Jan. 9, 1940. D. GORDON 2,186,456

SPLINT

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Fig. 1.

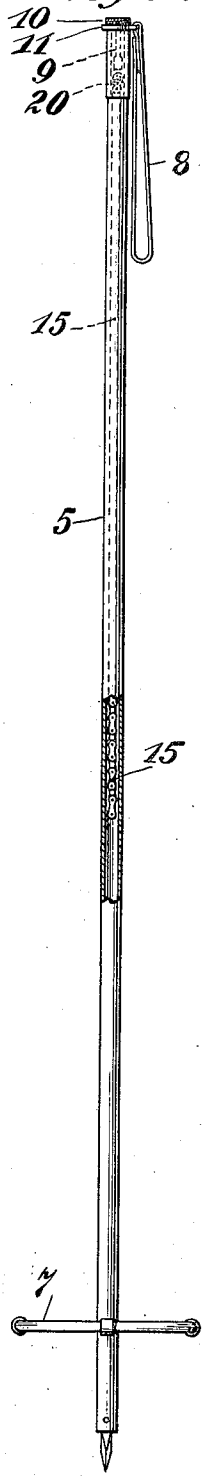


Fig. 2.

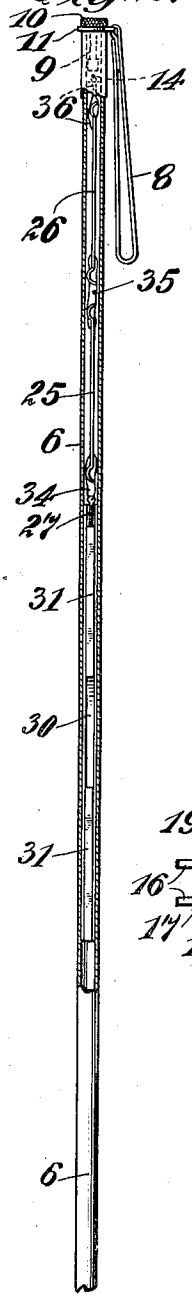


Fig. 3.

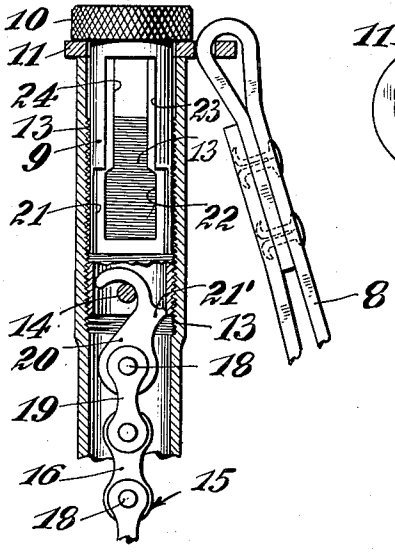


Fig. 4.

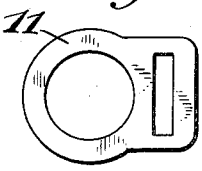


Fig. 5.

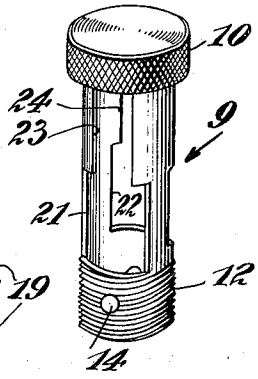
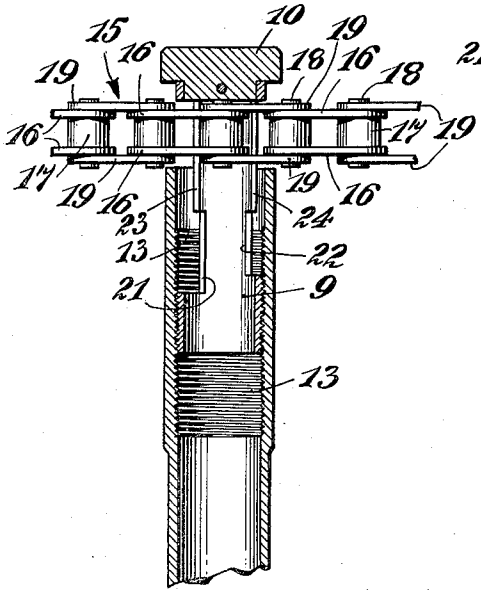


Fig. 6.



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Fig. 7.

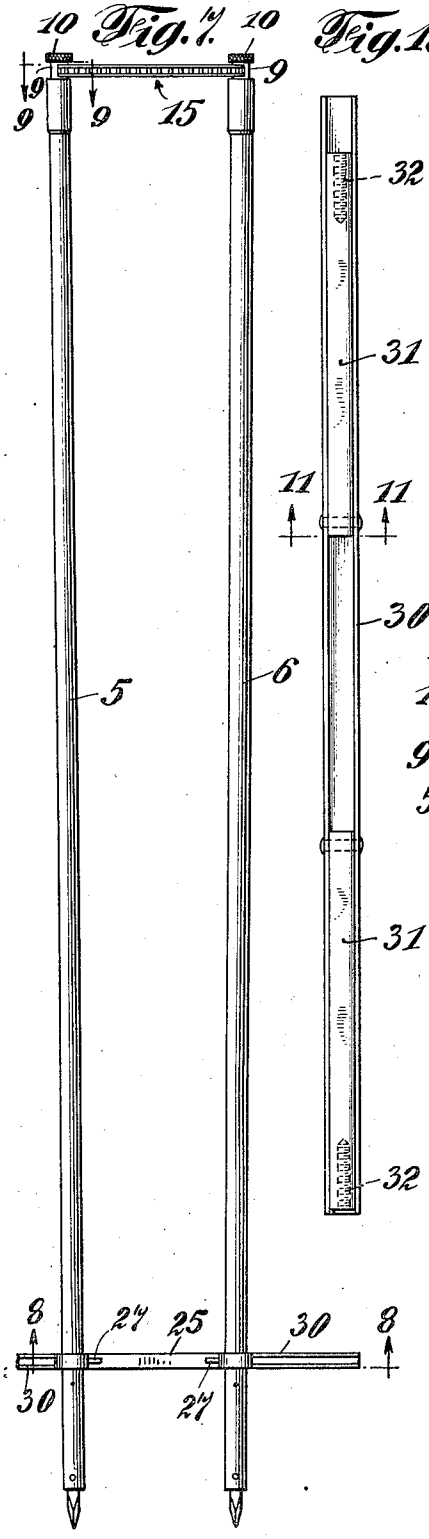


Fig. 10.

Fig. 8.

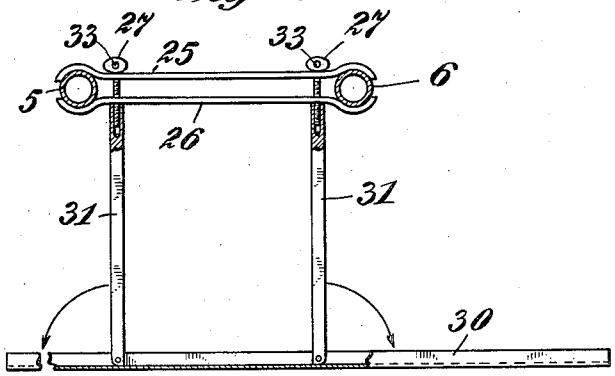


Fig. 9.

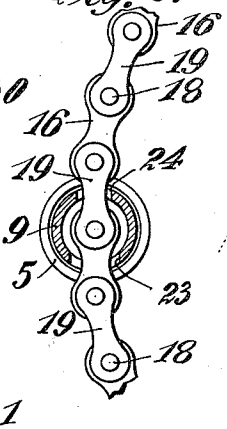


Fig. 12.

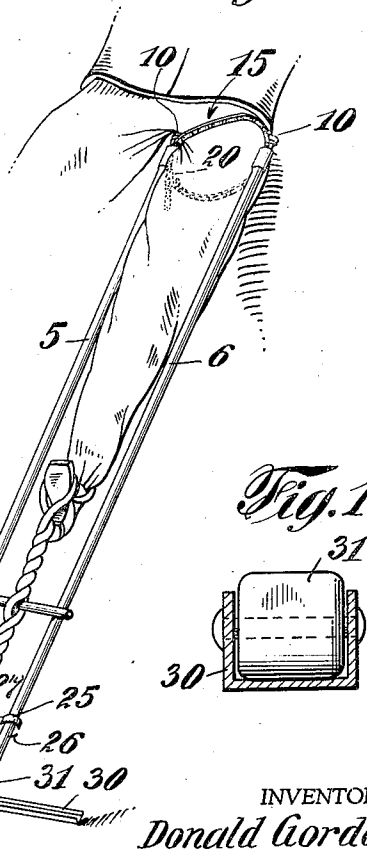


Fig. 11.

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Fig. 13.

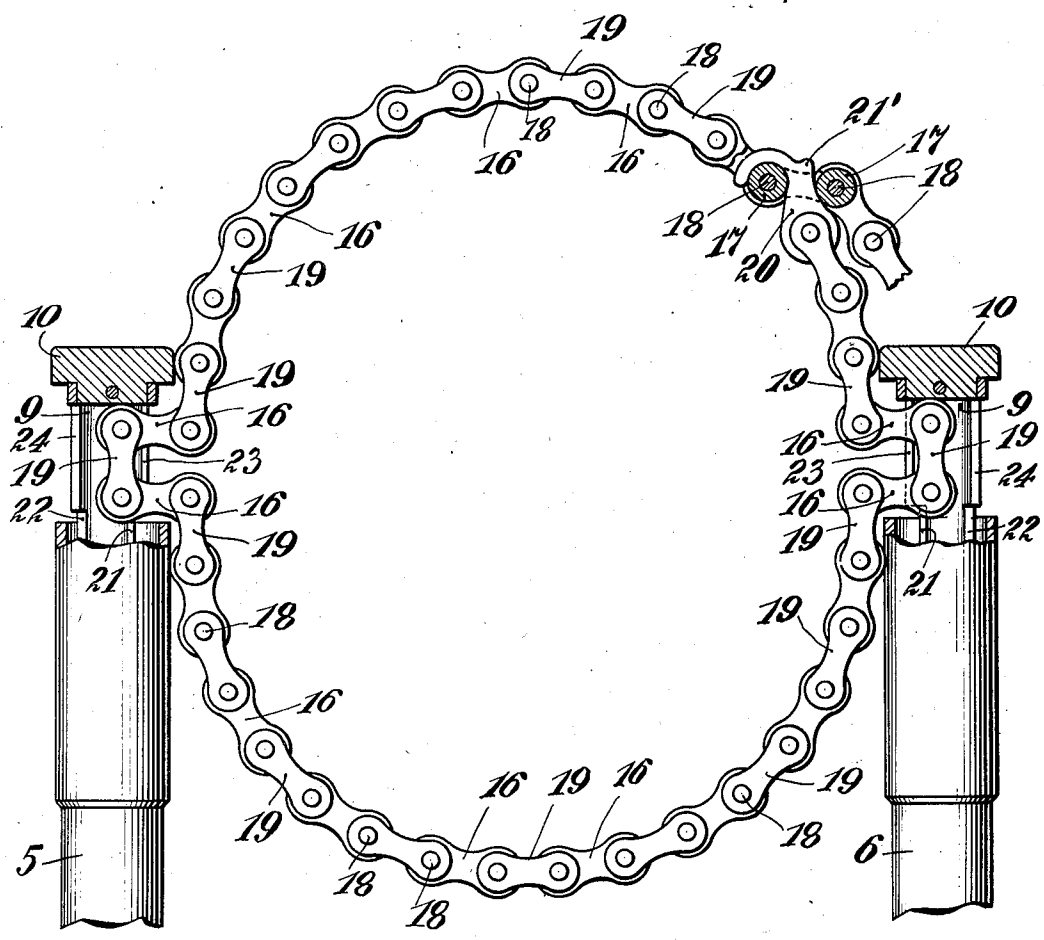
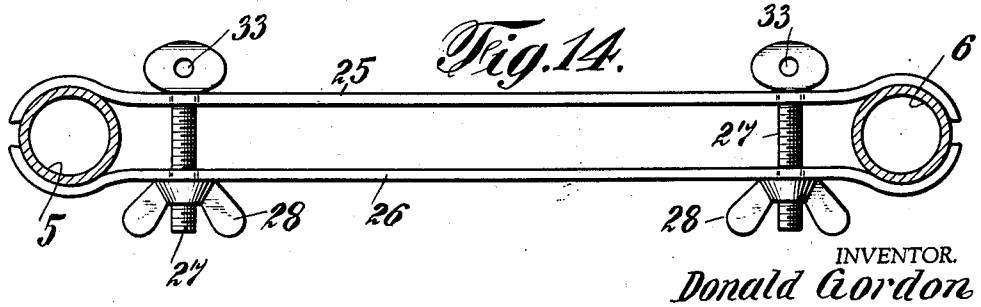


Fig. 14.



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Fig. 15.

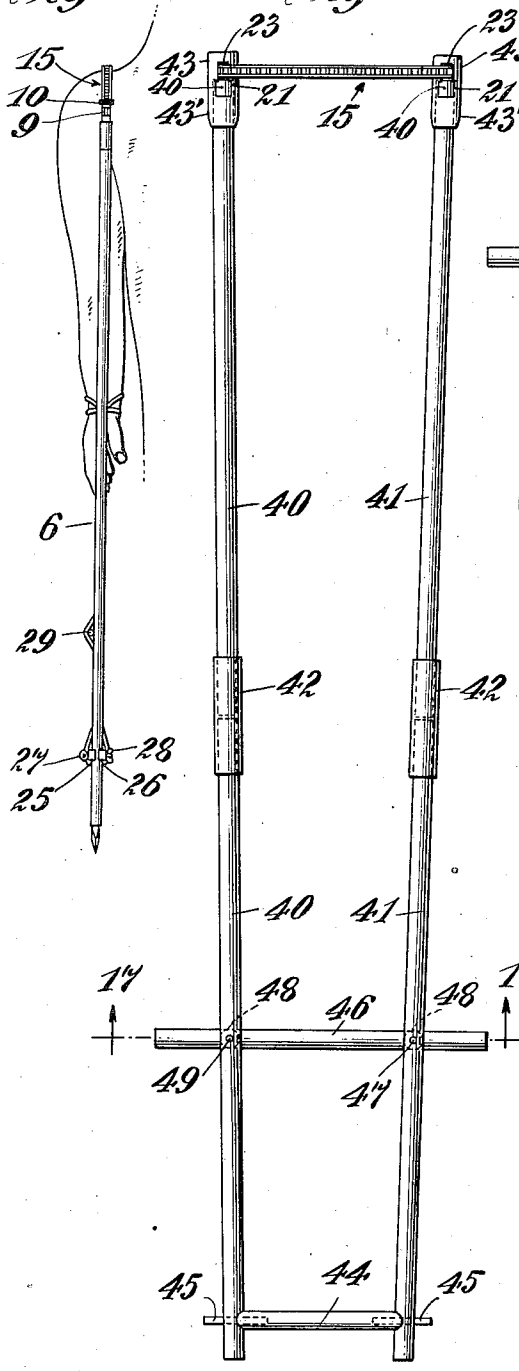


Fig. 16.

Fig. 17.

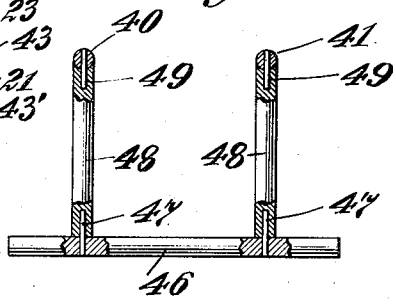


Fig. 18.

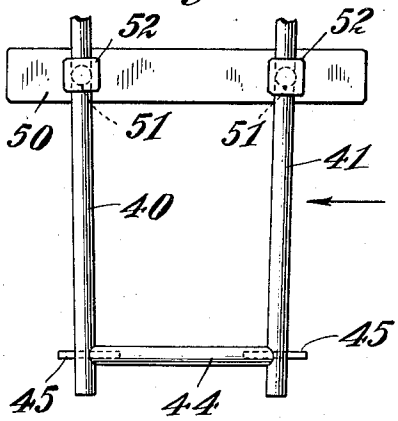
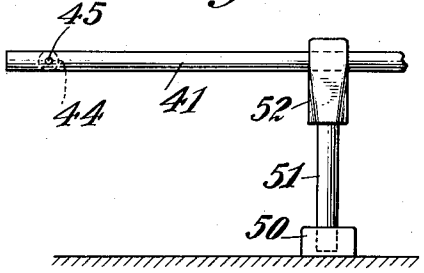


Fig. 19.



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Patented Jan. 9, 1940 2,186,456

UNITED STATES PATENT OFFICE

2,186,456

SPLINT

Donald Gordon, New York, N. Y.

Application January 8, 1938, Serial No. 183,954

12 Claims. (Cl. 128—87)

This invention relates to splints, and more particularly to so-called "traction" or "transportation" splints for maintaining fixed traction upon a fractured limb immediately following the fracture and during transportation of the patient to a hospital or other place of treatment. With increasing numbers of limb fractures incident to automobile accidents, the popularization of sports such as skiing, and other causes, prompt and effective emergency treatment has become especially important. When a limb is fractured, muscular contraction ensues with consequent tendency to produce overriding of the ends of the fractured bone. Such contraction should be counteracted immediately after the fracture occurs and until the fracture has been reduced.

An object of my invention is the provision of a novel, simple, and efficient splint, capable of being transported with particular facility and adapted to be applied effectively and expeditiously to maintain a fractured limb under traction. The splint of my invention is, moreover, speedily applicable to either fractured legs or fractured arms, and to widely varying sizes thereof.

A further important feature of my invention resides in the provision of a traction splint especially adapted for ski-ers and utilizing a pair of ski sticks as the longitudinal elements of the splint. A more specific aspect of the invention comprises the provision of a ski splint comprising ski sticks for the longitudinal elements and means carried within the sticks for forming the splint in cooperation with said sticks.

Through my invention the sticks, which can be used readily for skiing, can be quickly and easily converted into a practical splint for transporting, with traction, injuries of the long bones of the upper or lower limbs received either in skiing or otherwise.

My splint can be used to supplant the well-known full-ring Thomas splint, or the Keller-Blake hinged half-ring splint for the application of emergency traction for transportation of fractures of the lower limb, and can also be employed in place of the Murray-Jones hinged-ring arm splint for emergency traction for transportation of fractures in the upper limb.

Another prominent feature of my invention comprises the provision of an element (such, for example, as a bicycle chain or other chain of similar properties) flexible in a given plane, in combination with means for attaching the same to a pair of longitudinal elements to form a ring of variable radius. The invention provides also for attachment of said flexible element to form a ring with its plane either substantially parallel to the longitudinal elements of the splint or transverse thereto.

Further features and advantages of the invention will be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a view in elevation of a ski stick forming an element of my ski-splint, said stick being shown partly broken away to show another element of the splint carried therewithin.

Fig. 2 is a similar view of the companion ski stick, broken away to show other elements of the ski-splint.

Fig. 3 is a vertical sectional view showing the head of the stick of Fig. 1.

Fig. 4 is a view of a detail.

Fig. 5 is a perspective view of the head employed on the ski-sticks.

Fig. 6 is a vertical sectional view of the upper or head portion of one of the ski-sticks showing a chain passed therethrough to form the ring element of the splint.

Fig. 7 is a view showing the assembled ski splint.

Fig. 8 is a view taken on line 8—8 of Fig. 7.

Fig. 9 is a detail view showing the chain passed through the upper slots in one of the head members.

Fig. 10 is a view in elevation showing the foot rest for the splint, in folded position.

Fig. 11 is a sectional view on line 11—11 of Fig. 10.

Fig. 12 is a view illustrating the application of the ski splint.

Fig. 13 is a view showing the chain applied to the head members, with its plane parallel to the longitudinal axes of the sticks, for application to the shoulder above a fractured arm.

Fig. 14 is a view in transverse section through the ski sticks of Fig. 13, showing clamping means attached to the sticks for receiving the traction applying means.

Fig. 15 is a view illustrating the application of the ski splint to a broken arm.

Fig. 16 is a view of another form of splint embodying my invention, and utilizing solid, as distinguished from hollow, longitudinal members.

Fig. 17 is a view taken on line 17—17 of Fig. 16.

Fig. 18 is a view of a further modification.

Fig. 19 is a view in side elevation of the construction shown in Fig. 18, looking in the direction of the arrow in Fig. 18.

Referring to Figs. 1 and 2 of the drawings, there are shown at 5, 6, a pair of hollow ski sticks. These sticks may be of suitable metal, such as

aluminum, Duralumin, or other light metal alloy of adequate strength. Each stick may have a conventional foot ring 7 secured thereto near its lower end, and the usual strap loop 8 attached near its upper end. These elements are well known.

In carrying out my invention I apply to each of the sticks 5, 6, an upper tubular member 9 constructed to receive a flexible element such as a chain to form a loop for engaging the thigh, in case of a fractured leg, or the shoulder, in case of a broken arm.

Each of the tubular members 9 is shown provided with a slightly enlarged head, which is preferably knurled to afford a grip, and which also serves to hold in place the washer 11 to which the strap 8 is applied. Since the structure of the tubular members 9 is identical, a description of one will suffice.

Each member 9 is threaded over a portion of its length, as indicated at 12, for engagement with a corresponding screw thread 13 on the interior of the upper portion of the stick 5 or 6.

Each member 9 is also provided with a pin 14 attached thereto and extending across the lower interior portion thereof. The pin 14 of one of said members serves as a means for carrying the flexible element 15; while pin 14 of the other member 9 provides a point of attachment for other elements of the splint as hereinafter described. Through the members 9 and their pins 14 the chain 15 and other splint elements are carried within the hollow sticks as illustrated in Figs. 1–3.

The element 15 may be any suitable element flexible in a given plane to form a ring of variable radius and is illustrated as a roller chain of the type commonly employed in bicycles. The chain comprises pairs of links 16, 16, each pair of said links having spacer elements in the form of rollers 17, 17 interposed therebetween, said rollers being mounted on pins 18 extending through said links. Interposed between adjacent pairs of the links 16, 16 are pairs of outer links 19, 19, said links 19, 19 of each pair being mounted at one end on a pin 18 of a pair of the links 16, 16 and, at the other end on a pin 18 of the next adjacent pair of links 16, 16. Said links 19, 19, as shown, are positioned exteriorly of the links 16, 16. At one end, the chain 15 is provided with a hook 20 adapted to engage pin 14 of one of the members 9 for transportation within stick 5 or 6 (see Fig. 3) and also adapted to engage one of the rollers 17 to complete a ring when the splint is assembled.

Each of the members 9 has a pair of lower (or distal) openings 21, 22 cut in opposite sides thereof, which openings are of sufficient size to permit the end of the chain 15 opposite the hook 20 to be passed therethrough with the axes of the rollers extending longitudinally of the members 9, as illustrated in Fig. 6. After the chain is so passed through said openings it is moved toward the knurled head 10 into narrower openings or slots 23, 24, communicating with the respective openings 21, 22. The slots 23, 24, as shown in Fig. 9, are of sufficient width to permit the links 16, 16, and 19, 19, to pass therethrough, when applied as above described, with the rollers 17 extending longitudinally, but said slots are not of sufficient width to permit roller 17 to pass therethrough.

The member 9 into which the chain is passed as above described is then inserted into the open end of the stick 5 or 6, a distance sufficient for the upper edge of the stick to prevent the chain from dropping completely out of the slots 23, 24. At this point the threads 12 on the member 9 engage the threads 13 in the stick, and a few turns of the latter, while the knurled head 10 is held, will lock the chain in position by drawing down the member 9 and clamping the chain between the upper edge of the ski stick and the head 10. The degree to which the member 9 is screwed into the stick determines whether the chain will be at a right angle to the stick, or a few degrees from a right angle, as is sometimes desirable.

The longer end of the chain is then passed through the other member 9, and a sufficient length of chain allowed between the members 9 to form half a circle of such size as will encompass the upper posterior part of the thigh of the injured person, so that the sticks which will form the parts of the splint to support the limb will rest on the inner and outer aspects of the thigh one hundred and eighty degrees from each other. The stick 6 is then screwed into its member 9 and the chain locked to said stick. This furnishes the upper ends of the sticks with a flexible open ring (as shown in Figs. 7 and 12) which may be applied to the posterior aspect of the upper thigh over the clothing or over a pad formed with clothing.

Means are provided for holding together the distal or lower ends of the sticks to complete the splint for use on the lower limb. Such means comprises a pair of metal cross bars 25, 26 having their ends slightly curved to fit the sticks 5, 6. Said members 25, 26 are applied to the sticks as illustrated in Figs. 8 and 12, and are provided with holes for receiving a pair of bolts 27. The curved ends of the bars 25, 26 are applied to the distal end portions of the sticks at a suitable distance from the chain ring 15 to extend beyond the foot of the leg to which the splint is to be applied. After the bolts 27 are inserted through the openings in said bars a pair of wing nuts 28 (Fig. 14) may be threaded on said bolts to secure the bars 25, 26 to the sticks.

The splint having been formed as above described, it is applied as follows to a fractured leg:

A traction device or straps are applied about the foot, or about padding on the ankle, as in accepted emergency practice, and the leg is pulled longitudinally. The closed portion of the chain ring is applied, padded with clothing or over the clothing, to the upper and posterior aspect of the thigh with the ring against the pelvic bone. The hook 20 of the chain is then engaged into the under surface of the opposite free end so that the ring fits the circumference of the thigh snugly. The sticks 5, 6 now extend along opposite sides of the leg, as shown in Fig. 12, with the cross bars 25, 26 beyond the patient's foot. The traction straps are then tied to said cross bars and twisted by a stick or bar 29 (as in standard practice), after which said bar is rested on the sticks 5, 6. The limb may then be supported and fastened to the splint, as by strips of cloth passed under the leg and attached to the sticks, as in standard first aid methods.

I have also provided means, adapted to cooperate with the bolts 27, for supporting the splint and leg above the ground or other level. For this purpose there is disclosed a bar 30 of channel formation, which has pivoted thereto a pair of bars 31, 31, each of which has a threaded opening 32 in an end thereof. When not in use, the bars 31, 31 are folded into the channel of the bar 30.

When, however, the support is to be utilized, the bars 31, 31 are unfolded, and, instead of applying the wing nuts 28 to the bolts 27, the latter are threaded into the openings 32 in said bars, as shown in Fig. 8. The distal end of the splint may thus be supported by the bars 31, 32, and the splint thereby caused to support the leg above the ground or other level on which the patient rests, instead of permitting the injured limb to support the splint as not infrequently occurs in practice.

The heads of the bolts 27 are shown provided with openings 33 for receiving a small pointed object to be used as a wrench when the fingers are cold.

The bars 25, 26 and the support comprising the bars 30, 31, may be carried, when not in use, in either of the sticks 5, 6. When the bars 31, 31, are folded into the channel of the bar 30, as shown in Fig. 10, the assembly may be inserted into stick 5 or 6 (Fig. 2) and supported, together with bars 25, 26 from the associated member 9. For example, when the parts are to be stowed in one of the sticks, the support 30, 31, may be connected to the bars 25 by a wire 34 (Fig. 2) passed through one of the bolt holes in said bar and also through opening 33 in the head of one of the bolts 27. Bar 25 may similarly be connected at its other end to bar 26 by a wire 35 through the bolt holes in adjacent ends of said bars, and bar 26 may have a wire 36 passed through the bolt hole in the opposite end of said bar and secured to pin 14 of member 9. Then upon inserting said support 30, 31, and attached members 25, 26 into the stick, and threading the member 9 thereinto, said support and members are effectively carried ready for expeditious withdrawal whenever necessary.

In case of a fracture of the arm the chain is not passed transversely through the members 9 but is attached as follows:

Referring to Fig. 13, a pair of the outer links 19 are chosen, and the adjacent inner links 16 attached to the opposite ends of said links 19 are bent toward each other. The outer links are passed through the larger aperture 21 in the member 9 and are pushed upwards so that the inner links 16 project through the slot 23. The axes of the rollers 17 within the member 9 now extend transversely of the longitudinal axis of the latter. The slot 23 is of insufficient width to permit the outer links 19 to pass therethrough. The stick 5 or 6 is then applied and is rotated to draw down the member 9 until the chain is firmly secured in position, with said links 19 engaged with the head 10 and the adjacent lower pair of links 16 engaged with the upper end of the stick. An adequate length of chain is allowed to fit the under surface of the shoulder as a crutch, and another pair of outer links 19 and associated pairs of inner links 16 are then passed into the other member 9 and are fixed in position by the associated stick in the same manner as above described. The free ends of the chain are now extended upwardly one in front of and one behind the shoulder, and, when applied over a pad of clothing, can be locked by hook 20 to form a ring encompassing the shoulder (Figs. 13 and 15). The chain now extends in a plane parallel to the longitudinal axis of the sticks 5, 6.

The cross bars 25, 26 are then applied to the sticks below the hand and are secured to the sticks by the bolts 27 and wing nuts 28. Traction straps applied to the patient's wrist are then attached to said cross bars and are twisted by a stick 29 in the customary manner to subject the arm to traction. The arm is then stabilized in the splint by standard first aid methods. The folding support 30, 31 is not employed in the application of the splint to the arm.

While the opening 21 in each member 9 is of sufficient size to receive the pair of outer links 19 and adjacent pairs of inner links 16, with rollers 17 transverse to the longitudinal axes of member 9, as above described the opening 22 is too narrow for this purpose. Also the slot 24 is too narrow to permit the pairs of links 16 to project therethrough under this condition. The proper insertion of the pairs of links aforesaid to permit the chain to extend in a plane parallel to the longitudinal axes of the sticks is thus facilitated and their retention in proper position upon insertion of the sticks is insured.

The hook 20, may be provided with a projection 21' adapted to engage in the open space in the first link of the excess portion of the chain to insure locking the hook in position.

In Figs. 16 and 17 I have provided for attachment of the chain 15 to wooden sticks 40, 41. The latter may be ski sticks or they may be formed of sections capable of convenient transportation, in an automobile or otherwise, and held together by suitable sleeves or other couplings 42, 42 when assembled. For attaching the chain 15 to said sticks I employ members 43, 43, having the same arrangements of slots as hereinbefore described in connection with the members 9. Each of the members 43 is provided with an extension 43' having an inner cylindrical surface of such bore as to fit snugly over the upper end of the associated stick. The chain is applied to the members 43, to form a ring with its plane either transverse or parallel to the longitudinal axes of the sticks 40, 41 in the same manner as previously described in conjunction with the members 9, and is retained in said members 43 by the upper ends of the sticks 40 and 41 in the same way as it is retained in members 9 by the upper ends of the sticks 5, 6.

The sticks 40, 41 are united near their lower or distal ends by a bar 44, having concave ends conforming with the curvature of said sticks and having pins 45, 45 extending from said ends and passing through and firmly engaged with suitable openings in the sticks. Said bar 44 may receive the traction devices or straps in the same manner as the cross bars 25, 26 previously described. A support may be provided comprising a bar 46 having openings which receive pins 47, 47 projecting from upright forming bars 48, 48 (Fig. 17) having concave ends engageable with the under surfaces of the sticks 40, 41. Pins 49, 49 extend from the upper ends of said bars 48, 48 and enter apertures in the sticks 40, 41, as shown. The bars 46 and 48 may be assembled and disassembled with facility, as may also the bar 44 with respect to the sticks 40, 41.

In Figs. 18 and 19 a modified form of support for the sticks 40, 41 is illustrated, said support comprising a bar 50 having apertures which receive the ends of upright bars 51, 51. At their upper ends the bars 51, 51 have heads 52, 52 apertured to receive the sticks 40, 41. The bars 51 may be slidably adjusted along said sticks to position the support as desired.

The terms and expressions which I have employed are used as terms of description and not of limitation, and I have no intention, in the use of such terms and expressions, of excluding any equivalents of the features shown and de-

scribed or portions thereof, but recognize that various modifications are possible within the scope of the invention claimed.

What I claim is:

1. A traction splint comprising a pair of longitudinal elements, a member flexible in a given plane adapted to form a ring of variable radii, and means for attaching said member to said elements, said means comprising hollow members, one for each of said elements and mounted on an end thereof, each of said hollow members being provided with an opening in a wall thereof and a slot in said wall communicating with said opening and narrower than the latter, said flexible member being adapted to be received by said openings and passed into said slot.

2. A traction splint comprising a pair of longitudinal elements, a member flexible in a given plane and adapted to form a ring of variable radii, and means for attaching said member to said elements, said means comprising hollow members, one for each of said elements and mounted on an end thereof, each of said hollow members having slotted walls through which said flexible member is adapted to be passed.

3. A traction splint comprising a pair of longitudinal elements, a chain comprising alternate pairs of links having spacer elements therebetween, and other pairs of links receiving said alternate pairs therebetween and connecting the same, means for attaching said member to said elements, said means comprising hollow members, one for each of said elements and mounted on an end thereof, each of said hollow members being provided with openings in its walls for enabling said chain to be passed therethrough, and means for connecting portions of said chain to form a ring of variable radii.

4. A traction splint comprising a pair of longitudinal elements, a chain comprising alternate pairs of links having spacer elements therebetween, and other pairs of links receiving said alternate pairs therebetween and connecting the same, each of said longitudinal elements having a hollow member at one end thereof provided with openings in its walls for enabling said chain to be passed therethrough, said openings communicating with slots to enable said chain to be passed into said slots in a direction transverse to its direction of passage through said openings, the walls of said slots being spaced apart a distance insufficient to permit a spacer element of said chain to pass therethrough, each of said longitudinal elements being adapted to be moved longitudinally into the respective hollow member to confine the chain therein, and means for connecting portions of said chain to form a ring of variable radii.

5. A traction splint comprising a pair of longitudinal elements, a chain comprising alternate pairs of links having spacer elements therebetween, and other pairs of links receiving said alternate pairs therebetween and connecting the same, each of said longitudinal elements having a hollow member at one end thereof provided with an opening in a wall thereof, said opening being in communication with a slot in said wall, said opening being of such dimension as to receive a portion of said chain comprising alternate pairs of said links folded one over the other together with the pair of outer links connecting said alternate pairs, and said slot being of such dimension as to receive said chain portion and to permit said alternate pairs of links to extend therethrough but being of insufficient width to permit said pair of outer links to pass therethrough, each of said longitudinal elements being adapted to be moved longitudinally into the respective hollow member to confine said chain portion therein, and means for connecting portions of said chain to form a ring of variable radii.

6. A traction splint comprising a pair of longitudinal elements, a chain comprising alternate pairs of links having spacer elements therebetween, and other pairs of links receiving said alternate pairs therebetween and connecting the same, each of said longitudinal elements having a hollow member at one end thereof provided with openings in its walls for enabling said chain to be passed therethrough, said openings communicating with slots to enable said chain to be passed therein transversely to its direction of passage through said openings, the walls of said slots being spaced apart a distance insufficient to permit a spacer element of said chain to pass therethrough, one of said openings in each of said hollow members being further of such dimension as to receive a portion of said chain comprising alternate pairs of said links folded one over the other together with the pair of outer links connecting said alternate pairs, the slot communicating with said last mentioned opening being of such dimension as to receive said chain portion and to permit said alternate pairs of links to extend therethrough but of insufficient width to permit said pair of outer links to pass therethrough, each of said longitudinal elements being adapted to be moved longitudinally into the respective hollow member to confine the associated chain portion therein, and means for connecting portions of said chain to form a ring of variable radii.

7. A traction splint comprising a pair of longitudinal elements, a member flexible in a given plane and adapted to form a ring of variable radius, and means comprising slotted hollow members on said longitudinal elements for enabling said flexible member to be attached to said elements to form a ring with its plane either substantially parallel with the axes of said elements or transverse thereto.

8. A splint comprising a hollow longitudinal ski stick, and a splint support contained entirely within said stick.

9. A splint comprising a hollow longitudinal ski stick, and a traction bar contained entirely within said stick.

10. A splint comprising a hollow longitudinal ski stick and a ring forming member contained entirely within said stick.

11. A splint comprising a hollow longitudinal element, and a support comprising a channel bar having a pair of upright members pivoted thereto, said support when folded being adapted to be inserted into said element for transportation.

12. A splint comprising a pair of longitudinal elements, each of said elements having at one end a hollow member provided with slotted walls, and a chain extending through said slotted walls and retained between the ends of said elements and portions of said members.

DONALD GORDON.