April 30, 1929. W. H. ELFRETH 1,711,017

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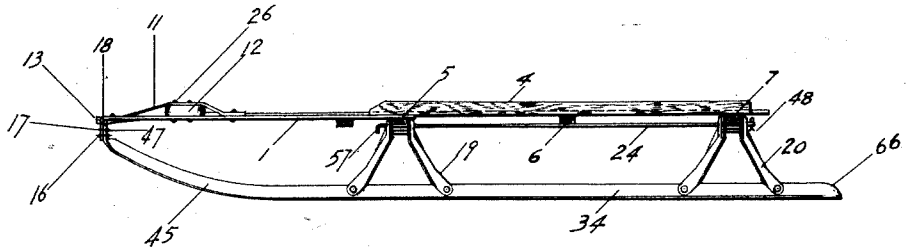


Fig. 1

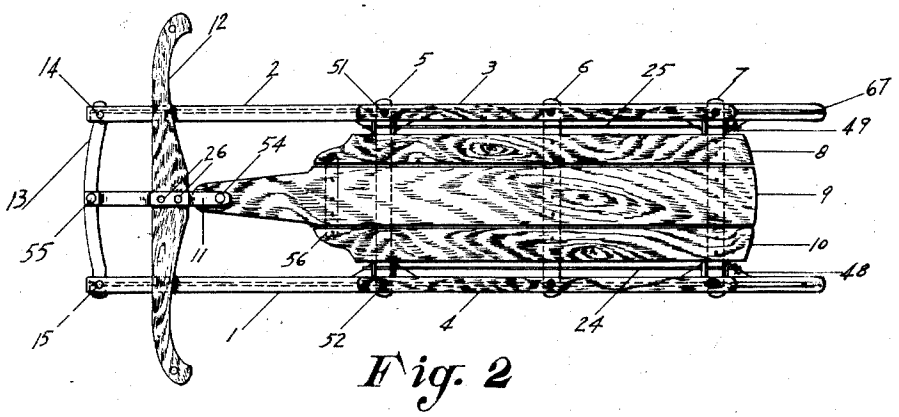


Fig. 2

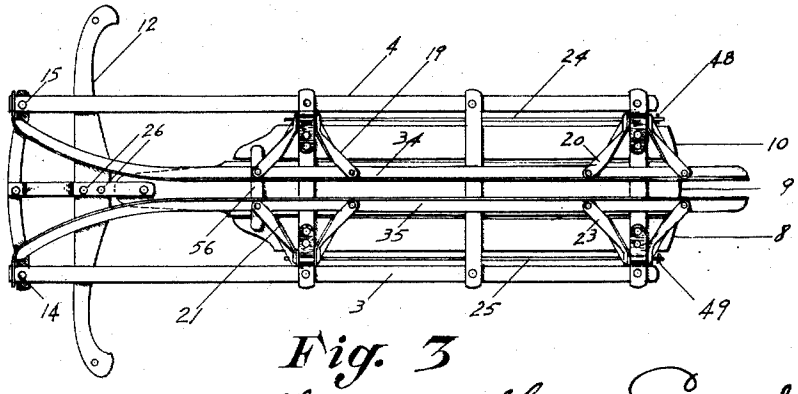


Fig. 3

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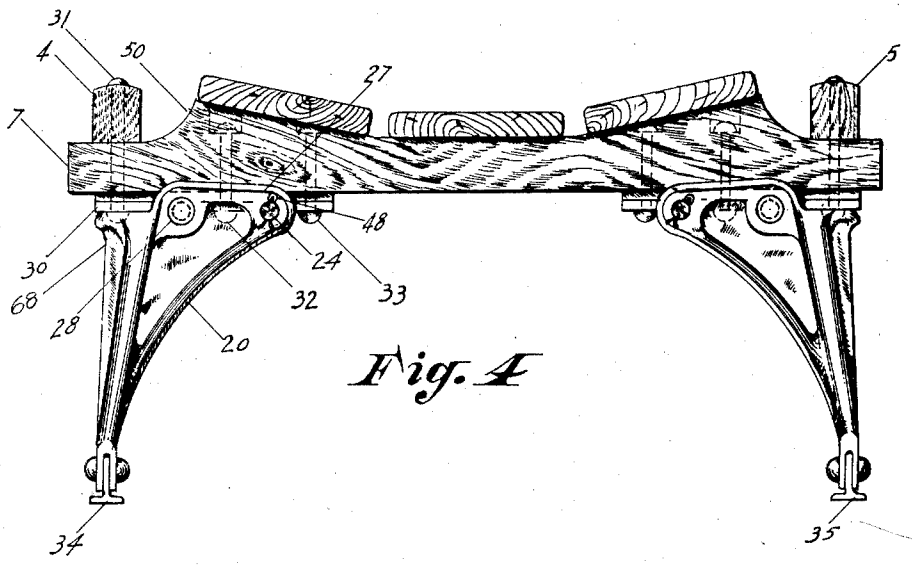


Fig. 4

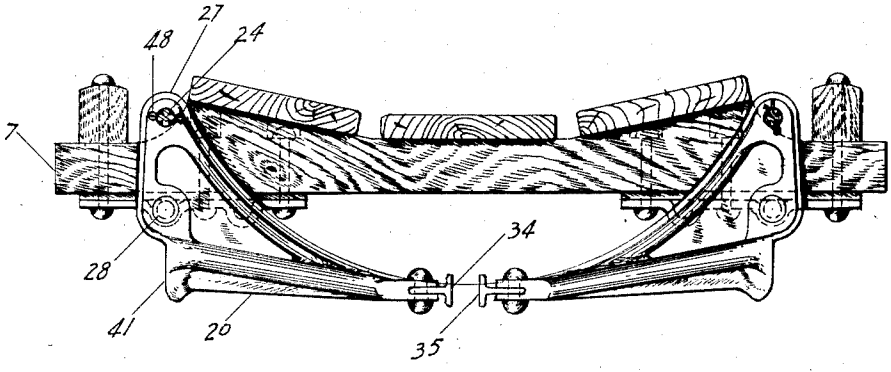


Fig. 5

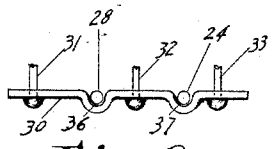


Fig. 6

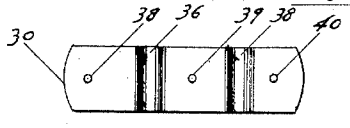


Fig. 7

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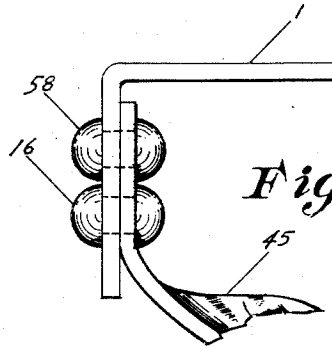


Fig. 12

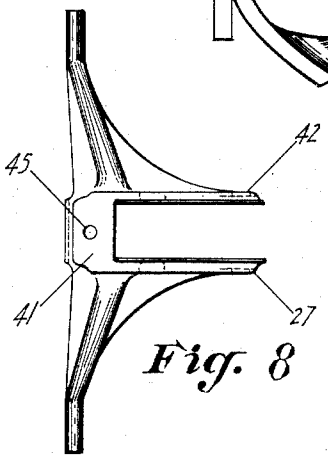


Fig. 8

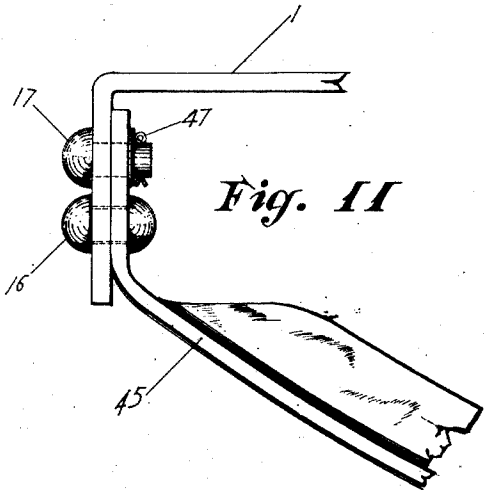


Fig. 11

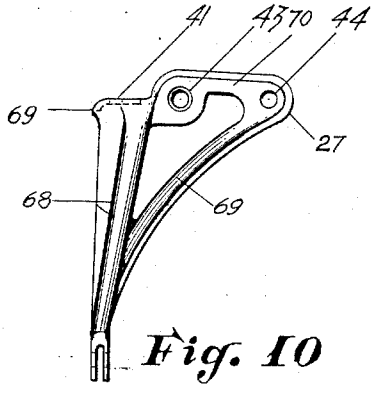


Fig. 10

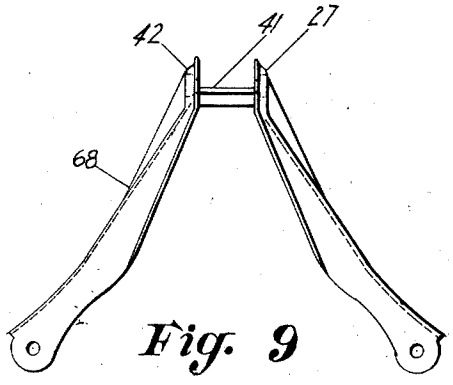


Fig. 9

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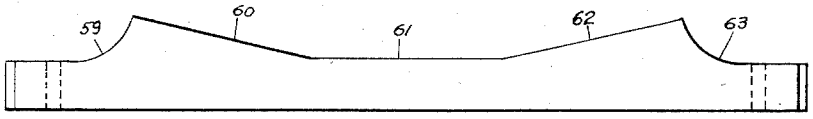


Fig. 13

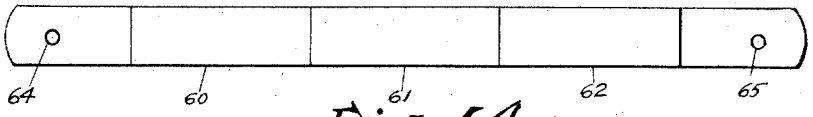


Fig. 14

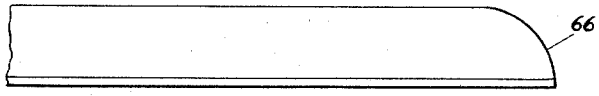


Fig. 15

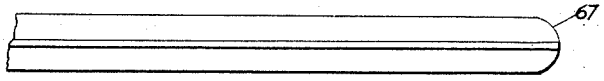


Fig. 16

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Patented Apr. 30, 1929. 1,711,017

UNITED STATES PATENT OFFICE.

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Application filed August 22, 1925. Serial No. 51,832.

My invention relates to improvements in sleds particularly of the type steerable by means of laterally bending or flexing runners, and also of the type known as folding sleds in which the runners fold beneath the deck of the sled, and my invention further relates to improved processes in the manufacture of flexible sleds generally and folding sleds particularly whereby less space and time and cost is required in the process of manufacturing and whereby less space is required in the subsequent storage and shipment, and whereby the parts employed in the manufacture may be used interchangeably in both the folding and non-folding type of sled, and whereby the various parts employed are simplified as to their structure and reduced in weight. My invention further relates to improvements in the form of the deck construction of sleds and in the construction of the runners and the cross-bars supporting the deck slats as well as in the knees attached to the runners and supporting the deck structure.

One of the objects of my invention in one aspect is to provide folding means for a sled steerable with laterally bending runners of such a character as will be simple in operation, light in weight, commercially economical to manufacture, and to provide a folding means which will not interfere with the efficient steering of the sled nor interfere with the low racing type of sled in general demand, and further to provide a folding means of such a character that the folding device when employed in folded or non-folded position will strengthen the structure of the sled over the structure generally used in the non-folding type, and further to provide a folding means of such a character that the chances of the locking means becoming loose and slipping out and away from the sled while the sled is in normal non-folded position and being used and steered is rendered impossible.

A further object of my invention is to provide a folding means of such a character that when the sled is in normal non-folded position and in use and being steered the steering force when applied will be transmitted undiminished to the runners, bending them laterally, and none of the force lost in twisting the runners, the forward upward ends of the runners being secured in such a manner that they cannot be pivoted and the lower section twisted by the application of the steering force.

Another object of my invention is to provide an improved deck construction applicable to sleds with flexible runners either of the folding or non-folding type. In the past it has been the custom of manufacturers to make the deck portion or seat flat. Under my invention the deck or seat is made substantially concave thus conforming to the shape and contour of the body of the user whether he is in a sitting or reclining position. Since practically every surface part of the human body is substantially cylindrical or convex in shape, such parts of the sled as come in contact with the body of the user should be made concave to conform with the shape of the body thus adding to the comfort of the user of the sled by giving proper support to every part of the body coming in contact with the sled and adding to the safety of the use of the sled since the body is less likely to slip from a concave seat than from a flat seat particularly when the sled is being steered in a curved course or is passing over an uneven surface or obstacles. By this construction the center of gravity is kept low and it is possible to maintain the low racing lines of the sled which type of sled is greatly in demand, and by notching the ends of the cross-bars, the hand or side-rails are kept low, thus reducing the height of the sled and thus further maintaining a low center of gravity.

A further object of my concave deck construction is thereby to provide space whereby the knees of the sled may swing when folded beneath the deck of the sled, the outer edges of the outer deck slats being higher than the middle deck slat.

A further object of my invention is to provide a type of runner of such a character as to increase the amount of surface space of the runner that comes in contact with the snow or ice particularly of that portion that is bent or flexed laterally in order to steer the sled. Owing to the fact that the forward ends of runners must necessarily be bent upwardly a large portion of the surface of the runner particularly on packed snow never comes in contact with the snow and owing to the fact that only the forward part of the runners bend to the maximum when the sled is being

steered it follows for the two reasons just given that the length of the runner that is curved and that actually comes in contact with the snow in order to steer the sled is in actual practice very small and as a consequence sleds of the flexible type and of the most improved style to date have been more or less inefficient and dangerous because of their limited steering range. The two principal methods in use today in attaching the forward ends of the runners to the forward end of the upper portion of the sled has been first to bend the end of the runner to a horizontal position and rivet to the top bar of the sled, and second to form a goose neck on the end of the runner with a horizontal end riveted to the upper cross-bar of the sled, neither type of construction giving the maximum amount of steering surface to the runner for the reason that since the end of the runner is riveted to the upper cross-bar of the sled by vertical rivet the runner must necessarily be set back a considerable distance in order to permit of this construction. The goose neck construction just described added materially to the steering length of the sled but in my invention the steering length is very materially increased over the structures just described, and under the structure of my invention the absolute maximum of efficiency in this respect is obtained for a given length of runner or a given length of sled.

I obtain the foregoing objects and results of my invention by the mechanical means illustrated in the accompanying drawing, in which—

Figure 1 is a side elevation of my folding sled steerable by means of laterally bending runners; Figure 2, a top plan view of the sled in normal fixed and locked non-folding position; Figure 3, a plan view of the bottom of the sled showing the runners and knees in a folded position against the bottom of the deck of the sled; Figure 4, a rear elevational view of the sled with the runners and knees in normal fixed and locked non-folded position; Figure 5, a rear elevational view, showing the runners and knees in a folded position beneath the deck of the sled; Figure 6 a side elevational view of the plates whereby the knees are secured to the upper portion of the sled; Figure 7, a plan view of the said plate; Figure 8, a plan view of one of the knees employed in the sled; Figure 9, a side elevational view of the knee; Figure 10, a rear elevational view of the knee; Figure 11, a side elevational view of the forward end of one of the runners and the rod of the upper portion of the sled secured thereto with removable bolt, and Figure 12, a side elevational view of the forward end of one of the runners and the rod of the upper portion of the sled secured thereto with non-removable rivets; Figure 13, is a side elevational view of the cross-bar used in the deck construction of the sled; Figure 14, a top plan view of said cross-bar; Figure 15, a side elevational view of a fragmentary rear end of one runner; Figure 16, a top plan view of a fragmentary rear end of one of the runners.

Similar figures refer to similar parts throughout the several views.

In Figures 1, 2 and 3 the knees 19 and 20 are rigidly attached at their lower extremities to the runner 34 and at their tops support respectively the cross-rods 5 and 7 which in turn support the deck of the sled. The cross-bar 6 is not attached to a knee, and is employed merely to strengthen the deck. The knees 21 and 23 on the opposite side of the sled are similarly employed. The hand or side rails 3 and 4 extend the length of the deck and are secured to the cross-bars 5, 6 and 7 preferably by means of rivets. The rods 1 and 2 extend from the side rails 4 and 3 to the forward ends of the sled, being pivoted at 51 and 52 and at 14 and 15 to permit the forward top end of the sled to pivot at these points and move laterally as the runners are flexed or bent when the steering force is applied on the lever 12, which is rigidly attached to the plates 11, which are pivoted and riveted at 54 and 55. The slats 8, 9 and 10 are nailed or otherwise secured to the cross-bars 6 and 7 but not to the cross-bar 5, which is free to move beneath the forward ends of the slats as the sled is steered, the forward ends of the slats 8, 9 and 10 being held in fixed relative position by the cross-bar 56.

In Figure 1, the rod 1 has a downwardly turned end 18 which is attached to the upwardly turned end of runner 45 by means preferably of a rivet 16 and a bolt 17 which pass through two holes in the end of the rod 18 and through the holes opposite in the end of the runner 45, the bolt being held in position by a cotter pin 47 or other suitable means, and removable and adjustable so as to permit of the folding of the runners on the rivet 16. A bolt with a cotter pin may be employed in place of rivet 16 if desired. The purpose of this device is to have the runner 45 engaged to the end of the rod 1 at two or more points to prevent the twisting of the runner when the steering force is being applied for the purpose of bending the runner laterally, and a further object is to prevent the pivoting of the runner which would occur in the event that only one rivet or bolt were used to secure the runner to the downwardly extended end of the rod just described. The bolt 17 is removed when it is desired to fold the runners, thus permitting the runner to pivot or hinge at 16, which rivet or bolt is not intended to be removed but may be removable. The positions, however, may be reversed and the removable bolt placed at 16 and the hinging or pivoting of the runner effected at 17 by means of a bolt or rivet not intended to be removed but which may or may not be removable. Tests

and experience have demonstrated that if only one bolt or rivet or other pivoting means is used to attach the forward end of the runner 45 to the lip 18 of the rod 1, when the sled is in normal fixed non-folded position and is being steered, a great part of the steering force is lost in twisting and pivoting the forward end of the runner 45 and the entire steering force, therefore, does not go into bending the runner laterally, very materially decreasing the steering radius and the efficiency of the operation of the sled. When the runner 34 is attached to the lip 18 at two points 16 and 17 or several points, the pivotal action is destroyed and likewise the twist of the runner and the steering force instead of being partially employed in twisting and pivoting the forward end of the runner is employed to the maximum in bending the runner laterally. The same principle and construction is used in the opposite runner 35 and the opposite rod 2. In folding the sled the cotter pin 47 and the bolt 17 must be removed to allow the runner to pivot at 16 whereupon the bolt can be replaced in the hole of lip 18 and the cotter pin replaced in the hole of the bolt thus providing a place for the cotter pin and bolt while the sled is in either a folded or non-folded position and making the bolt and cotter pin always available when it is desired to adjust the sled from one position to another.

In Figures 1 and 2 the rod 24 passes through the knees 19 and 20 and through the cross-bars 5 and 7. The rod 24 is provided at one end with a hook or other suitable means to prevent its passing through the knee 19 or the cross-bar 5 while at the other end there is employed a cotter pin 48 to prevent the rod from slipping through the holes of the knee 20 or the hole of the cross-bar 7, thus forming an effective adjustable locking device for the knees which are further secured to the cross-bars 5 and 7 pivotally preferably by bolt or a rivet 28 as shown in Figure 4, upon which bolt or rivet the knee pivots for the purpose of folding the knees and runners which is effected by removing the cotter pin 48 and by withdrawing the rod 24 from the sled. A similar rod 25 is employed on the opposite side of the sled, the position of the two rods when the sled is not folded being shown in Figure 2, rod 25 being equipped with a cotter pin 49 at one end and having a hook or other means at the other end to prevent the said rod from slipping out of its position.

Figure 3 shows the sled with the runners 34 and 35 folded underneath the deck, the rods 24 and 25 then occupying the positions directly beneath the slots between the side rails 3 and 4 respectively and the slats 8 and 10 respectively and passing above the cross-bars 5, 6 and 7 and through holes in the folded knees thus holding the runners and knees in a folded position. Cotter pins 48 and 49 are then inserted in the holes in the ends of the rods 24 and 25.

It will be observed that the rods 24 and 25 are utilized after the sled is folded to hold the sled securely in a folded position and that the cotter pins 48 and 49 are reinserted in the holes at the ends of the rods so that all the movable parts are thus given a place and position in the folded sled so that they may be immediately available when it is desired to readjust the sled to the normal non-folded position.

In Figure 4 the knee 20 is shown attached to the cross-bar 7 by means preferably of a rivet or bolt 28 upon which the knee is free to pivot when desired being held in fixed normal upright position by the rod 24 and the cotter pin 48, the rivet or bolt 28 passing beneath the cross-bar 7 and thence through a groove in the plate 30 which is preferably secured to the cross-bar 7 by means of the rivets 31, 32 and 33, and the rod 24 which likewise passes through the knee and beneath the cross-bar 7 and through a groove in the plate 30. The rod 24 in like manner passes through the knee 19 and beneath the cross-bar 5 and through a groove in a plate similar to 30. The construction on the opposite side of the sled with respect to the rod 25 as shown in Figures 2 and 3 is similar to the construction employed with respect to rod 24.

In Figure 5 the knee 20 is shown folded or pivoted about the rivet or bolt 28 and beneath the deck of the sled, while the rod 24 is shown passing through a hole in the lip 27 of the knee 20 and above the cross-bar 7, thence it passes through a lip of the knee 20 on the oppesite side of the cross-bar 7. The rod 24 then extends the length of the deck of the sled passing through knee 19 Figure 1 and cross-bar 5 in a manner similar to that described with respect to knee 19 and cross-bar 7.

In Figure 6 is shown a side elevation of the plate 30 with rivet or bolt pivot 28, the rod 24 and the grooves 36 and 37 of the plate 30 through which pass the pivoting rivet or bolt 28 and the locking rod 24. The parts 31, 32 and 33 are fragmentary views of the rivets which secure plate 30 to the cross-bar 7, similar construction being employed throughout the sled for similar parts, it being observed that the rivet 31, Figure 4 also secures the side or hand-rail 4 to the cross-bar 7.

In Figure 7 is shown a plan view of the plate 30, 36 and 38 being the grooves through which pass the rivet or bolt 28 and the rod 24 Figure 4, 38, 39 and 40 being the holes through which pass the rivets 31, 32 and 33 Figure 4.

In the means provided to secure the lip 18 to the forward upwardly bent end of the runner 45 Figure 1 I have shown the runner so that it may be pivoted or hinged upon the aforesaid lip. This is a construction that

may be used either in a folding or a non-folding sled which may be modified by employing two non-removable rivets or removable bolts, thus in a non-folding sled destroying the tendency to twist the runners when the steering force is applied for the purpose of bending the runners laterally.

Figures 11 and 12 show more particularly the structure above described, with respect to the two types of sleds, namely folding and non-folding, it being observed that the principal parts are interchangeable.

In Figure 13 and Figure 14 showing respectively a side elevational and a top plan view of the cross-bar construction as used in assembling the deck portion of the sled, 60, 61 and 62 are to indicate the plurality of the plane surfaces on the upper surface of the cross-bar upon which rest the slats of the seat of the sled which are shown in Figures 4 and 5 in substantially concave construction. In Figure 13 and Figure 14, 59 and 63 are notches at the ends of the cross-bar upon which rest the side hand-rails 4 and 5 more particularly shown in Figure 4.

Figure 15 is a side elevational view of a portion of the rear end of one of the runners of the sled showing the curved portion 66 and Figure 16 is a top plan view of the same runner showing the curved portion 67, the runner as shown being rounded both vertically and horizontally in order to eliminate the angles and sharp points that are usually left at the end of the runners in sleds as generally manufactured and used today.

In Figure 8, 27 and 42 are the vertical lips of the knee construction used throughout in the manufacture of the sled. These lips are formed from a portion of the seat 41 of the knee by bending the seat portion from a horizontal to a vertical position. 45 is a perforation in the seat 41, designed to register with the head of the rivet 68 as shown in Figure 4.

In Figure 10, 41 is the seat of the knee previously described, and 43 a hole through which passes a pivoting rivet as previously described and 44 a hole through which passes the fastening rod for bolt or rivet previously described, depending upon whether the knee is used to be folded or not, in the event that the knee is used for the folding construction, the bolt or rod passing through the hole 44 would be removable. When the removable rod is used in the folding construction, there is a tendency for the vertical lips to spread when the weight is applied to the deck of the sled or when there is lateral pressure on the runners. To overcome this bending or spreading tendency, a strengthening web, 70, is employed to extend substantially parallel to the top edge of each lip and a strengthening web, 69, substantially parallel to the side edge of the lip, and merging with the strengthening web, 68, with which each leg of the knee is provided, which combined with the strengthening lip, 69, tends to prevent the bending or breaking of any portion of the knee. In Figure 9 is shown another view of the knee, 42 and 27 being the vertical lips, 41 the seat and 68 the strengthening web of the leg.

I claim:

1. In a sled, the combination of laterally bending runners, cross bars and a deck, with knees secured to the runners and pivotally secured to the cross-bars of the deck of the sled, a locking means consisting of a removable horizontal rod extending through perforations in the knees and the cross-bar structure of the sled deck, and adjustable means to prevent the said rod from slipping out of position.

2. A sled embodying laterally bending runners, knees secured thereto, side rails, cross bars secured to said rails, rods extending from the side rails to the forward end of the sled, and pivotally mounted at their front ends to a cross member connecting said side rails.

3. A sled embodying laterally bending runners, knees secured thereto, side rails, cross bars secured to said rails, rods extending from the side rails to the front end of the sled, and pivotally mounted at their front ends to a cross member connecting said side rails, and means connecting one of said rods with said cross member and removable to permit of the folding of the sled.

4. In a sled, the combination of cross-bars for supporting a deck, laterally-bendable runners, knees pivoting the runners to the cross bars, horizontal bars connected to the deck and having depending lips which are pivotally connected to ends of the sled runners, and a longitudinally extended removable rod cooperative with a multiplicity of spaced-apart runner supports, for holding the runners in a determined position.

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