Jan. 16, 1940. W. KELTON ET AL 2,187,323

CRUTCH SPLINT

Filed March 9, 1936 3 Sheets-Sheet 1

Fig. 1

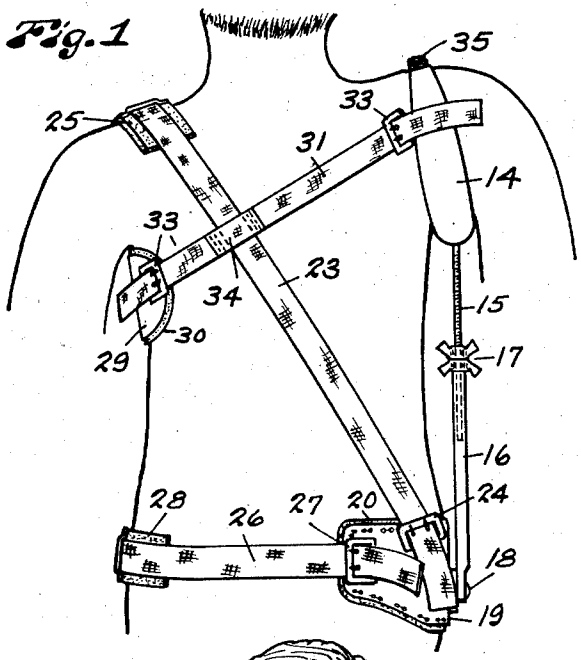
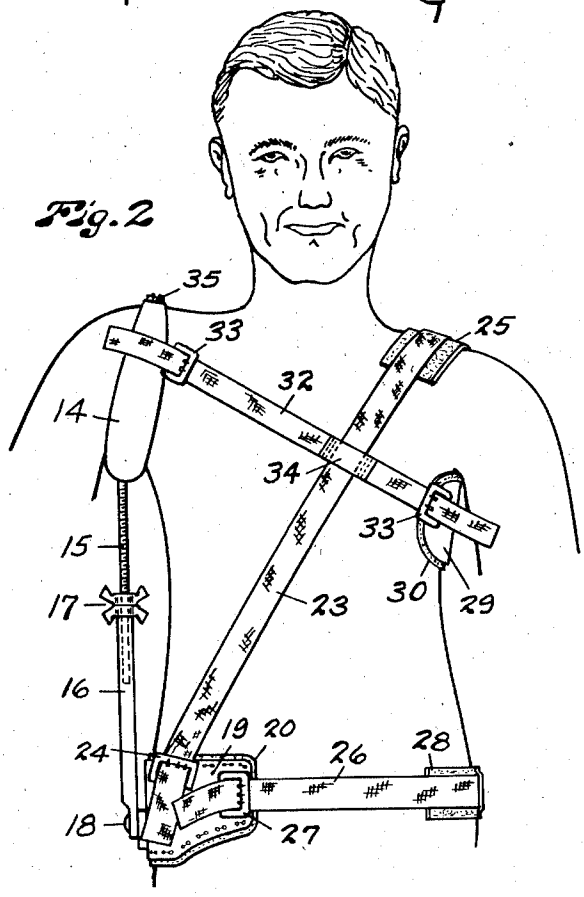


Fig. 2



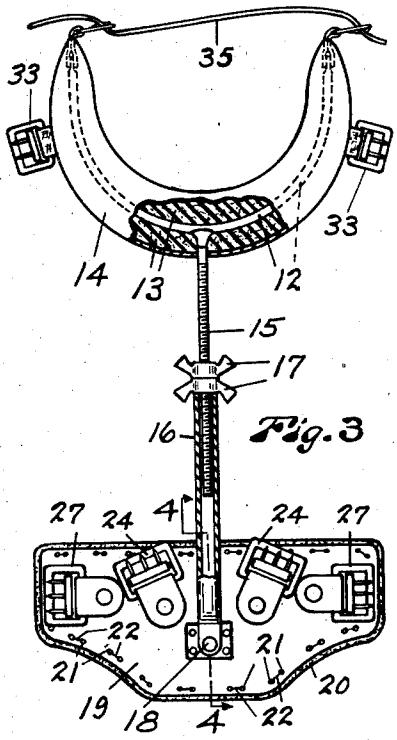


Fig. 3

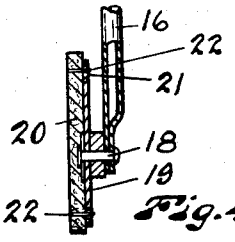


Fig. 4

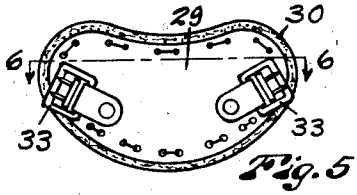


Fig. 5

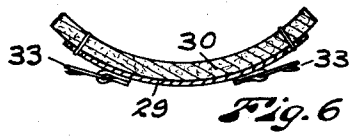


Fig. 6

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CRUTCH SPLINT

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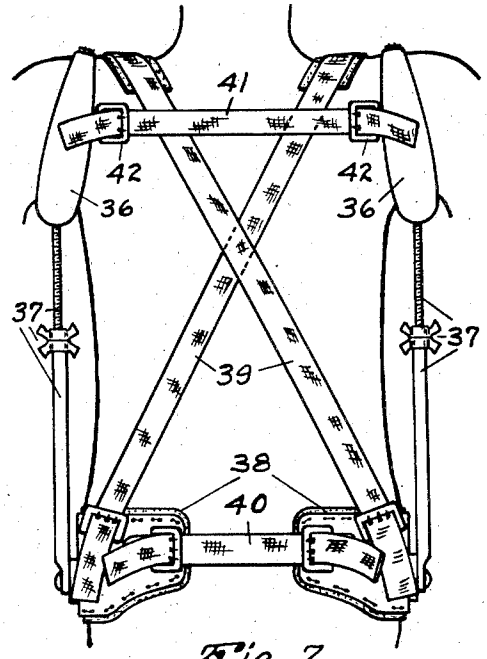


Fig. 7

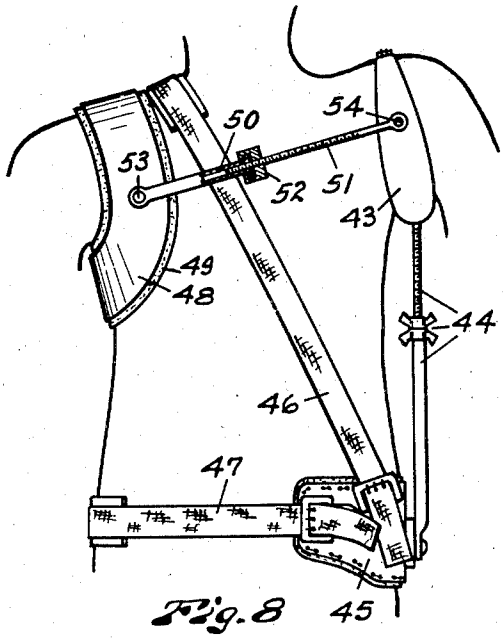


Fig. 8

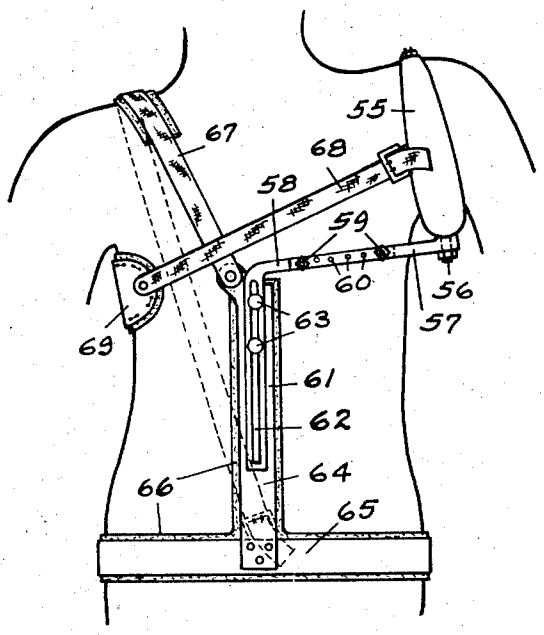


Fig. 9

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CRUTCH SPLINT

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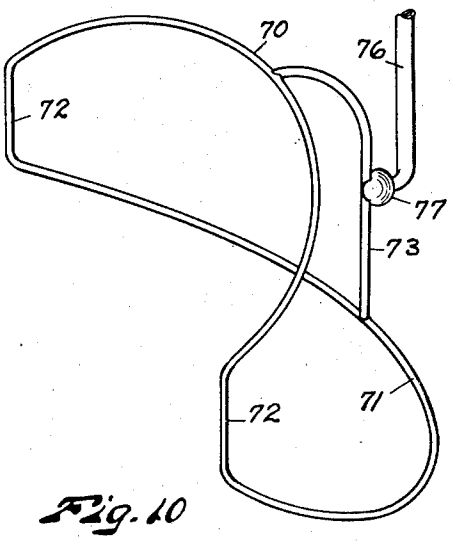


Fig. 10

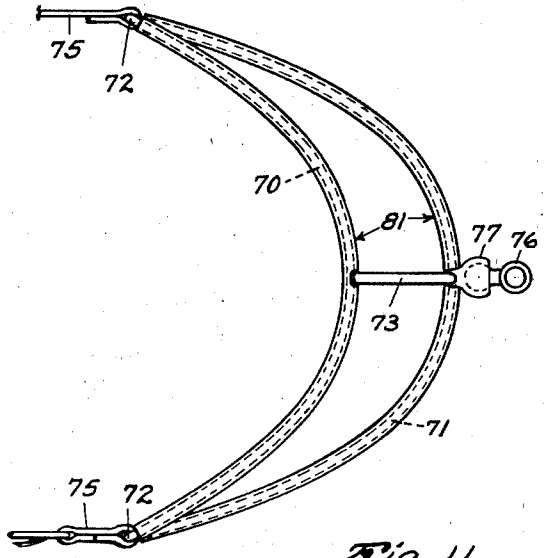


Fig. 11

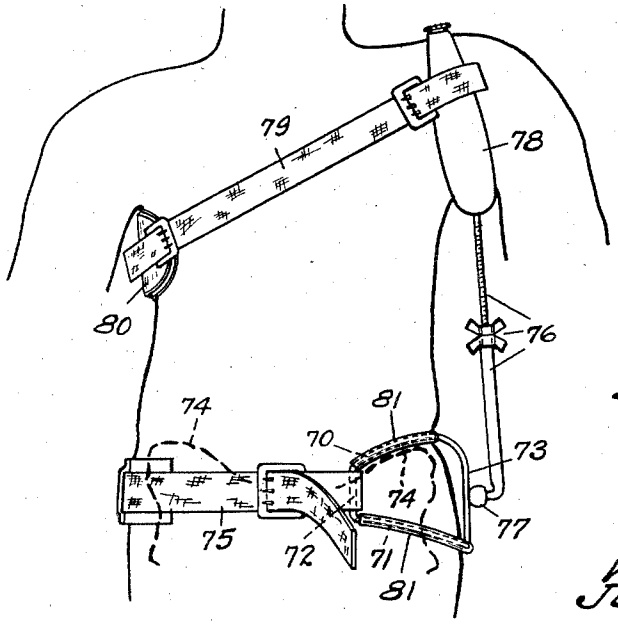


Fig. 12

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Patented Jan. 16, 1940

2,187,323

UNITED STATES PATENT OFFICE

2,187,323

CRUTCH SPLINT

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Application March 9, 1936, Serial No. 67,777

4 Claims. (Cl. 128—87)

This invention relates to a crutch splint of a form adapted to be used in the treatment or reduction of a fractured or broken clavicle or collar bone and of fractured or broken rib or ribs.

A primary object of this invention is to provide a crutch splint which will maintain the fractured clavicle parts or ribs in a predetermined position during treatment. The position desired during treatment is raising the arm and shoulder upwardly, holding the arm outwardly and holding the arm and shoulder in a backward or erect position and maintaining the chest in an expanded position.

An important object of the invention is to provide a crutch splint having a padded crutch member which is pivotally supported for swinging movement forwardly and rearwardly and is further supported for rotative movement on an upright axis and connected at the back of the body with rotative positioning means which holds the crutch member in a correct rotative position and draws and holds the shoulder back as far as the fracture requires.

Another object of the invention is to provide a crutch splint which will maintain the fractured end portions of the clavicle or rib substantially immovable relative to each other and at the same time otherwise afford reasonable freedom of movement to the patient.

Other objects of this invention are to provide a crutch splint which is comfortable for the patient to wear, which permits free use of the arm on the injured side, including use of the forearm and hand and which makes it possible for the patient to be active during the time he is wearing the crutch splint.

Other objects of the invention are to provide a crutch splint which is capable of repeated use, is adjustable and bendable or formable to insure an accurate and comfortable fit and to fit different individuals; is reversable and equally well adapted for use on either the right or left side, and is easily applied and removed but not readily displaced by normal activity of the patient.

Another object of the invention is to provide a crutch splint which leaves the injured parts open for inspection and massaging.

Another object of the invention is to provide a modified form of pelvic or hip plate adapted to rest securely on the top portion of the ilium or hip bone, thus supporting the major portion of the weight of the injured shoulder or side from the hip and making it possible to entirely dispense with the use of shoulder straps so that fractures of both clavicles or ribs on each side can be more practically treated.

It is a further object of this invention to provide a crutch splint which is also useful in the case of fractured ribs. The thing accomplished is the bringing together the fractured ends of the ribs, while at the same time relieving the patient of any pain in breathing, and which holds the chest at complete rest. The manner in which this is accomplished is by holding the shoulder on the injured side upwardly and backwardly, thus increasing the chest capacity. By holding the shoulder on the injured side upwardly and backwardly, the chest is expanded (in contrast to collapsed position), which tends to move the fractured ends of the ribs into alignment, prevents overlapping of the ends of the ribs, so that the ribs are properly positioned for healing. Furthermore, the crutch splint by holding the chest in a fully expanded condition prevents movement of the broken parts of the ribs relative to each other with the breathing of the wearer, which aids in the reduction of the fracture and the comfort of the patient.

The above mentioned general objects of the invention, together with others inherent in the same, are attained by the device illustrated in the following drawings, the same being preferred exemplary forms of embodiment of the invention, throughout which drawings like reference numerals indicate like parts.

In the drawings:

Figure 1 is a rear elevation of a crutch splint constructed in accordance with this invention as it may appear when applied to the patient;

Fig. 2 is a front elevation of the same;

Fig. 3 is a side elevation on a larger scale, with parts in section, of a crutch splint and support for the same constructed in accordance with this invention;

Fig. 4 is a fragmentary sectional view substantially on a broken line 4—4 of Fig. 3, of a pivot mounting means;

Fig. 5 is a detached elevation of an axilla plate embodied in the invention;

Fig. 6 is a sectional view of said axilla plate taken substantially on broken line 6—6 of Fig. 5;

Fig. 7 is an elevation showing a double or duplex crutch splint constructed in accordance with this invention as the same may appear when in use;

Fig. 8 is an elevation of a modified form of crutch splint constructed in accordance with this invention as the same may appear when in use;

Fig. 9 is an elevation of still another modified

form of this invention showing the same as it may appear when in use;

Fig. 10 is a detached perspective view of the metal frame portion of a modified form of pelvic bracket constructed in accordance with this invention;

Fig. 11 is a plan view of the bracket illustrated in Fig. 10, showing certain portions of said bracket provided with rubber tube padding means; and

Fig. 12 is an elevation of a crutch splint employing the bracket shown in Fig. 10, as this splint may appear when in use.

Figs. 1 to 5, inclusive, disclose a preferred embodiment of this invention comprising a semi-circularly shaped crutch member formed of an arcuate metal frame 12 embedded in padding material 13, as sponge rubber, and preferably covered with a soft covering 14, as of chamois skin or soft leather. The metal frame 12 is sufficiently pliant to permit it to be bent and shaped to fit different individuals but still retain its shape when in use. This contributes greatly to the comfort of the person wearing the splint. A downwardly extending straight stem 15 is rigidly secured to the metal frame 12. A tubular support 16 telescopically receives the lower end of the stem 15. The stem 15 is externally threaded for the reception of two wing nuts 17 which relatively jam and lock against each other and one of which rests on the top end of the tubular support 16, leaving the stem 15 and crutch member free to move rotatively. The wing nuts 17 form a readily operable means for adjusting the position of the crutch member vertically. The lower end portion of the tubular support 16 is pivotally mounted on a pivot member 18 which is secured to a curved supporting pelvic plate 19. The supporting plate 19 preferably has a pad 20 of soft material secured to the inner or concave side thereof. One preferred means for securing the pad 20 to the curved supporting plate 19 is to provide holes 21 in the plate 19 and sew or lace the pad 20 to the plate 19 by cord or thread 22 which is sewed or laced through the pad 20 and through the holes 21 in the plate.

The padded plate 19 forms a support which rests on the hip of the patient and provides means from which the crutch member is supported in a desired elevated position. By the arrangement hereinbefore described it will be apparent that the crutch member and parts 15 and 16 are free to pivot backwardly and forwardly on pivot 18 while the crutch member and stem 15 are free to move rotatively on the axis of the stem 15. This pivotal and rotative movement makes it possible to draw the shoulder of the patient back and hold it back.

The padded supporting plate 19 is supported on the hip of the patient by inclined sling strap means 23 which is adjustably secured, as by buckles 24, to the supporting plate 19 and passes up over a pad 25 on the shoulder on the opposite side of the patient. A belt strap 26 is also adjustably secured to the supporting plate 19, as by buckles 27, and passes around the body of the patient at the location of the hips. A pad 28 is preferably provided under the belt strap 26 where it passes around the hip opposite to the one against which the padded plate 19 rests.

A curved axilla plate 29 having a pad 30 secured thereto, see Figs. 1, 2, 5 and 6, is provided at the location of the arm pit or axilla of the patient on the side opposite to that being treated. This axilla plate 29 is curved to fit the curvature of the body and will not appreciably slip when in use so that it forms an anchor means at the location of the opposite shoulder. Two flexible and adjustable tightener straps 31 and 32, positioned respectively at the back and front of the patient, are connected by buckles 33 with the axilla plate 29 and with the two arms of the crutch member 12—13—14. The sling straps 23 preferably pass slidably through guides 34 on the tightener straps 31 and 32. By adjusting the tension of tightener straps 31 and 32 it is possible to draw and hold the patient's shoulder back in the correct location to properly position the fractured clavicle or ribs, the axilla plate 29 serving as an anchor means for the tightener straps.

The open top of the crutch member 12—13—14 is provided with an adjustable and releasable cross strap 35 which may be buckled across the top of the shoulder to provide means for holding the crutch means snugly in contact with the shoulder. It will be noted that the crutch member is inclined at an angle to the stem 15 (see Figs. 1 and 2) so that it will conform to the shape of the axilla and shoulder to which it is applied. This angle may be varied, within the limits required for adjustment, by bending the parts 12 and 15. This bendability of the crutch member makes it possible to provide much greater comfort for the wearer. The crutch member is relatively bulky especially in the portion which fits into the axilla so that it acts as a fulcrum and holds the tip of the shoulder outwardly enough to insure proper relative longitudinal adjustment of said fractured clavicle portions.

In applying this crutch splint to a patient the crutch member may be fitted into the axilla and the top strap 35 fastened. The padded pelvic plate 19 may then be adjusted to the hip, the stem 15 fitted into the tubular support 16 and the sling straps 23 and belt strap 26 fastened. The axilla plate 29 is adjusted to the axilla of the opposite arm and the tightener straps 31 and 32 fastened. After the crutch splint has been applied as above described it may be adjusted to properly position a fractured clavicle or ribs by adjusting the wing nuts 17 to raise the shoulder to the required height and adjusting the tightener straps 31 and 32 to draw the shoulder back into the proper position. This adjustment of the tightener straps 31 and 32 requires a loose adjustment of the anterior or front strap 32 and a tight adjustment of the posterior or rear strap 31. The tensioning of the rear strap 31 tends to impart a rotary movement to the crutch member on the axis of the stem 15 and this draws the shoulder back and holds it back. The axilla plate 29, being shaped to conform to the curvature of the body, will remain in the correct position under the opposite arm and resist slippage due to unequal tension of tightener straps 31 and 32. The thickness and bulk of the crutch member acting as a fulcrum under the arm on the injured side will hold the tip of the shoulder outwardly. This crutch, when properly adjusted, thus functions efficiently to hold the injured shoulder upwardly and backwardly and outwardly and to keep the chest fully expanded, thereby meeting all of the requirements necessary to properly reduce a clavicle fracture or rib fractures. The padding 13 of the crutch member is soft and yielding, thus eliminating all danger of crutch paralysis.

The plates 19 and 29 are preferably constructed of strong light weight non-corrosive material, as

aluminum, or aluminum alloy, thus reducing the weight of the apparatus to a minimum.

Fig. 7 shows a double crutch splint embodying two crutch members, designated generally by 36, adapted to be positioned under the two respective arms of a patient. The crutch members 36 are supported from the hips of the patient by two adjustable supporting means 37 connected with two padded pelvic or hip plates 38. The crutch members 36, supporting means 37 and pelvic plates 38 are identical with those hereinbefore described and illustrated in Figs. 1 to 6, inclusive. The pelvic plates 38 are supported by diagonal sling straps 39 and belt straps 40. Only one belt strap is shown but it is understood that there is a similar belt strap at the other side. The rear arms or forks of the two crutch members 36 are connected with each other by a transverse strap 41 which is adjustable by buckles 42. By tensioning the rear strap 41 the crutch member 36 may be rotated any desired amount on their upright axes to draw the shoulders rearwardly into their proper positions. The splint shown in Fig. 7 is particularly useful in cases of rib fractures on both sides of a patient. The operation of the splint shown in Fig. 7 is substantially the same as the operation of the splint shown in Figs. 1 to 6, except that the device shown in Fig. 7 supports both shoulders.

Fig. 8 shows a modification of the invention embodying a crutch member 43, supporting means 44, pelvic plate 45, sling strap means 46 and belt means 47 all similar to the corresponding parts hereinbefore described and illustrated in Figs. 1 to 6. In this modification of this invention, a shoulder ring 48 is provided to slip on over the arm and encircle the shoulder opposite to the injured shoulder of the patient. A pad 49 may be used in connection with this shoulder ring 48. An adjustable connector, in the nature of a rigid tubular support 50 receiving a threaded stem 51 connects one arm of the crutch member 43 with the shoulder ring 48. The stem 51 is threaded through a nut 52 which is rotatively connected with the end portion of the tubular support 50 in such a manner that the over all length of the connector formed by parts 50 and 51 may be increased or decreased by turning the nut 52. Two pivot members 53 and 54 connect the respective outer end portions of the tubular support 50 and threaded stem 51 with the shoulder ring 48 and crutch member 43. By adjusting the nut 52 on the connecting means 50—51, the crutch member 43 may be moved rotatively so as to hold the injured shoulder back in proper position. The operation of the splint device shown in Fig. 8 is substantially the same as the operation of the device shown in Figs. 1 to 6 in so far as supporting the shoulder and ribs is concerned.

Fig. 9 shows still another modified form of the invention in which a crutch member 55 is connected by a pivot 56 with a transverse supporting member 57. The member 57 is adjustably connected with another transverse supporting member 58 as by bolts 59 adjustable into different holes 60. The member 58 is rigid with an upright supporting member 61 which has a slot 62 and is adjustably connected by thumb screws 63 with an upright rigid plate member 64. The upright plate member 64 is positioned medially of the back of the patient and is secured to a metallic belt member 65 which extends around the hips of the patient. Padding means 66 is preferably provided inside the plate 64 and metallic belt member 65. A sling strap 67 is secured to the upper end of the upright plate member 64 and extends over the shoulder of the patient opposite to that being treated and may connect with the belt 65 at the front of the patient as indicated by dotted lines. This sling strap aids in preventing the belt 65 from slipping down. A tightener strap 68 adjustably connects the rear arm of the crutch member 55 with an axilla plate 69 positioned under the opposite arm of the patient, providing means for moving the crutch member 55 rotatively on the pivot 56 to draw the shoulder back into correct position. Vertical adjustment of the crutch member 55 is had by means of thumb screws 63 operating in slot 62. The adjustment afforded by bolts 59 in holes 60 takes care of individuals of different size and also makes it possible to exert an outward thrust on the shoulder and upper arm to obtain a desired positioning of the fractured portions of a clavicle or ribs.

In Figs. 10, 11 and 12 we have shown a modified form of hip or pelvic support which is adapted to support a crutch member solely from the hips, making it possible to dispense with diagonal shoulder straps employed in the devices shown in Figs. 1 to 9, inclusive. Dispensing with the shoulder straps and taking the load entirely off of the shoulders makes the splint shown in Figs. 10, 11 and 12 especially desirable in cases of fractures on both sides of a patient. The distinctive features of the device shown in Figs. 10, 11 and 12 reside in the provision of a different type of hip or pelvic support adapted to be supported on the hip bone or ilium; and in the provision of universal joint means connecting said pelvic support with upright supporting means by which a crutch member is supported. This pelvic support comprises a metal frame capable of being bent or formed so as to best fit the body and most comfortably and efficiently support the load. This pelvic support embodies an upper curved member 70 and a lower curved member 71 connected with each other at the ends by upright portions 72 and connected together substantially midway between the two ends by a generally upright member 73 which is secured to, and extends substantially vertically from, the lower curved member 71 and is thence curved inwardly and secured to the upper curved member 70. When this pelvic support is applied to a person the upper curved member 70 is pressed against and due to its small cross sectional area depresses the yielding flesh portions of the abdomen just above the hips and rests upon the crest of the ilium 74, indicated by dotted lines in Fig. 12. The lower curved member 71 rests against the hip of the wearer. It is to be noted that this lower curved member is deeper and extends farther outwardly than the upper curved member 70. The member 73 extends outwardly from the upper curved member 70 clear of the hip and thence downwardly to the lower curved member 71. Belt means 75, connected with members 72, holds the pelvic support in place with the upper curved member 70 resting on the crest of the ilium 74 so that a load may be comfortably and firmly supported. Preferably padding means in the nature of rubber tubes 81 are provided on the upper and lower curved members 70 and 71. Adjustable upright supporting means 76 is pivotally connected with the member 73 of the pelvic support by a ball and socket or universal joint means

77. A crutch member 78 is supported by the supporting means 76. Tightener belt means 79, connected with the crutch member 78 and with an axilla plate 80, is used to adjust the crutch member 78 rotatively. No shoulder straps are used and the weight is comfortably supported from the hip of the patient. The ball and socket joint means 77 provides a maximum freedom allowing both the pelvic support and the crutch member to fit the body of the patient without binding or undue strain.

Manifestly the device herein described is applicable to the situation where a patient is suffering with partial paralysis of the muscles of the shoulders or ribs. In this case there may be no fracture whatever, but nevertheless the device is adapted to support the shoulders and the ribs so that there is no dropping of the shoulder and the ribs are prevented from collapsing upon the lungs and prevent the normal operation thereof.

Obviously, changes may be made in the forms, dimensions and arrangement of the parts of this invention, without departing from the principle thereof, the above setting forth only preferred forms of embodiment.

We claim:

1. A crutch splint embodying, a pelvic support; a vertically adjustable rod supporting means mounted on said support and extending upwardly therefrom; a crutch member carried on the upper end portion of said rod supporting means, said crutch member being rotatably movable with respect to the axis of the rod supporting means; anchor means adapted to interfit with the body portion of a patient directly below the axilla opposite to the crutch member and said anchor means being adapted to be held substantially immovable with respect to the side of a patient opposite the crutch member; and crutch member positioning means comprising adjustable anterior and posterior connecting means joining the said anchor means to said crutch member.

2. In a crutch splint, a pelvic support; supporting means pivoted at one end portion to said pelvic support and extending upwardly therefrom; a crutch member carried by said supporting means and freely rotatably movable axially of said supporting means; anchor means adapted to interfit with the body portion of a patient directly below the axilla opposite to the crutch member and said anchor means being adapted to be held substantially immovable with respect to the side of a patient opposite the crutch member; and crutch member positioning means comprising adjustable tension strap means between the rear portion of said crutch member and said anchor means rotatively positioning said crutch member axially of said supporting means.

3. In a crutch splint, a pelvic support; a tubular support pivoted at one end portion to said pelvic support and extending upwardly therefrom; a threaded supporting rod telescopic within said tubular support; nut means on said rod positioned to rest on the upper end portion of said tubular support providing rotary movement and longitudinal adjustment of said supporting rod; a padded crutch member secured to the upper end portion of said supporting rod; and positioning devices connected with said crutch member and adapted to be connected with the body of a patient at the opposite shoulder to the crutch means.

4. In a crutch splint, a pelvic support; upright supporting means pivoted at one end portion to said pelvic support; a crutch member carried by said supporting means and rotatively movable axially relative to said supporting means; shoulder ring means adapted to be held substantially immovable by the shoulder of the patient opposite to that injured; and adjustable devices connecting the crutch means with the shoulder ring means providing rotary adjustment of the crutch means axially of the supporting means.

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