

Sept. 1, 1936.

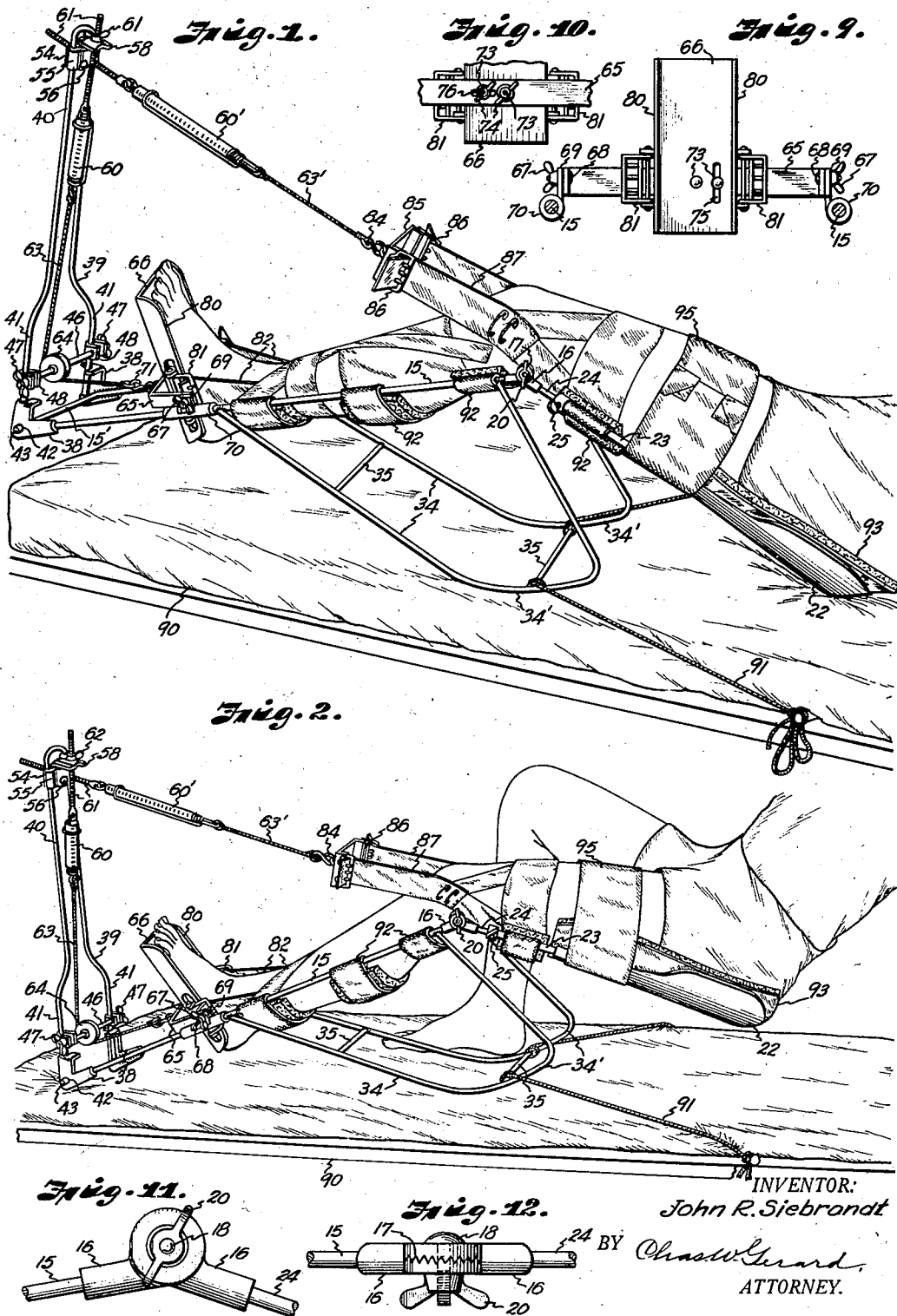
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LEG SPLINT STRUCTURE

Filed Oct. 13, 1934

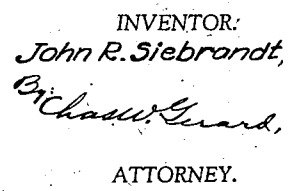
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UNITED STATES PATENT OFFICE

2,052,990

LEG SPLINT STRUCTURE

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Application October 13, 1934, Serial No. 748,202

9 Claims. (Cl. 128—85)

The present invention relates to surgical apparatus, and has for its object to provide a novel and improved form of traction appliance adapted for use more especially in the reduction of leg fractures,—the present application being a continuation, so far as common subject-matter is involved, of my co-pending application Serial No. 520,227, filed March 5, 1931.

One of the primary objects of the invention is to devise a leg splint structure for application to the patient in a recumbent position and which will provide an efficient and even or uniform cradling support for the entire leg and at the same time permit certain necessary movements for the comfort and welfare of the patient without disturbing the set position of the fracture.

For carrying out this object I have devised a splint structure having suitable supporting means adapted to rest upon a bed or cot and of such a character as to allow a rocking movement of the splint structure upon that portion of the support which underlies the middle or knee portion of the splint, whereby the splint may be conveniently rocked in a forward direction in response to rising movements of the thigh or trunk portion of the patient. In its most efficient form the apparatus includes an extension provided with a pelvic plate or rest for supporting engagement with the buttock, for affording the most effective balance of the appliance with reference to the axis of its movement, as well as insuring as complete immobilization as possible of the limb while supported by the splint and during any movement of the splint itself as permitted by its rocking support.

It is further sought to devise an apparatus in which provision is made in connection with the pelvic support for affording an abutment for the counteraction of traction as applied to the upper leg or thigh portion of the patient and thus guarding against any shifting in the position of the patient upon said pelvic seat or support under the influence of traction or during any movement of the patient as provided for by the rocking feature of the apparatus.

It is further sought to provide a device of this character which is adapted to be constructed in either of the forms required for proper use with either the right or left leg of the patient, as well as to provide a construction having provision for all necessary adjustments and for the application of the usual tractive tensions to the parts both above and below the knee, and in such a manner that the operation of said tractive tension is

exerted uniformly in all the various positions of the appliance.

With the foregoing general objects in view, as well as various other minor objects as will appear in the course of the detailed specification, the invention will now be described by reference to the accompanying drawings illustrating a practical and efficient form of construction which has been devised for embodying the several features of improvement, after which those features and combinations of parts deemed to be novel will be particularly set forth and claimed.

In the drawings—

Figure 1 is a perspective view illustrating a splint appliance constructed in accordance with the present invention, and shown as applied to a bed supporting a patient in reclining position;

Figure 2 is a similar view, with the parts conforming to the movement of the patient in partly raised position;

Figure 3 is an enlarged perspective view of the apparatus, removed from the bed;

Figure 4 is a plan view of the pelvic supporting plate in detached relation;

Figure 5 is a transverse sectional view, representing a section taken on the line 5—5 of Figure 4;

Figures 6 and 7 are enlarged plan and sectional details of the top portion of the upright frame for anchoring the traction means (Figure 7 representing a section on the line 7—7 of Figure 6);

Figure 8 is an enlarged detail view of one of the connections at the end of the splint frame for said upright frame;

Figure 9 is a sectional view, representing a section taken on the line 9—9 of Figure 3, on a larger scale and showing a front view of the foot rest plate;

Figure 10 is a detail view showing the adjusting means at the opposite side of said foot rest plate; and

Figures 11 and 12 are enlarged detail views of one of the adjustable connections between the thigh and lower leg portions of the splint frame.

Referring now to said drawings in detail, these illustrate the splint or leg supporting structure as comprising a pair of side rods 15 integrally connected by a transverse rod portion 15' at the foot end of the splint frame, while at the knee portion said rods 15 are provided with hinge brackets 16 formed with rosette clamping faces 17 connected by hinge bolts 18 provided with wing nuts 20 for clamping said brackets in any set angular relation. These brackets 16 provide appropriate connections for the thigh and

pelvic portion of the apparatus comprising a plate 22 carried by telescoping tubes 23 and rods 24 connecting with corresponding brackets 16, as clearly illustrated in Figure 3, suitable clamping screws 25 being provided at the ends of the tubes 23 for securing the proper length adjustment of this part of the apparatus according to the patient's thigh. As will be noted, the plate 22 is of appropriately curved design to conform to the buttock of the patient, and at one side—corresponding to the inner side of the thigh—a further pronounced depression is formed, indicated at 27, to provide a shoulder 28 for abutting engagement with the muscular portion at this point, as a means for counteracting the pull of traction as applied to the thigh, as hereinafter explained.

For a further anchorage at this point, for the same purpose, a post may be provided in the form of an upright stem 30 secured at the forward edge of said depression 27 and fitted with a rubber ferrule 32 as an abutment for the thigh to prevent any forward shifting of the patient upon the pelvic seat.

To the under sides of the rods 15 are secured—as by soldering or the like, a pair of curved and approximately U-shaped supporting frames 34, braced by cross members 35 and providing a rocker-like support for the splint structure, one end of each of said frames 34 being secured adjacent the hinge bracket 16 and the other end being secured some distance from the foot end of the splint frame. The contour of the frames 34 is such as to provide moderately curved rocker portions 34' underlying the hinged portions of the splint frame, thereby affording a support which permits the splint to be rocked forwardly and rearwardly in response to corresponding movements of the patient but without disturbing the set position of the fracture.

The opposite side corners at the forward end of the splint frame comprising the rod portions 15 and 15' are fitted with angular corner brackets 38 (which may be welded or soldered to the frame) for the attachment of a frame member 39 comprising a rod bent into shape to provide a narrow upper frame portion 40, with the lower ends 41 of the rod spread apart sufficiently for engagement with the brackets 38, which are provided with openings 42 for receiving the outward bent terminals 43 of the rod. The terminals 43 thus form journals for mounting of the frame member 39 in swinging relation to the brackets 38, and the latter are formed with latch nibs 44 for latching engagement with said lower end portions of the frame 39, whereby the latter is maintained latched in approximately upright position, as shown in Figures 1 to 3.

The lower ends 41 of the frame member 39 are braced by a cross-bar 46 threaded at its ends for wing nuts 47 engaging U-shaped clips 48 fitted to said lower ends 41,—suitable keys 50 being carried by the cross-bar in engagement with the inner sides of the clips 48, whereby turning of the nuts 47 serves to clamp said clips securely to said lower end portions of the frame 39. In this connection it may be noted that by loosening of the clips 48 the cross-bar 46 may be adjusted upon the frame 39 as required, or by the loosening of either of said clips the frame may be sprung for releasing its terminals from the brackets 38 to enable the frame to be detached therefrom and conveniently removed from operative position when desired.

The frame member 39 serves as a framework

for the mounting of tension or traction pulling means for the application of a tractive pull upon the leg of the patient, either above or below the knee, as illustrated in Figures 1 and 2. For this purpose the upper end of the frame 39 is fitted with a bracket structure comprising a pair of plates 54—55 adjustably clamped to opposite sides of the frame by means of a bolt 56 and wing nut 57, and the top of the plate 54 is formed with an extension 58 bent backward through the frame and over the upper edge of the other plate 55, to provide an attaching means for the anchorage of the traction means for the lower leg portion of the patient. This traction means comprises a suitable dynamometer 60 attached by an adjustable link 61 and nut 62 to said extension 58, and a cord 63 operating around a pulley 64 journaled on the cross-bar 46 and attached to a bail 65 carrying a foot rest 66 from which the usual traction connections are made to the patient's leg. The opposite ends of the bail 65 are journaled on bolts 68 mounted in lugs 69 formed on ferrules 70 which are slidably adjustable on the sides 15 of the splint frame, said bail being adapted to be secured in adjusted position by means of suitable wing nuts 67.

The foot rest 66 comprises a plate connected with the bail 65 by means of a pair of bolts 73 and nuts 74, one of which bolts also carries a hook 71 for attachment of the cord 63, while for the other bolt 73 both the plate and bail are formed with slots 75 and 76 respectively at an angle to each other, whereby the foot rest may be adjusted angularly with reference to the first bolt, and thus clamped in various adjusted positions as required. The plate 66 is formed with side flanges 80 to which are attached any appropriate form of buckles 81 for the securing of the tapes 82 comprising the conventional form of adhesive hitch applied to the patient's leg (see Figures 1 and 2).

The traction means for the thigh portion of the leg comprises a similar form of dynamometer 60' attached by an adjustable link 61' and nut 62' to the bracket structure 54—55, and connected with a cord 63' which is attached by means of a hook 84 to the middle portion of a plate 85, the opposite ends of which are equipped with suitable buckles 86 for the securing of the tapes 87 used for the adhesive hitch applied to the thigh, as illustrated in Figures 1 and 2.

The method of applying and using the splint structure is illustrated in Figures 1 and 2 of the drawings. The device is placed upon the bed 90 and conveniently secured thereto by means of a cord or other suitable fastening 91, attached to one of the cross bars 35 of the rocker frame, and in such position that the rocker portions 34' will underlie the knee of the leg to which the splint frame is to be applied.

After the adhesive traction bandages 82 and 87 have been applied to the leg, this is placed within the framework of the splint, which is provided with the usual padded strips or bands 92 for cradling the leg, as well as with a suitable pad 93 underlying the buttock and upper part of the patient's thigh,—the length of the thigh portion of the splint frame having been adjusted and clamped by means of the screws 25, and the foot rest 66 having also been adjusted to bring it into engagement with the foot of the patient the same may be tilted laterally the required extent by loosening and tightening of the nuts 74 to permit angular shifting of the foot rest in an obvious manner. Suitable bands 95 are used for securing

the upper end of the splint frame to the thigh of the patient.

The traction devices are then connected to the foot rest member and to the plate 85 (if both are to be used), and then an appropriate degree of tension is produced, by proper adjustment of the respective nuts 62, for effecting the proper indicated tractive pull for extension purposes. In this connection it will be noted that the provision of the depression 27 in the plate 22 and forming the shoulder or abutment 28, together with the post 30, enables all the necessary traction to be applied to the thigh, without any tendency for the patient to slide forward out of proper position upon the pelvic rest or seat.

With this construction it is apparent that the patient is allowed a certain range of movement of the different parts of his body, including the parts supported by the splint structure as this is permitted to rock upon the curved supporting portions 34' of the frame, without disturbing in the least degree the proper setting of the fractured parts.

One of the most important features of the improved apparatus is the fact that the pelvic seat or support 22 is formed as a rigid extension of the remainder of the splint frame, so that the rocking action takes place by a bodily movement of the whole splint structure as supported by said curved rocker portions, thereby insuring such a supporting action as will preserve complete and effective immobilization of the fractured parts at all times, while at the same time permitting any proper movement of the splint upon said support. This is evident from the location of the curved rocker portions of the frames 34 in a position underlying the knee portion of the splint, which results in a counterbalancing of the parts below and above the knee, so that any excess load or pressure upon the splint below the knee simply causes the upper portion of the splint frame to hug all the more closely the thigh and pelvic region of the patient,—and vice versa. Moreover, it is of course obvious that the form and arrangement of said frames 34 is such that with the curved portions 34' projecting somewhat in a relation underlying the thigh portions of the splint frame, the normal tendency of the structure is to rock forward (i. e., toward the foot), with the result that this tends naturally to keep the thigh and pelvic portions of the splint frame raised against the corresponding thigh and pelvic regions of the patient.

Another important feature of advantage characterizing the improved apparatus is the ease and convenience with which the bed pan service may be carried out, since any lifting of the patient's body (as by raising himself with the aid of a pull strap or the like) automatically rocks the splint structure and affords ample space beneath the patient for this service, and without any disturbance whatever of the fracture. Such freedom of movement of the patient, and the ability to shift his position safely from time to time for greater comfort also promotes the process of reduction of the fracture, with a prospect for a more complete and earlier recovery than is possible with a completely passive state with its attendant bed sores and other complications.

A further feature of advantage with the improved construction is the possibility of employing the rocking splint as a lever, the lower end of which may be depressed for raising the patient, who may be too weak or feeble to offer any assistance in the use of the bed pan. Likewise, in bathing the leg, or other operations, such as chang-

ing the padding at the various points, the splint member may be rocked to produce sufficient space between the leg and splint parts,—without disturbing the fractured parts.

In the event of the traction devices being dispensed with, in some cases, the frame member 39 and the parts carried thereby may be readily removed from the brackets 38 in the manner already indicated (the cord 63 being disconnected from the foot rest), and the remainder of the appliance simply used as a supporting splint. The pivotal connection of said frame and brackets also enables the frame 39 to be swung entirely around to the under side of the splint frame for compact packing or storing of the appliance when not in use.

It will therefore be apparent that I have devised a practical and efficient splint construction and apparatus adapted to fulfill all the desired objects of my invention for the treatment of leg fractures; and while the foregoing in the light of the drawings submitted represents what is now regarded as the preferred form of embodiment of the improvements as well as method of practicing the invention I desire to be understood as expressly reserving the right to make whatever changes or modifications may fairly be deemed to fall within the spirit and scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a splint construction for leg fractures, a splint structure comprising substantially rigid frame portions connected in fixed relation for embracing the leg both above and below the knee, and a pair of spaced rocker members connected with and underlying the knee portion of said frames and affording the same free rocking movement.

2. In a splint construction for leg fractures, a splint structure comprising a substantially rigid frame for embracing the leg both above and below the knee, a pelvic rest or seat in rigid relation to one end of said frame, and rockable supporting means connected with the knee portion of said frame and affording the same free rocking movement.

3. In a splint construction for leg fractures, a splint structure comprising a substantially rigid frame for embracing the leg both above and below the knee, a pelvic rest or seat adjustably connected in rigid relation to one end of said frame, and rockable supporting means connected with and underlying the knee portion of said frame and affording the same free rocking movement.

4. A splint construction for leg fractures comprising a splint structure having frame portions for embracing the leg both below and above the knee, said frame portions being connected for relative angular adjustment at the knee, and spaced rockable supporting structures connected with and underlying the knee portion of said first structure and affording the same free bodily rocking movement.

5. In a splint construction for leg fractures, a splint structure for embracing the leg both above and below the knee and provided with a pelvic seat or rest, and spaced rockable supporting means connected with and underlying the knee portion of said structure and affording the same free rocking movement.

6. In a splint construction for leg fractures, a splint structure for embracing the leg both above and below the knee and provided with a pelvic

seat or rest, having means for abutting engagement with the patient in a direction to oppose tractive pull for extension purposes, and rockable supporting means connected with and underlying the knee portion of said structure and affording the same free rocking movement.

7. A splint construction for leg fractures comprising a splint structure having frame portions for embracing the leg both above and below the knee, and spaced rocker frames connected to said frame portions in underlying supporting relation thereto and formed with curved portions constituting rockers affording said splint structure free bodily rocking movement.

8. In a splint construction for leg fractures, a splint structure comprising a substantially rigid frame adapted to embrace the leg both above and below the knee, a pelvic rest or seat in rigid

relation to the thigh embracing portion of said frame, and supporting means connected with said frame and comprising frame members having rocker portions projecting into underlying relation to said thigh embracing portion of the splint frame whereby the normal rocking tendency of the structure serves to raise the thigh and pelvic portions thereof toward the patient.

9. In a splint construction for leg fractures, a splint structure comprising a substantially rigid frame for embracing the leg both above and below the knee, a pelvic rest or seat in rigid relation to one end of said frame, and supporting means connected with the knee portion of said frame in supporting relation thereto and affording the same free rocking movement.

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