F. I. SAEMANN.

SPLINT.

APPLICATION FILED MAR. 23, 1912.

1,196,887. Patented Sept. 5, 1916.

2 SHEETS—SHEET 1.

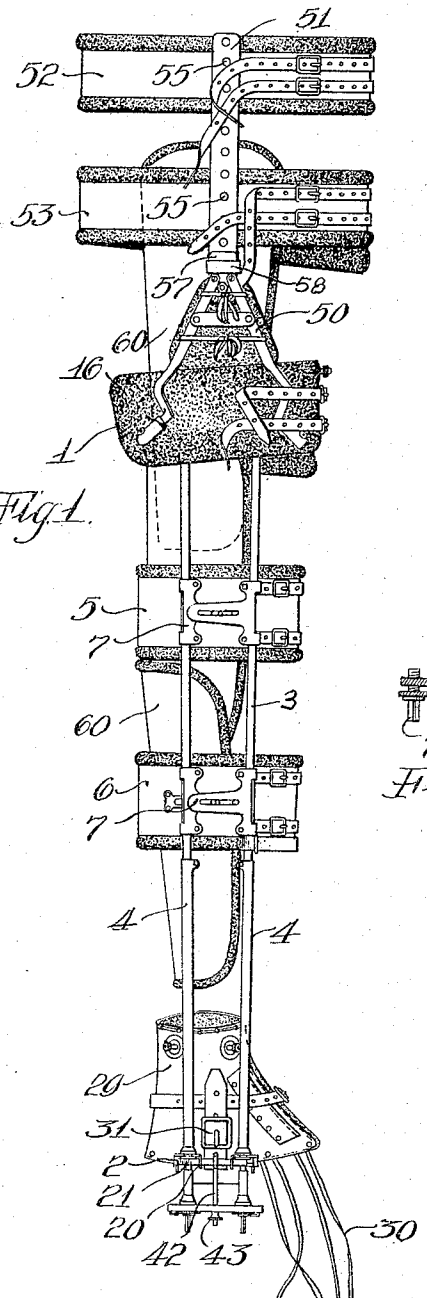


Fig. 1.

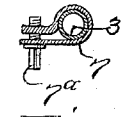


Fig. 9.

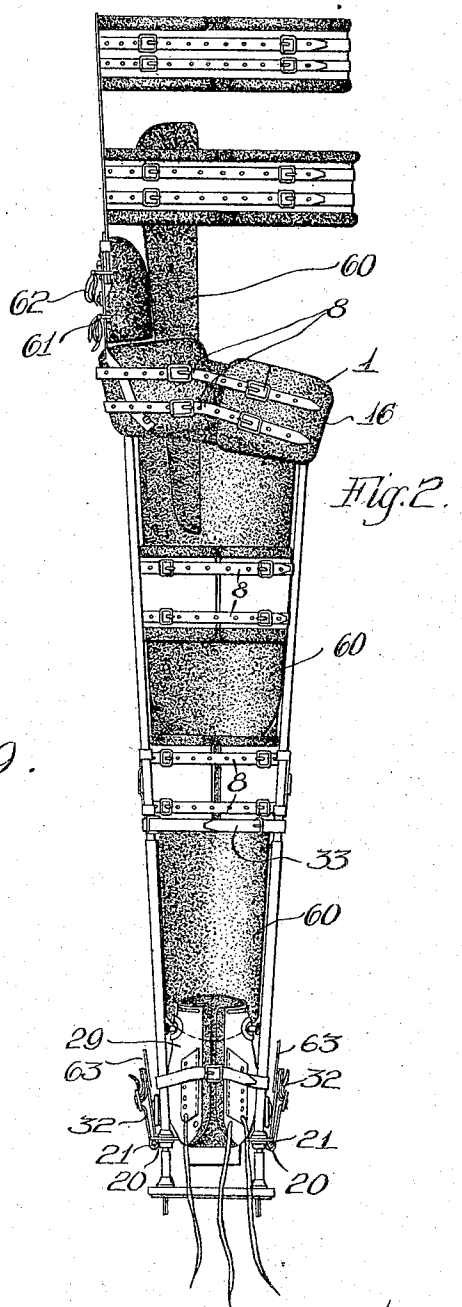


Fig. 2.

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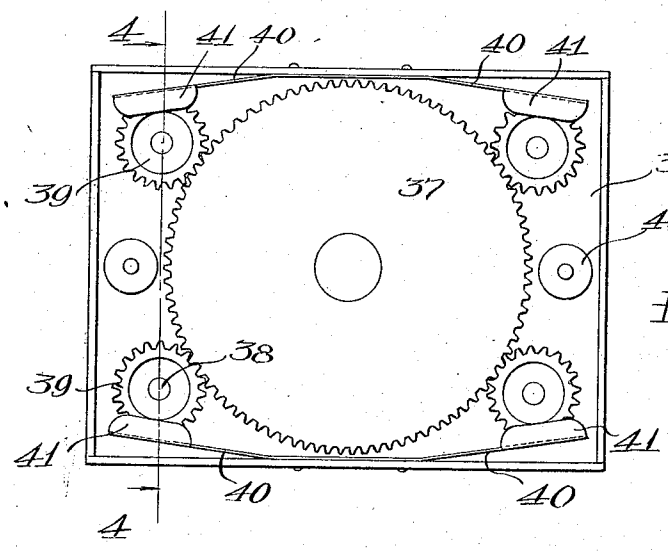


Fig. 3.

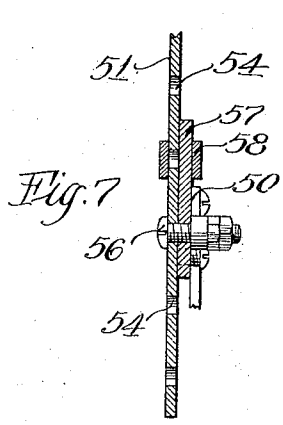


Fig. 7

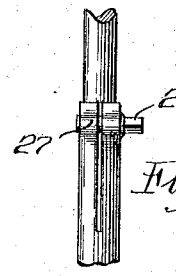


Fig. 5

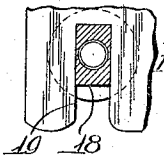


Fig. 6

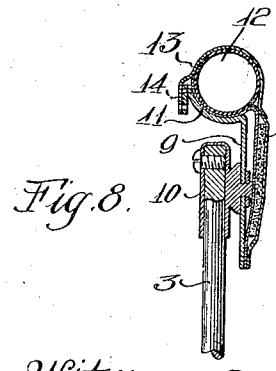


Fig. 8.

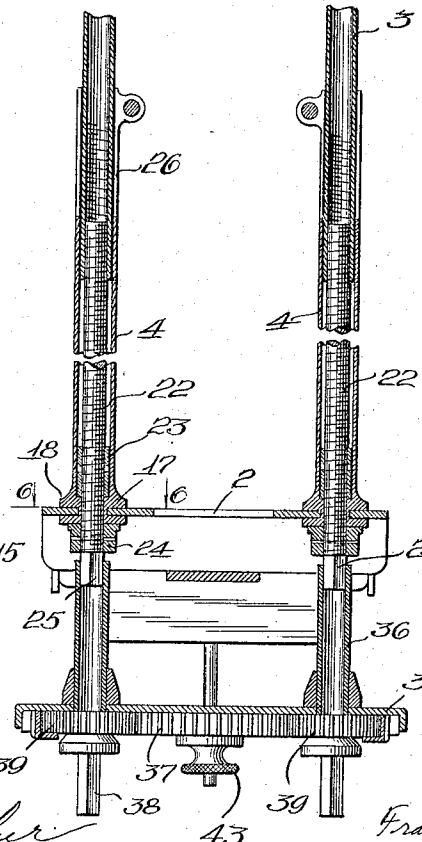


Fig. 4.

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THE NORRIS PETERS CO., PHOTO-LITHO. WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

FRANKLIN I. SAEMANN, OF OAK PARK, ILLINOIS.

SPLINT.

1,196,887. Specification of Letters Patent. Patented Sept. 5, 1916.

Application filed March 23, 1912. Serial No. 685,667.

To all whom it may concern:

Be it known that I, FRANKLIN I. SAEMANN, a citizen of the United States, residing at Oak Park, county of Cook, State of Illinois, have invented a certain new and useful Improvement in Splints, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to splints of the type illustrated in Letters Patent 653,179, and, generally speaking, has for its object to improve the same and extend its field of use.

The various features of novelty whereby my invention is characterized will hereinafter be pointed out with particularity in the claims; but, for a full understanding of my invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a side elevation of a preferred embodiment of my invention; Fig. 2 is a front elevation of the same; Fig. 3 is a bottom plan view of the compound key for adjusting the length of the splint; Fig. 4 is a section on line 4—4 of Fig. 3; Fig. 5 is a detail illustrating the connection between the telescoping tubes; Fig. 6 is a section on line 6—6 of Fig. 4, showing the connection between one of the tubes and the foot plate; Fig. 7 is a vertical section through the joint of the hip joint attachment; Fig. 8 is a vertical section through the seat cushion; and Fig. 9 is a section on a larger scale than Figs. 1 and 2 through one of the posts and one of the cushion supporting cross heads thereon.

The main portion of the splint comprises four long adjustable rods or posts on the upper end of which is a seat cushion 1 and fixed to the lower end of which is a foot plate 2. Each rod or post is made of two telescoped tubes 3 and 4. The seat cushion is in the form of an open ring which permits the rods to be spread apart at the top, while the lower ends of the rods are permanently spaced apart at the corners of a rectangle of sufficient length to permit a foot and ankle to be placed between the two rods on each side without touching them. On the rods between the seat cushion and the foot plate are a thigh cushion 5 and a leg cushion 6, both in the form of rings open on the same side as the seat cushion, that is, on the front of the splint. The cushions 5 and 6 are carried upon cross heads 7 each of which is slidably mounted on two of the rods on the same side of the splint and is adjustable so as to permit these rods to be moved from and toward each other and locked in any desired position by screw stud 7^a. Each cushion is provided with suitable straps 8 by which it may be secured in the form of a closed ring, thus immobilizing the portion of the limb about which it is placed.

The cushions 5 and 6 may conveniently be made of canvas or other strong material lined with felt on the inner side, the whole being covered with flannel or other material which may easily be removed, washed, and replaced. The seat cushion, by means of which counter-traction is obtained and upon which the weight of one side of the body rests when the patient walks on the splint, is made pneumatic so as to be as comfortable as possible. At the same time this cushion must give a firm support so as to prevent displacement of the splint on the patient. To this end I have made this cushion as shown most clearly in Fig. 8; there being one or more curved metal plates 9 provided with sockets 10 into which the upper ends of the telescoping tubes project and in which they are detachably secured in any suitable manner. The plate or plates lie on the inner sides of the tubes and have outwardly extending curved flanges 11 which overlie the upper ends of the tubes and form cushion-receiving seats directly above the tubes. In the curved seat lies a rubber tube 12 which may be inflated, when desired, in any suitable manner. The tube is incased in a canvas covering 13 which is secured on the outer side of the splint to a flange 14 projecting downwardly from the seat. On the inner side of the splint the canvas covering is secured to a soft pad 15 which overlies the inner face of the plate or plates 9 and gives a soft bearing surface for the hip. The whole may be covered with a piece of flannel as indicated at 16 in Fig. 1. When the tube is inflated it forms a soft comfortable cushion lying directly over the telescoping tubes of the splint, so that the most effective distribution of weight of the

patient upon the splint is obtained. Furthermore, by supporting the pneumatic cushion in a curved bearing seat which lies on the underside thereof, there is no danger that any portion of the patient will rest upon a hard unyielding corner or edge.

The means for adjusting the tubes is best shown in Fig. 4. The lower end of each of the tubes 4 is provided with an enlargement 17, the middle portion of which is reduced to form a rectangular neck 18. The foot plate is provided with slots 19 opening out through the edges thereof, there being one slot at each corner, and the width of the slots being the same as the widths of the reduced necks 18 on the tubes. The thickness of the metal of the foot plate is substantially equal to the lengths of the necks 18, measured lengthwise of the tubes. Consequently the foot plate may be assembled upon the lower ends of the tubes by simply slipping one of the reduced necks into each of the slots. The length of the slots limits the inward movement of the necks, and the rectangular configuration of the necks prevents the tubes from twisting. The plate may conveniently be locked in place by providing it with downwardly projecting flanges 20 on each side and screwing into each pair of flanges a stud 21 each of which lies against the outer sides of two of the tubes or, in other words, closes the outer ends of two of the slots in the foot plate and prevents the withdrawal of the tubes from the plate. It will be seen that this arrangement gives each tube a broad bearing both on the upper and on the underside of the foot plate and so produces an extremely rigid construction. In each of the tubes 4 is revolubly supported a long screw 22 whose upper end is screw-threaded into the lower end of the adjacent telescoping member 3. Relative axial movements between the members 4 and 22 is prevented by fastening a collar 23 to each of the screws at a point above the foot plate and a nut or collar 24 on the underside of the foot plate. If desired, the hole through the necks 18 may be smaller than the interior diameters of the tubes 4 so as just to leave room for the passage of the screws and provide transverse shoulders in the interior of the tubes for engaging with the collars 23. The nuts or collars 24 of course engage with the lower ends of the tubes instead of directly with the foot plate. Consequently each tube and its adjusting screw is independent of the foot plate. On the lower end of each of the screws is a square head 25 by which it may be turned. It will be seen that by turning one of the adjusting screws, the length of that telescopic tube with which it is associated may be lengthened or shortened independently of the others. Consequently, since the seat cushion is carried upon the upper ends of these tubes, its configuration may be changed so as to adapt it either to the right hand side or to the left hand side of the patient, or to raise or lower any portion thereof relative to the remainder so as to adjust it most advantageously for any condition encountered. The parts of each telescoped tube may be rigidly locked together in any adjusted position. This I accomplish by splitting the upper end of each of the tubes 4 longitudinally for a short distance, as indicated at 26, and providing at the sides of the slit outwardly projecting ears 27 through which extends a screw stud 28. By tightening the studs 28, the halves of the split tubes are drawn together and clamped tightly about the upper tube members. When the studs are unscrewed, the upper tube members are left free to slide up and down under the influence of the adjusting screws.

Detachably secured between the telescoped posts just above the foot plate is a pneumatic ankle cushion 29 in the form of the upper of a shoe and preferably provided with portions which may be inflated. The cushion is open in the front and is provided with suitable laces 30 by which it may be laced about the angle and beneath the foot. An adjustable strap 31 is fastened to the cushion 29 and passes around underneath the foot plate so as to tie the cushion to the lower end of the splint.

Secured on the foot plate, preferably by looping them around the screw-threaded member 21 are two straps 32 to which may be secured the lower ends of suitable adhesive strips as will be hereinafter described. Detachably secured to the two front tubes are straps 33, preferably looped around the members 3 just above the upper ends of the lower tubes, and hanging down so as to permit a temporary stirrup to be secured thereto for the purpose of supporting the foot of the patient when in a recumbent position as will be hereinafter explained.

The telescopic tubes provide a perfect means for obtaining a gradual steady and effective traction and counter-traction and for maintaining the same, in addition to affording means for adjusting the seat cushion and the length of the splint to suit the particular patient. After the splint has been placed on the patient, the adjustments having all been completed, it is desirable, in producing traction, to lengthen all four of the telescopic tubes or posts simultaneously and for this purpose I have provided a simple compound key by means of which all four of the adjusting screws may be turned simultaneously in either direction. The key comprises a supporting plate 35 of about the same size as the foot plate. On the upper side of the plate 35 are four rotatable posts 36 so spaced apart that when the key is placed under the foot plate each post will register with the squared head on one of the adjusting screws. Each of the posts 36 is

provided with a socket for receiving the head on the adjacent screw, this being conveniently effected by making each post hollow and of an interior configuration corresponding to the shape of the screw heads. On the underside of the plate 35 is a large gear wheel 37 which extends into proximity to each of the posts. The posts have squared portions 38 projecting down beneath the underside of the plate, and on these squared portions are loosely mounted pinions 39 which mesh with the gear 37. Consequently, whenever one of the members 38 is turned by means of a suitable key or wrench, motion is transmitted from its pinion through the gear wheel and to the other three pinions so that all four screws are turned simultaneously. The pinions are made loose upon the members 38 so that any or all of them may be detached when desired, they being normally held in place by means of springs 40 carried on the underside of the plate 35 and provided with flanges 41 which normally underlie the pinions. When it is desired to remove one of the pinions, the corresponding spring is pressed back so as to withdraw its flange from beneath the pinion and the pinion will then drop off. When it is desired to extend or shorten less than the whole number of adjustable posts of the splint, the pinions corresponding to those posts which it is not desired to extend or shorten are detached and the remainder of the posts may then be adjusted simultaneously. The compound key may conveniently be secured in place by means of hooks 42 which hook over the screw-threaded members 21 on the splint and pass down through perforations in the plate 35 and have on their lower ends thumb nuts 43 which engage with the underside of the plate 35. After the compound key has been placed in position, the thumb nuts are turned until the posts 36 are drawn up on the heads of the adjusted screws as far as they will go.

The parts which I have now described produce a splint adapted for the treatment of fractures or disease below the hip joint and the upper third of the femur. For the treatment of fracture of the upper third of the femur of the neck of the femur or of hip joint disease, it is desirable to have means for effectively immobilizing the hip joint. For this purpose I have provided a hip joint attachment which consists of a suitable bracket 50 detachably connected to the seat cushion and provided with an adjustable upright standard 51. On the upper end of the standard is a belt 52 suitably cushioned and padded, for passing around the chest of the patient. Below this is a second belt 53 adapted to go around the waist of the patient. The members 50 and 51 are made of metal and are attached to the metal plate members of the seat cushion so that when the parts are properly adjusted and secured the splint is rigid in the lengthwise direction from the top of the standard 51 down to the foot plate. The standard 51 is provided with a series of holes 54 distributed throughout the length thereof, the belts 52 and 53 being secured to the standard by means of screws 55 which enter these holes. By taking out the screws, the belts may be adjusted vertically to any desired positions and either of them, if it is deemed desirable, may be left off. Similarly the standard is secured to the upper end of the bracket 50 by means of a screw bolt 56 which is adapted to pass through one of the openings 54 and through the bracket. This arrangement permits the standard as a whole to be raised and lowered. When the standard is held in place on the bracket solely by the bolt 56, that may be swung angularly relative to each other about the bolt, the bolt acting as a pivot. This permits the standard to be adjusted at any angle with respect to the longitudinal axis of the main portion of the splint, permits the patient to lie with his head raised, and permits him to sit upright. At times when it is desired to prevent the body from moving at the hips or waist, the standard may be locked to the bracket in any suitable way. In the arrangement shown, I have provided the bracket with an upwardly projecting nose 57 lying beside the standard and of the same width as the standard. A loose sleeve or collar 58, large enough to surround both the nose 57 and the standard is placed on a standard below the belt 53. When it is desired to lock the standard against movement, the collar or sleeve is dropped down over the nose on the bracket. When it is desired to permit the standard to swing, the collar or sleeve is lifted and the standard released.

For the purpose of securing lateral pressure at any point I employ long curved cloth board members 60, suitably padded on one side and shaped so that they may be fitted around the limb of the patient on the inside of the main splint. In addition to these members, pads may be inserted at any point where it is desired to obtain pressure. For instance, on the inside of the bracket 50 there may be placed a thick pad 61 which is tied to the bracket by means of suitable strings 62.

In using the device, the parts are first adjusted so as to give the desired longitudinal distances between the various belts and cushions, the seat cushion is inflated and shaped to fit the patient, and the posts at the sides of the splint are adjusted from and toward each other, depending upon the size of the limb. Where the ankle cushion is to be used, it is detached from the splint and secured about the ankle of the patient and the splint is then placed on the patient and

the ankle cushion strapped to the foot plate. The other cushions and the belts are then tightened so as to fit snugly without being uncomfortable. To secure traction and counter-traction, the compound key is applied and the posts are gradually and steadily lengthened so that the ankle cushion draws down upon the bony prominences at the lower end of the limb while counter-traction is obtained on the bony prominences at the upper end of the limb. Where continued traction is desired, adhesive strips such as indicated at 63 may be secured to the limb below the fracture and the lower ends connected to the straps 32 carried by the foot plate. In this way the traction is divided between the upper part of the limb and the ankle. For fractures below the upper third of the femur the hip attachment is not required but, for fractures above this point and for the treatment of hip diseases, the hip attachment is applied so as to immobilize the hip joint. After the patient has recovered so far that it is safe to do so, the upper portion of the hip attachment may be unlocked so as to permit the patient to sit up without removing the attachment and without disturbing its adjustment, so that the hip joint will again be immobilized when the patient lies down and the attachment is locked again. A stirrup may be fastened to the straps 33 for receiving the foot and supporting it while the patient is in a reclining position. For fractures of the hip, adhesive straps may be attached below the fracture and connected to the straps 32 at the foot plate so as to suspend the splint directly from the hip.

While I have illustrated and described only a single preferred form of my invention, I do not desire to be limited to the particular structural details thus illustrated and described; but intend to cover all forms and arrangements which fall within the terms employed in the definitions of my invention constituting the appended claims.

I claim:

1. A splint comprising a lower member for immobilizing the leg of a patient, an upper member adapted to lie beside the trunk of the patient, said upper member having a series of holes distributed along the same, a bolt adapted to pass through any one of said holes and through said lower member for securing the same together, a belt adapted to surround the trunk of the patient, and means passing through another of said holes for securing the belt in place.

2. A splint comprising a lower member for immobilizing a leg of a patient, a bracket detachably connected to the upper end thereof, said bracket having an upwardly projecting nose, an upper member hinged to said bracket and lying beside said nose, a loose sleeve adapted to inclose said upper member and said nose so as to hold the upper member against movement relative to the lower member.

3. A splint comprising a lower member for immobilizing a leg of a patient, a bracket detachably connected to the upper end thereof, said bracket having an upwardly projecting nose, an upper member hinged to said bracket and lying beside said nose, a loose sleeve adapted to inclose said upper member and said nose so as to hold the upper member against movement relative to the lower member, an adjustable belt carried by said upper member and adapted to surround the trunk of the patient.

4. In a splint, a series of longitudinal posts, a plate secured to the upper end of one of the posts and lying on the inner side and parallel with the post, said plate having a laterally projecting flange overlying the post, an inflatable flexible tube resting on said flange, said flange being curved to form a seat fitting the underside of the tube when the latter is inflated.

5. In a splint, a series of longitudinal posts, a plate secured to the upper end of one of the posts and lying on the inner side thereof and parallel therewith, each plate having a laterally projecting flange overlying the post, an inflatable flexible tube resting on said flange, said flange being curved to form a seat fitting the underside of the tube when the latter is inflated, and a pad connected with said tube and extending down along the inner side of the plate.

6. An adjustable post for splints comprising two tubes telescoped within each other, a screw lying in one of the tubes and screw-threaded into the end of the other tube, the free end of the tube within which the screw lies having a reduced opening in the end to form an internal shoulder, and collars secured upon the screw so as to engage respectively with said shoulder and with the outer end of the tube to prevent longitudinal movement of the screw.

7. In a splint, a plurality of adjustable posts having tubular lower ends, the lower ends of said posts being enlarged and having grooves cut in the enlargements to form reduced rectangular necks, a foot plate having slots for receiving said necks, adjusting screws lying in the lower ends of said posts, and coöperating shoulders on the posts and on the screws for preventing relative axial movements between the lower ends of the posts and the screws.

8. In combination, a splint having a series of adjusting screws at one end, a member connected to said end, devices on said member for engaging with said screws to turn the same, said devices having squared portions, pinions slidably fitting on said squared portions, spring clips on said member for holding said pinions in place, and a gear

carried by said member and meshing with said pinions.

9. A splint comprising a skeleton frame, belts connected to the frame, and a series of long thin curved pads adapted to be placed in the frame about a limb to be immobilized therein.

10. A splint comprising a plurality of longitudinally-adjustable posts, means coöperating with the posts to produce a skeleton structure whose extreme length is determined by the adjustment of the posts, and selective mechanism for adjusting any desired number of said posts.

11. A splint comprising a plurality of longitudinally-adjustable posts, means coöpating with the posts to produce a skeleton structure whose extreme length is determined by the adjustment of the posts, adjusting screws for varying the length of said posts, and mechanism for simultaneously rotating any selected number of said screws.

12. A splint comprising a plurality of longitudinally-adjustable posts, means coöperating with the posts to produce a skeleton structure whose extreme length is determined by the adjustment of the posts, adjusting screws for varying the length of said posts, a compound key constructed and arranged to actuate any selected number of said screws simultaneously, and means for attaching and detaching said key to the lower end of the splint at will.

13. A splint comprising a skeleton frame including a plurality of longitudinal independent posts, and means for simultaneously adjusting all or any of the posts at will so as to vary their length.

In testimony whereof, I, sign this specification in the presence of two witnesses.

FRANKLIN I. SAEMANN.

Witnesses:

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RUBY V. BRYDGES.

Copies of this patent may be cotained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."