offset, as indicated at A in Fig. 2.

In normally forward propulsion in soft snow, for which the vehicle is particularly adapted, the propulsion conveyor and sub-frame will normally depend at the approximate angle illustrated in dotted lines in Fig. 2.

The amount of resistance to displacement which is offered by snow will be increased according to the amount of snow engaged by the traction surface of the propelling conveyor. Accordingly, the pockets provided by the bagginess of the belt between successive cleats of the conveyor system are of great assistance in increasing propulsive effort. The device is capable not only of carrying all of the men who are able to ride upon the seat 26, but also capable of towing behind it several heavily loaded toboggans.

When a hard surface is encountered by the cleats, the shock of impact is materially reduced by the wedge-shaped disposition of the flanges 75 at 80. Such shock is further reduced by the fact that the cleats are rigidly supported only at their ends upon the lower wooden guide members 61 which, with the whole sub-frame, are free to yield. While the sub-frame has considerable weight and inertia and does not yield readily, the fact that the intervening portions of the flanges 77 of the cleats are not directly supported is of great value in reducing shock upon impact with a stone or icy surface, particularly at high speeds.

With the improvements herein described, the chains are self-clearing and do not accumulate ice. Moreover, they are so guided between the wooden members 60 and 61 that they are no longer dependent upon the sprockets for guidance, but are held by the guide members in the proper alignment with the sprockets.

I claim:

1. In a device of the character described, the combination with a sledge having supporting runners, of a propulsion mechanism bodily movable vertically respecting the sledge and bodily tiltable in a vertical longitudinal plane and including an endless track between said runners and floating with said mechanism for bodily vertical movement at both ends of said mechanism respecting said runners, freely responsive manually operable lever means for actuating the track, and means for applying downward pressure to said propulsion mechanism nearer to one end than to the other.

2. A device of the character described comprising the combination with supporting runners of substantial width whereby to be adapted to operate in deep snow, a propulsion mechanism disposed between said runners and comprising a floating sub-frame vertically movable bodily respecting said runners, link means pivoted to the sub-frame and to the runners for transmitting propulsion from said mechanism, rotors mounted adjacent the ends of said sub-frame to partake of the bodily vertical movement of the sub-frame respecting the runners, an endless propulsion track operating over said rotors, means for actuating said track, and lever means freely responsive to operator manipulation for exerting a downward

pressure upon the sub-frame at a point nearer the rearward end thereof than the forward end thereof as viewed from the standpoint of the direction of propulsion.

3. In a device of the character described, the combination with supporting runner means, of endless track propulsion means, a floating sub-frame upon which said propulsion means is mounted and vertically movable respecting the runner means, both ends being free for self-adjustment in conformity with the surface traversed, driving connections for the propulsion means, link means pivoted to the sub-frame and the supporting runner means for the transmission of propulsion through the runner means while accommodating bodily floating movement of the sub-frame, means for biasing said sub-frame and propulsion means bodily downwardly respecting said runner means, and means including a lever constantly dependent on and subject to an operator's control for increasing the downward bias to which one end of said sub-frame is subject.

4. In a device of the character described, the combination with runner means, of endless track propulsion means provided with outwardly driving connections, sub-frame means bodily tiltable in a vertical longitudinal plane and upon which said endless track means is operatively mounted, mechanism connecting said sub-frame means to said runner means for bodily relative vertical movement, and mechanism constantly dependent on manual control for inclining said sub-frame means and said endless track means upwardly at its forward end with respect to said runner means.

5. A device of the character described comprising the combination with a toboggan surface adapted to receive support substantially horizontally in soft snow, of a propulsion device comprising a floating sub-frame and an endless conveyor operable thereon and provided with snow engaging track means, a link connecting said sub-frame with said toboggan surface for the transmission of traction thereto, said sub-frame being bodily movable vertically with respect to said surface, biasing means spaced longitudinally of said sub-frame and exerting downward pressure thereon with respect to said surface, and an actuating device including a freely movable lever dependent on manual control for its position and operatively connected with one of said biasing means for augmenting the bias thereof whereby to incline said propulsion device with respect to said surface and to press one end of said propulsion device more deeply than the other into snow traversed by said surface.

6. A vehicle comprising the combination with a supporting surface adapted to sustain the vehicle in soft snow, of an engine mounted on said surface, a seat carried by said surface, a floating propulsion device comprising an endless conveyor having snow engaging track means and a sub-frame having rotors over which said conveyor is operable, link means connecting the sub-frame with the vehicle for the propulsion of the vehicle, said link means permitting said sub-frame and conveyor bodily vertical movement respecting said surface, driving connections from said engine to said conveyor, a lever adjacent said seat, and biasing connections from said lever to said sub-frame operable thereon at a point nearer the rear than the forward end of the sub-frame whereby to differentially bias the rear end of the rear frame downwardly with more pressure than the front end thereof and to force said conveyor to operate in snow on an upward incline respecting said surface, without precluding its floating tendency to self conformation with a hard surface traversed.

7. In an automotive vehicle, the combination with supporting means adapted to sustain the vehicle in snow and highly flexible in a longitudinal direction whereby to adapt itself to inequalities in the surface traversed, of an engine mounted on said supporting means, a seat carried by said supporting means, and seat supports with respect to one of which said seat is fixed and with respect to another of which said seat is freely movable longitudinally of said supporting means whereby to leave the flexibility of said supporting means unimpaired.

8. In an automotive vehicle, the combination with an elongated snow-traversing runner means highly flexible longitudinally, of an engine mounted on said runner means, seat supports spaced longitudinally of said runner means, a seat connected with one of said supports and relatively movable longitudinally with respect to the other of said supports whereby to leave the flexibility of said runner means unimpaired, a propulsion device comprising an endless conveyor having snow engaging track means and a sub-frame provided with rotors over which said conveyor is operable, link means connecting said sub-frame with said runner means for relative vertical and tilting movement, driving connections from said engine to said conveyor, substantially equalized means biasing said sub-frame downwardly with respect to said runner means at points spaced longitudinally of said runner means, a biasing lever adjacent said seat and connections from said lever to said sub-frame for augmenting the downward bias on said sub-frame at least adjacent one of said points.

9. An automotive vehicle comprising the combination with runners, of a power driven propulsion device comprising an endless conveyor track between said runners having traction means engageable with a surface traversed by said runners, a sub-frame having rotors over which said conveyor track is operable, rock shafts extending transversely of said sub-frame at points longitudinally spaced thereon, arms on said rock shafts linked to said runners, spring means for biasing said rock shafts torsionally in a direction to exert downward pressure on said sub-frame, and a bias-augmenting lever provided with operative connections for increasing the bias on said sub-frame adjacent one of said rock shafts.

10. In a vehicle of the character described, a propulsion sub-frame comprising the combination with upper and lower pairs of wooden guide members, each having at least one end curving toward the members of the other pair, metallic struts intervening between the upper and lower wooden guide members of the respective pairs, oblique bracing between said struts whereby to make rigid sub-frame unit bearings at the ends of the sub-frame, rotors upon said bearings, and an endless track member operating over said rotors and including traction devices resting upon said wooden guide members and guided thereby, the aforesaid curved ends of the wooden guide members being disposed adjacent the rotors to pick up said traction devices as such devices leave the rotor.

11. The combination with vehicle runner means, of floating sub-frame means, endless traction conveyor means operable upon said subframe

means, a reversible driving connection to said conveyor means, and a selective biasing mechanism provided with selectively operable connections constantly dependent for position upon manual operation for exerting downward bias on said sub-frame means at either end thereof.

12. The combination with supporting runner structure, of sub-frame means mounted for vertical and tilting movement respecting said runner structure, traction conveyor means operable over said sub-frame means, biasing means disposed at points longitudinally spaced on said sub-frame means for the bias thereof downwardly respecting said runner means, and lever means constantly dependent for its biasing effect upon manual operation and provided with connections to the respective biasing means for the selective operation thereof to augment their bias.

13. The device of the claim 12 in which the biasing means comprise rock shafts mounted on the sub-frame and having arms linked to the runner means, and said lever means has fingers selectively engageable with the arms of differing rock shafts in the differing directions of lever movement for actuating the rock shafts in the same direction in which they are biased by said biasing means, said biasing means including springs acting upon said rock shafts.

14. A vehicle of the character described comprising a forward toboggan surface and lateral runners comprising ski-like rearward extensions of said surface, said forward toboggan surface being upwardly curved at its forward end and having an upwardly curved portion between said runners at its rearward end and said runners being likewise upwardly curved at their rearward ends remote from said toboggan portion, a propulsion device disposed between said runners, and power operated means for the actuation of said device in either direction, together with means for selectively exerting downward bias upon either end of said propulsion device for inclining it upwardly with respect to either direction of vehicle movement.

15. A vehicle of the character described comprising the combination with a supporting runner surface, of a steering runner pivoted beneath said surface and upwardly curved, the pivotal connection of said runner with said surface being disposed forwardly of the center of the effective supporting area of said runner whereby said steering runner is substantially self-straightening after being turned for steering.

16. An automotive snow-traversing vehicle comprising the combination with a toboggan of a propulsion device comprising an endless conveyor having traction means thereon, an engine operatively connected to actuate said conveyor and mounted on said toboggan with its center of gravity at one side of the longitudinal center line of the toboggan, a seat mounted on said toboggan and sufficiently offset at the other side of said center line so that the occupants of said seat tend to balance the weight of the engine about the longitudinal center line of said toboggan, the center line of the traction means of said propulsion device being disposed between the center line of the seat and the center of gravity of the engine.

17. A vehicle of the character described comprising the combination with elongated flexible snow-traversing supporting means, of an engine mounted thereon, a propelling device therefor with which said engine is in operative connection, a seat extending longitudinally of said first mentioned means, supports for said seat from said means spaced longitudinally of said means, said seat being connected with one of said supports and movably connected with the other of said supports whereby to leave the flexibility of said supporting means unimpaired, a fuel supply tank on said seat, and a flexible fuel line from said tank to said engine.

18. The combination with a vehicle having runner means and a prime mover, of a floating sub-frame both ends of which are independently movable vertically respecting said runner means, guides near the respective ends of the sub-frames, an endless propulsion belt operating over said guides, a rotor connected with one of said guides for the actuation of said belt, a second rotor mounted upon said runner means and connected with said prime mover, an endless driving means operating over the respective rotors for the transmission of motion from the prime mover on said runner means to the propulsion belt on said sub-frame, and a link pivoted to the sub-frame near the axis of the rotor mounted thereon and pivoted to said vehicle near the axis of the rotor mounted thereon, whereby to maintain approximately constant tension on said endless driving means while accommodating full floating movement of said sub-frame and propulsion belt respecting said runner means.

19. The device of claim 18 in further combination with means exerting a downward bias from said vehicle upon said sub-frame while accommodating floating bodily movement of said sub-frame vertically respecting the runner means and also accommodating bodily tilting movement of said sub-frame.

20. The device of claim 18 in further combination with means exerting a downward bias from said vehicle upon said sub-frame while accommodating floating bodily movement of said sub-frame vertically respecting the runner means and also accommodating bodily tilting movement of said sub-frame, said biasing means including a spring constantly operable upon said sub-frame and a lever dependent for its biasing effect upon manual operation.

21. The device of claim 18 in further combination with means exerting a downward bias from said vehicle upon said sub-frame while accommodating floating bodily movement of said sub-frame vertically respecting the runner means and also accommodating bodily tilting movement of said sub-frame, said biasing means including a spring constantly operable upon said sub-frame and a lever dependent for its biasing effect upon manual operation, said lever comprising manually selectively operable connections whereby the bias of said lever is applicable selectively to press downwardly on either end of said sub-frame to a degree manually determinable in the manipulation of the lever.

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