March 6, 1934. G. E. TORNSJO 1,950,331

ADJUSTABLE HUMERUS SPLINT

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Fig. 1.

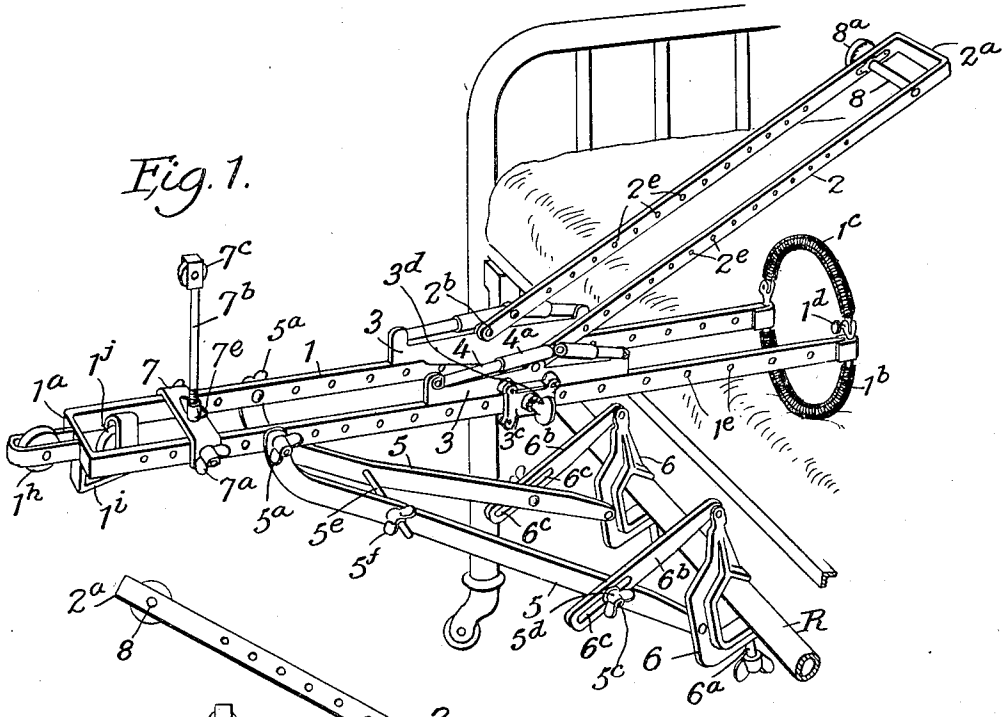
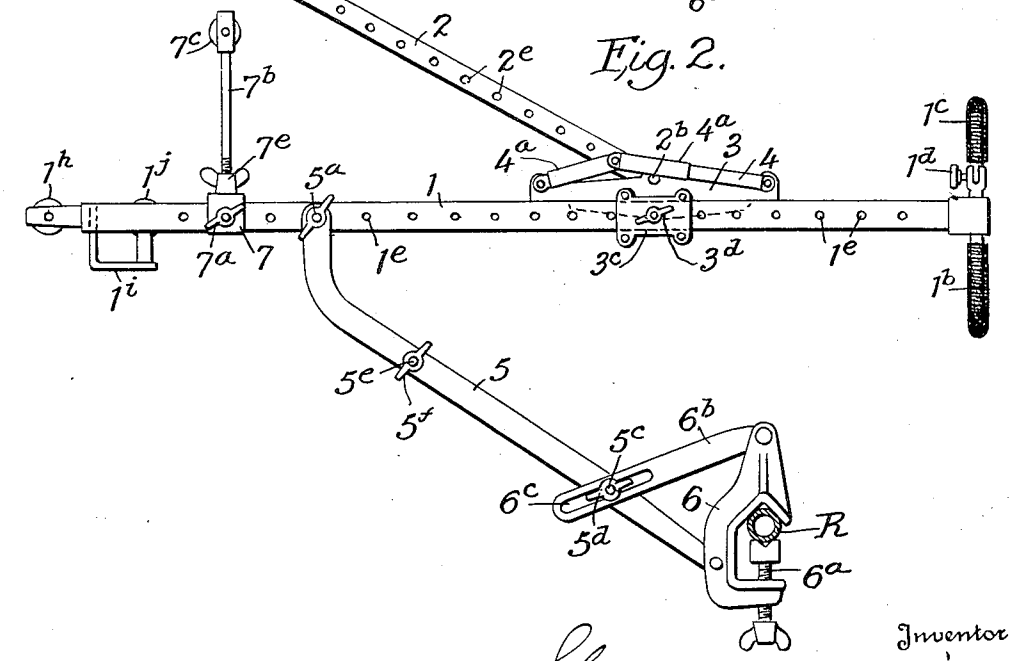


Fig. 2.



Inventor

Gustaf E. Tornsjo

By Alexander & Farrell

Attorneys

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Fig. 4.

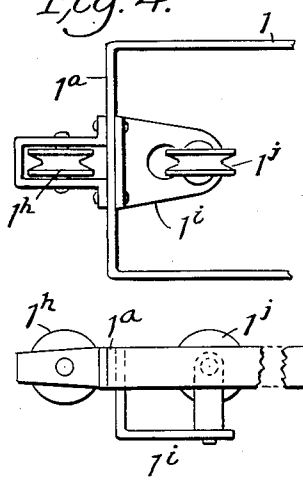


Fig. 3.

Fig. 5.

Fig. 7.

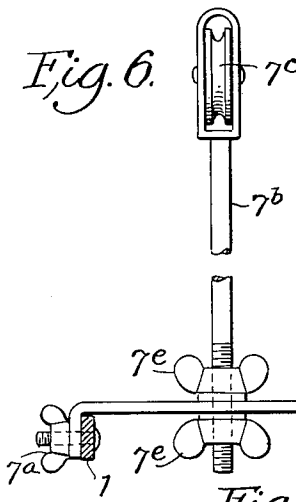


Fig. 8.

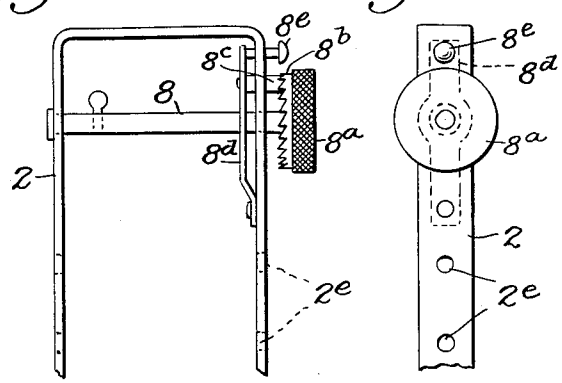


Fig. 9.

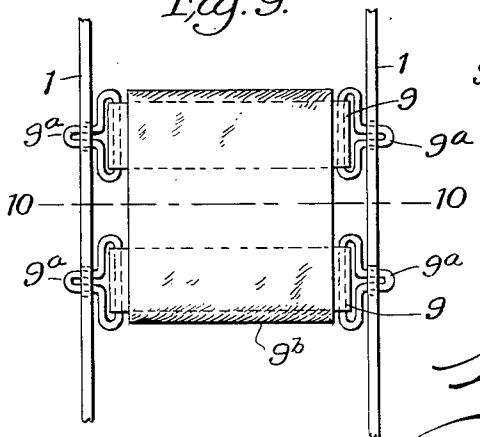
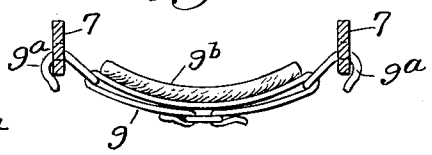


Fig. 10.



Inventor

Gustaf E. Tornsjo

By Alexander Forell

Attorney

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Fig. 11.

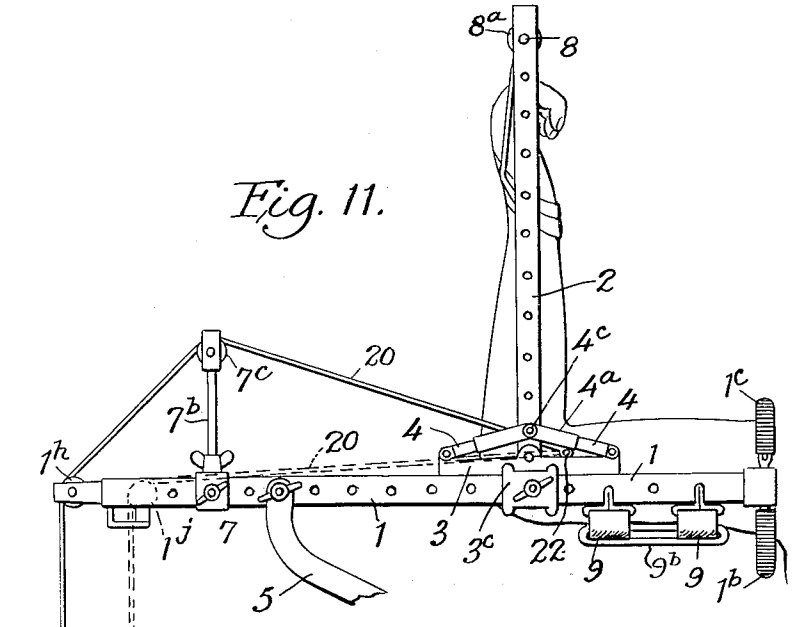


Fig. 13.

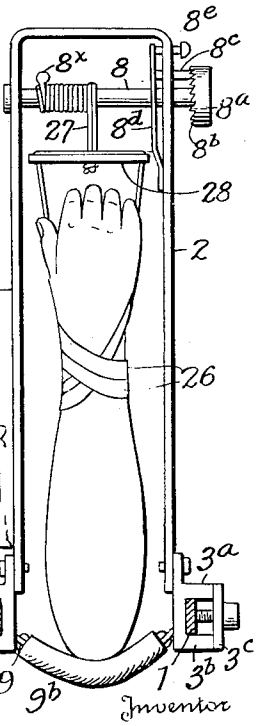
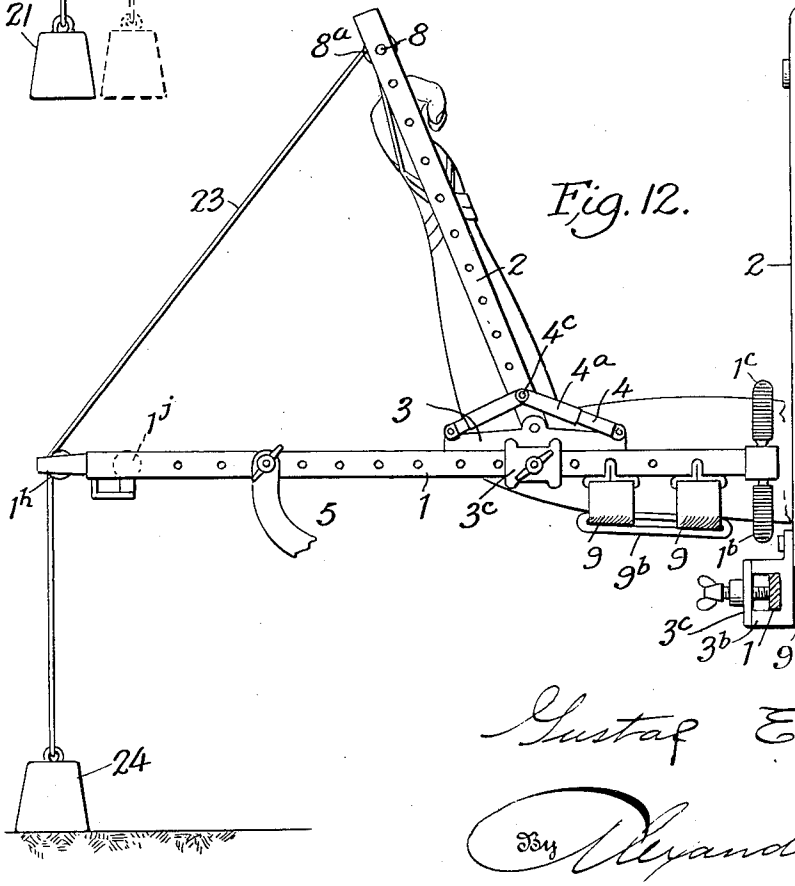


Fig. 12.



Inventor

Gustaf E. Tornsjo

By Alexander & Dowell

Attorneys

Patented Mar. 6, 1934 1,950,331

UNITED STATES PATENT OFFICE

1,950,331

ADJUSTABLE HUMERUS SPLINT

Gustaf Elof Tornsjo, Columbia, Mo., assignor to Research Foundation, Inc., Columbia, Mo., a corporation of Missouri

Application March 20, 1933, Serial No. 661,799

6 Claims. (Cl. 128—88)

This invention is a novel splint for use in the treatment of injuries to the arm of a patient, and especially useful in treating fractures of the humerus by traction and mobilization, and its object is to provide a splint which can be attached to the bed in which the patient lies, and adjusted to support the upper arm and forearm in any desired positions, and is provided with means for raising or lowering the upper arm to any level desired away from the horizontal, and for adjusting the forearm to any angle desired relative to the upper arm. It also provides means whereby the arm may be readily supported in proper position while being bandaged and can be adjusted and manipulated as required during the treatment of the injured member.

In the accompanying drawings I have illustrated one practical embodiment of the invention and will describe the same with reference thereto, to enable others familiar with the art to readily use the same. The essential features of the invention and novel combination of parts for which protection is desired are summarized in the claims.

In the drawings:—

Fig. 1 is a perspective view of the splint and means for detachably attaching the same to the bed in which the patient lies.

Fig. 2 is a side elevation of the splint detached.

Fig. 3 is an enlarged view of the splint adjusting devices.

Fig. 4 is a detail top plan view of the outer end of the supporting frame.

Fig. 5 is a sectional view on the line 5—5, Fig. 3.

Fig. 6 is a transverse section of the frame showing the means for adjusting the pulley supporting standard thereon.

Fig. 7 is a detail view of the means on the splint for adjusting the traction on the forearm.

Fig. 8 is a side view of Fig. 7.

Fig. 9 is a detail view showing the detachable pads attached to the frame.

Fig. 10 is a transverse section on the line 10—10, Fig. 9.

Fig. 11 is a side elevation illustrating use of the splint for producing tension on the upper arm.

Fig. 12 is a similar view illustrating use of the splint for maintaining the forearm in a fixed position.

Fig. 13 is an end elevation illustrating use of the splint for producing tension on the forearm.

The splint comprises a base frame, for supporting the upper arm; and a perpendicular splint frame for supporting the forearm. The base frame is composed of parallel side bars 1 spaced apart sufficiently to permit easy placing of a patient's arm or forearm therebetween. Each of the bars 1 is provided with a series of equi-spaced perforations 1*e* for a purpose hereinafter explained. The outer ends of bars 1 are connected, preferably by a transverse piece 1*a*; and the inner ends of the bars 1 are connected to opposite ends of a semi-circular member 1*b*, to one end of which is hinged a similar member 1*c* which with member 1*b* forms a split ring. The free end of the member 1*c* may be secured to the other end of member 1*b* by a thumb screw or other suitable device indicated at 1*d*. The member 1*c* can be turned back out of the way when the patient's forearm is to be placed between the bars 1 of the base frame. The ring members 1*b*, 1*c* are preferably covered with rubber as indicated.

The perpendicular splint frame is composed of parallel side bars 2, connected at their outer ends preferably by a cross piece 2*a*, and their inner ends are pivoted respectively as at 2*b*, to supports 3. The bars 2 are also provided with equi-spaced perforations 2*e* for a purpose hereinafter described.

The supports 3 are slidably and adjustably mounted on the bars 1 and may have flanges 3*a* and 3*b* (Fig. 5) respectively above and below the bars extending in front of the bars 1, and attached to the outer faces of the flanges 3*a* and 3*b*, are plates 3*c* through which are tapped thumb screws 3*d* adapted to frictionally engage the outer sides of bars 1 whereby by tightening screws 3*d* the supports 3 can be fixed in adjusted positions on the bars 1.

Each bar 2 is connected above its pivot 2*b* to opposite ends of the supports 3 preferably by resilient members composed of telescopic tubes 4 and 4*a* (Fig. 3) enclosing springs 4*d*. The outer end of each member 4 is pivoted at 4*b* to a lug on the adjacent end of the member 3, and the inner end of each member 4*a* is pivotally connected to a pin 4*c* on the bar 2. Within the telescopic members 4, 4*a* are preferably arranged expansion springs 4*d*. These resilient members tend to hold the splint frame 2 in a position perpendicular to bars 1, the inclination of the splint frame 2 relative to the bars 1 being regulable and preferably controlled as hereinafter described.

The frame bars 1 may be supported on the bed by any suitable means, preferably by means of a supporting frame composed of opposite bars 5 adjustably connected at their upper ends to the bars 1 by means of bolts 5*a*, which may be engaged

with perforations 1e in the bars 1 and secured by thumb nuts. Each of the bars 5 is pivoted at its lower end to a clamp member 6 provided with an adjustable bolt 6a tapped through the lower jaw thereof, the upper jaw of the clamp engaging the side rail R of the bed in which the patient is lying (see Fig. 1). The angle of adjustment of the base frame 1 can be varied by means of links 6b, pivoted on the clamp members 6 and having slots 6c transfixed by bolts 5c passed through the slots in links 6b and into the bars 5 and secured by thumb nuts 5d (see Figs. 1 and 2).

The bars 5 may be braced by a tie rod or bolt 5e adjacent their upper ends, which rod or bolt 5e is adjustable by means of a thumb nut 5f.

Mounted on the base frame is an adjustable cross-plate 7 (Figs. 1, 2 and 6) which can be secured in position on bars 1 by clamp bolts provided with thumb nuts 7a. The cross-piece carries a standard 7b, in the upper bifurcated end of which is journaled a pulley 7c. The standard 7b may be threaded through the piece 7 so that it can be adjusted up or down, and may be locked in adjusted position by means of opposed thumb nuts 7e.

To the outer face of end piece 1a of the base frame is secured a bracket carrying a pulley 1h (Figs. 1, 2 and 4); and attached to the inner face of said end piece 1a is a bracket 1i in which is mounted a pulley 1j.

Mounted in the bars 2 adjacent the end bar 2a is a rotatable shaft 8 (Figs. 1, 7 and 8) to which a cord may be attached. On one end of this shaft 8 is a disk 8a, preferably knurled, having ratchet teeth 8b on its inner face (Figs. 7 and 8). These teeth are adapted to be engaged by a pawl 8c which is normally pressed outward by a flat spring 8d on which the pawl is mounted, the spring being attached at one end to the adjacent bar 2 and carrying a thumb piece or button 8e. By pressing button 8e inwardly the pawl 8c can be disengaged from the ratchet 8b.

In preparing the apparatus for use, the base frame and the perpendicular splint frame are adjusted to convenient positions to receive the patient's arm preparatory to bandaging it. To support the arm during bandaging I provide detachable pads, see Figs. 9 and 10, which preferably consist of felt pads 9b carried by adjustable straps 9 connecting hooks 9a. The hooks 9a can be engaged with opposed perforations 1e or 2e in the opposite bars 1, or 2 respectively. A sufficient number of these pads are placed in position to comfortably support the patient's arm during the bandaging, and these pads 9b constitute the main support of the arm and forearm as long as the splint is used.

In operation when tension is desired for the upper arm the two pulleys 7c and 1j are used. Adhesive tapes (not shown) are wrapped along and around the upper arm when in the position shown in Fig. 11, and a cord 20 is attached at the elbow where the tapes converge and is passed over one of the pulleys 7c or 1j, with a weight 21 attached at the other end of the cord to produce the desired tension. This tension on the upper arm also tends to hold the rubber-covered ring 1b, 1c of the splint against the patient's side and shoulder thereby securing necessary stability.

If it is desired to keep the upper arm in a horizontal position the cord 20 is run over pulley 1j, as shown in dotted lines in Fig. 11. The pulley 7c is used if a slightly upward pull or tension away from the horizontal is desired and the cord passed over pulleys 7c and 1h as shown in full lines in Fig. 11. The pulley 7c is, as hereinbefore stated, adjustable as to height, and may be adjusted at any time should it become necessary. If adhesive tapes cannot be used around the upper arm a Steinman pin 22 is inserted through the lower part of the humerus, and the cord 20 and weight 21 attached to the pin in the same manner above described.

The perpendicular splint frame in which the forearm is bandaged is used mostly as an exerciser. In order to keep the muscles soft and pliable the patient may swing the arm back and forth against the action of the opposed springs 4d (Fig. 3) which being oppositely acting tend to keep the perpendicular frame upright. These springs would normally keep the lower arm in a perpendicular position, which is desirable, but will also yield to the pressure of the arm which may be done without injury to the fractured parts. If this movement were not possible and the arm kept in a stationary position during healing of fracture it would take several months to limber up the muscles.

It is, however, sometimes desirable to keep the forearm in a certain position, relative to the humerus, and the pulley 1h is used for that purpose. A cord 23 is fastened to the shaft 8 and run through pulley 1h to a weight or fixed object 24 on the floor, as shown in Fig. 12.

The ratchet 8b and pawl 8c at the end of the perpendicular frame (Figs. 7 and 8) is used for tension on the forearm. As shown in Fig. 13 adhesive tapes 26 are applied along the forearm and the ends secured to a cross member 28 suspended from a cord 27 attached to a peg 8x on shaft 8. When the ratchet 8a is turned the proper tension on the forearm may be obtained, and the pawl will prevent backward rotation of the shaft 8.

I claim:—

1. In a splint of the character specified, a base frame comprising opposite side bars, supporting members adjustably mounted on said bars, a splint-frame comprising opposite bars respectively pivotally attached to the said suporting members, spring members at opposite sides of the splint-frame and respectively connected to the splint-frame and to the supporting members and adapted to hold the splint frame perpendicular to the base frame.

2. In a splint as set forth in claim 1, supports connected with the base frame, clamps connected to the lower ends of said supports adapted to engage the side of a bed and links, connecting said clamps and adjustably connected to said supports.

3. In a splint of the character specified, a base frame comprising opposite parallel bars, a split ring connecting the inner ends of the bars, supporting members adjustably mounted on said bars, a splint frame comprising opposite bars respectively pivotally attached to the said supporting members, telescopic spring members at opposite sides of the splint-frame and respectively connected to the splint-frame bars and to the supporting members and adapted to hold the splint-frame perpendicular to the base frame, means for supporting the upper arm of a patient in said base frame, and means for supporting the forearm of the patient in the splint-frame.

4. In a splint as set forth in claim 3, supporting bars connected with the bars of the base frame, clamps connected to the lower ends of said supporting bars adapted to engage the side

of a bed, and links connected to said clamps and adjustably connected to said supporting bars.

5. A splint comprising a base frame having opposite side bars and means for supporting a patient's upper arm on said frame, a splint-frame comprising opposite side bars pivotally mounted on the side bars of the base frame and adjustable longitudinally of said base frame, means for supporting a patient's forearm in the splint frame; and resilient means connected to the splint frame and adjustable longitudinally of the base frame normally holding the splint frame perpendicular to the base frame.

6. In a splint as set forth in claim 5, supports connected with side bars of the base frame, clamps connected to said supports adapted to engage the side rail of a bed, and bracing links connected to said clamps and adjustably connected to said supports.

GUSTAF ELOF TORNSJO.