W. S. CROUCH.

FRACTURE APPARATUS.

APPLICATION FILED JUNE 12, 1918.

1,334,596.

Patented Mar. 23, 1920.

2 SHEETS—SHEET 1.

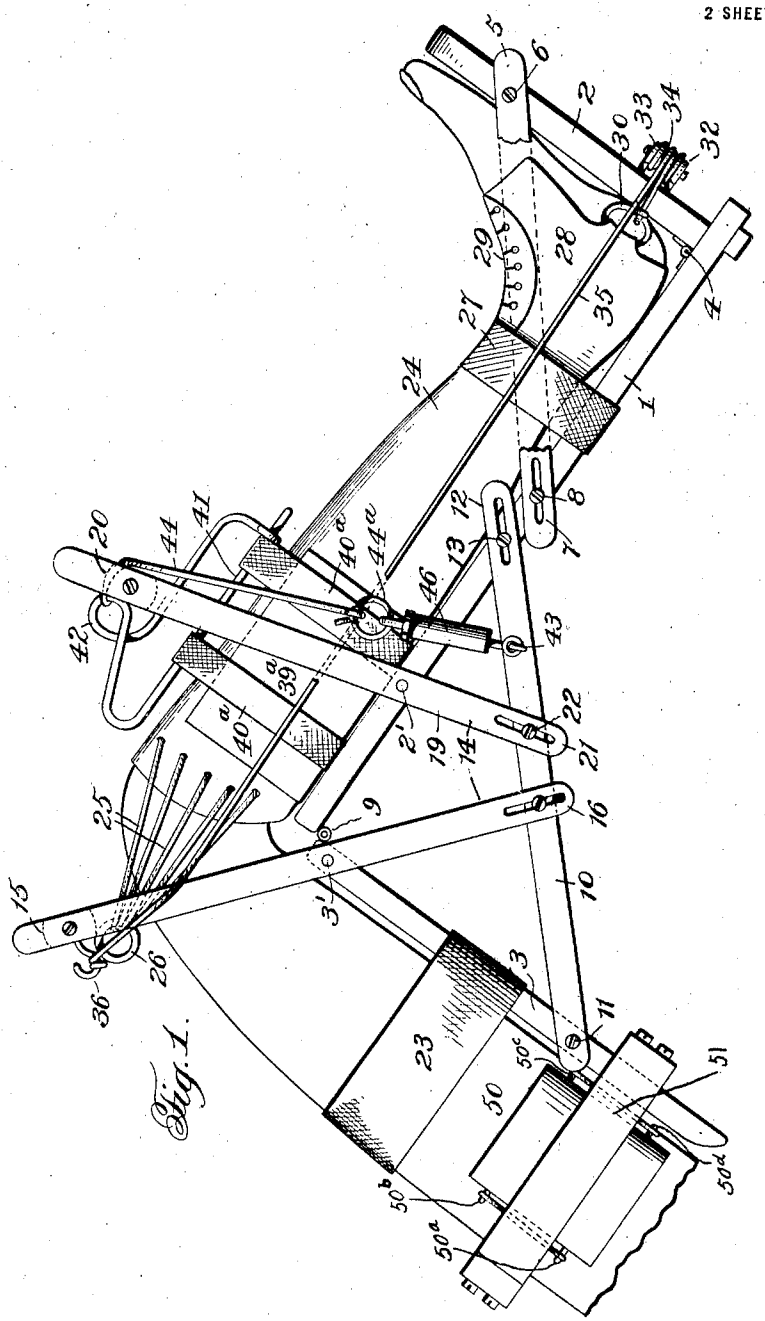


Fig. 1.

Witness:

Jas. E. Hutchinson.

Inventor:

Wm. S. Crouch,

By

Joseph H. Hunter

Attorney.

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2 SHEETS—SHEET 2.

Fig. 2.

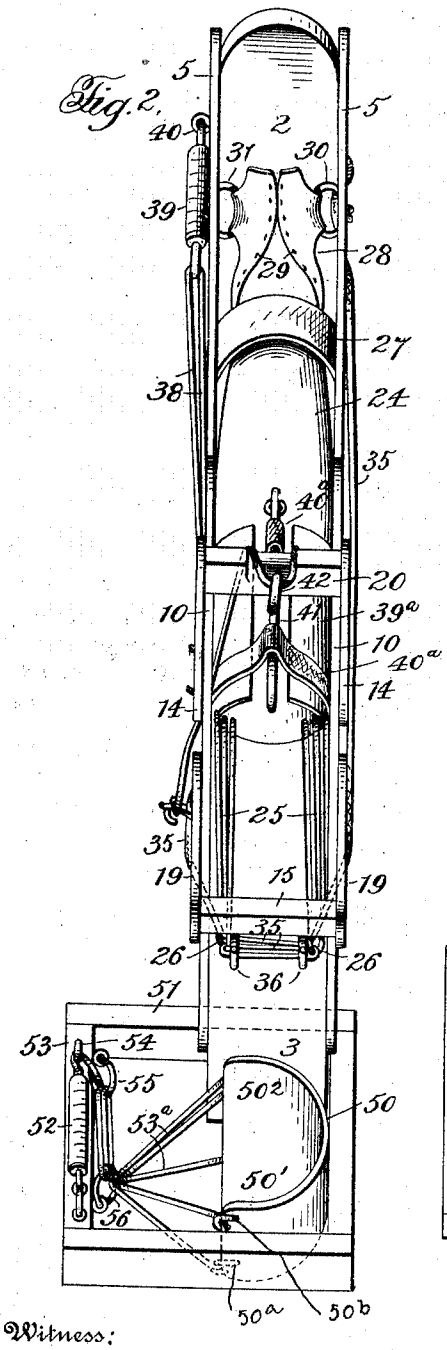


Fig. 3.

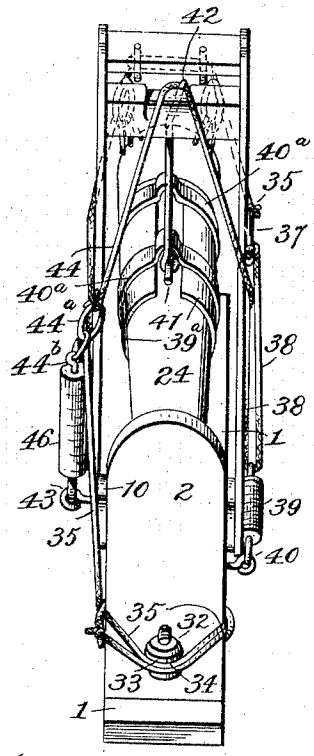
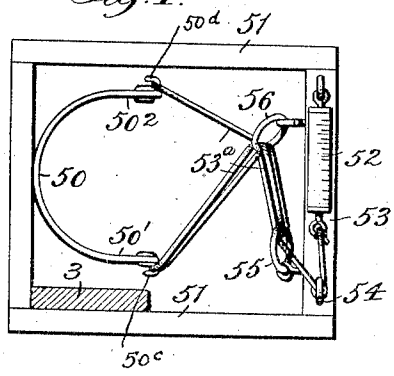


Fig. 4.



Witness:

Jas. E. Hutchinson.

Inventor:

Wm. S. Crouch,

By

Joseph H. Hunter Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM S. CROUCH, OF STAFFORD, KANSAS.

FRACTURE APPARATUS.

1,334,596. Specification of Letters Patent. Patented Mar. 23, 1920.

Application filed June 12, 1918. Serial No. 239,594.

To all whom it may concern:

Be it known that I, WILLIAM S. CROUCH, a citizen of the United States, residing at Stafford, in the county of Stafford and State of Kansas, have invented certain new and useful Improvements in Fracture Apparatus, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to improvements in fracture apparatus particularly for treatment of fractures of the thigh and leg.

In the treatment of fractures of the leg above the knee, considerable difficulty has heretofore been experienced in various directions, notably the employment of weighted members which oftentimes result in placing undue strain on the parts, which is not only a source of constant suffering and pain on the part of the patient, but frequently results in an imperfect reduction and knitting of the fracture, and leaving the patient after the healing operation, with a crippled limb.

Another objection incident to the use of the weighted devices, at present in use resides in the fact that it is extremely difficult to obtain the proper and uniform tension on the part weighted thereby resulting in interfering with the free circulation, and it is quite important that the circulation be maintained as nearly normal and uniform as possible.

It is one of the primary objects of the present invention to provide an improved fracture apparatus, which may be termed a splint, having means whereby a fracture of the femur or thigh bone may be successfully treated in order to set the fracture or fractures as the case may be without any appreciable pain or suffering on the part of the patient due to the application or use of the apparatus, and in a manner whereby tension on the parts being treated is rendered uniform to obtain the best results, and whereby this tension may be regulated to a nicety at will, the apparatus being of a character to facilitate free circulation through the injured parts.

Another object of the invention is to provide an improved fracture apparatus equipped with means whereby the intracapsular fracture close to the hip joint can be advantageously treated.

It is a further object of the invention to provide means whereby the tibia and fibula bones below the knee, assuming that either or both of the same have been fractured, may be set and treated at the same time, and in the use of the same apparatus employed, for the treatment of the thigh bone as above described. In this connection it is contemplated by the invention to treat either the femur or thigh bone at the same time as the tibia and fibula bones are treated, or assuming that the leg is not fractured both above and below the knee, it is possible to employ the apparatus for the treatment of the fracture regardless of its position on the leg.

One of the features of the invention resides in means whereby that portion of the leg adjacent the knee may be firmly and yieldably supported under tension without interfering with the straight pull from the knee to the great trochanter.

It is further contemplated by the invention to provide means for exerting a pulling action on the thigh bone outwardly from the knee, with the leg at substantially right angles to the thigh, thus loosening the action of the gastrocnemius and quadratus muscles, which cause most of the trouble in the treatment of fractures, the pulling action on the thigh bone in the present apparatus being obtained by an outward forward pull exerted upon the rear side of the upper portion of the leg.

Another feature of the invention resides in so supporting the leg in case of fracture below the knee whereby the parts to be treated will with firmness be properly supported in a manner comfortable to the patient and in a manner whereby proper tension is applied to the parts, which tension may be accurately adjusted or regulated.

It is further contemplated by the invention to provide yieldable tensioning means for the parts under treatment and associated indicating means whereby accurate adjustments and tensions may be made, and whereby said adjustments may be indicated, with the result that the tension is not only properly placed upon the parts at the beginning of the treatment, but such tension may be altered or rendered uniform from time to time by simple adjustments provided for this purpose.

Still other improvements, and novel details in the construction and arrangement of the parts will be appreciated from the de-

scription to follow which, for a more comprehensive understanding of the invention is to be considered in connection with the accompanying drawings, which form a part hereof, and wherein is disclosed, for the purpose of illustration a convenient and satisfactory embodiment of the invention.

In the drawings:

Figure 1 is a side elevation of an apparatus constructed in accordance with my invention.

Fig. 2 is a top plan view with parts broken away for the purpose of clearness.

Fig. 3 is a front elevation with parts broken away.

Fig. 4 is a detail end elevation of supporting means associated with the main support or frame at the upper part thereof.

With more particular reference to the drawings, wherein like reference numerals refer to corresponding parts throughout the several views, a suitable main support is provided, the same including the member 1 adapted to extend back of that portion of the leg beneath the knee, a foot portion 2 adapted to extend along the undersurface of the foot, and a thigh portion 3 adapted to underlie the rear surface of the thigh of the leg. The foot portion 2 is preferably hingedly connected as at 4 to the member 1 of the splint, suitable brace rods 5 being employed to maintain the foot in proper adjusted position. The brace rods 5 are conveniently pivoted at 6 to the foot member and have a slotted part 7 adjacent the upper ends thereof whereby to be engaged by a threaded bolt or the like 8 which latter when seated will hold the foot part in predetermined position, but which when loosened will permit of the adjustment of the foot part about its hinged connection 4. The thigh portion 3 is preferably hingedly connected to the member 1 as indicated at 9, and the same is adapted to be supported substantially at right angles to the portion 1 as by means of bracket arms 10 pivotally connected as at 11 to the free rear end of the thigh member 3 and having a slotted portion 12 adapted to be engaged by a threaded bolt or the like 13 whereby when the member 3 is accurately adjusted about its hinged connection the same may be secured in place by threading the bolt 13 into holding position.

The parts 1, 2 and 3 of the frame work of the splint may be and are preferably constructed of wood, and this is also the case with regard to the brace or bracket arms 5 and 10.

For the purpose to be presently described additional brace or bracket arms are provided, the same comprising opposed upwardly extending arms 14 projecting to a point above the knee cap and connected to one another as by a cross bar or arm 15 which extends across the limb at a point above and in a vertical plane adjacent the vertical plane of the hinged connections 9 between the members 1 and 3. The arms 14 intermediate their ends are pivotally connected with the thigh portion 3 by suitable pivot bolts 3′ and each of said arms at their lower ends have a slotted portion 16 adapted to receive suitable securing bolts or the like. 19 designates a pair of oppositely disposed supporting arms pivotally connected intermediate their ends with the leg portion 1 by suitable bolts 2′, and each having at their lower ends slotted portions 21 adapted to be engaged by suitable threaded retaining bolts or the like 22 whereby to be secured to the bracket arm 10 when the parts are properly adjusted.

For the purposes of convenience in description the arms 14 and connecting cross member 15 may be termed a U-shaped support or bracket and the arms 19 and connecting piece 20 an auxiliary U-shaped support or bracket.

Assuming that the fracture has been reduced and the parts have been properly treated and dressed by suitable bandages, cotton covering or the like, the thigh will be positioned to extend over the upper surface of the thigh member 3 of the splint, and the limb below the knee will extend along the member 1 of the splint in a comfortable position substantially at right angles to the thigh. The thigh will be supported against movement relatively to the member 3 as by means of suitable adhesive tape or the like 23. Assuming further that the fracture has occurred below the knee, a suitable tubular splint member 24 of any desirable material is applied to this portion of the leg, the fiber splint member extending preferably from a point above the ankle, assuming that the break is thereabove to a point snugly fitting in the crotch at the point of connection between the thigh and that portion of the limb below the knee. The fiber splint member has a cut-out part to receive said crotch and is upwardly extending over the sides and the front of the knee and adapted to have secured thereto in any desired manner connecting straps or cords 25 projecting outwardly to be secured in any desired manner to suitable rings or the like 26. These rings are supported under yieldable tension in any desired manner, but preferably through the medium of flexible connections about to be described.

The lower portion of the leg conveniently adjacent the ankle is supported against movement relative to the member 1 of the splint as by means of adhesive tape or the like 27, and to the foot portion of the limb is applied a boot or shoe shaped splint member of any suitable material such as thin leather as indicated at 28, the same being adapted to be laced in place by suitable

lacing 29. Applied to the opposite sides of the boot shaped foot covering are suitable eyes or rings 30 and 31, respectively. The foot portion 2 of the main frame or splint is preferably positioned at a point about the lower edge of the part 1 and suitably supported as by eye brackets 32 in the space beneath the foot portion 2 is a suitable pulley 33 having a groove 34 for the reception of a strap, cord or the like 35. The cord 35 is secured as by tying to the ring 30 and projects beneath the foot portion 2 engaging the groove portion 34 of the pulley 33 from whence it passes through the eye 31 at the one side of the boot support, the cord turning back upon itself beneath the foot part 2 engaging the groove 34 of the pulley passing through the eye 30 at the opposite side of the boot support, thence upwardly over suitably spaced eye brackets 36 on the connecting arm 15 of the U-shaped bracket, said cord passing through and around one of the rings 26 thence back upon itself and through and around the auxiliary ring 26, thence again over the brackets 36 and connected at its free end to a ring 37. The ring 37 is connected by means of a strap, cord, chain or the like 38, a strap being illustrated and the same being adjustably connected in any desired manner to an eye extension of the movable member of a spring balance scale 39 the body portion of which is connected as by a hook and eye connection 40 to the foot portion 2 of the main frame.

From the construction just described it will be observed that the foot portion or lower end of the limb will be firmly held under yieldable tension upon the foot portion 2 of the main frame or splint, and that the upper portion of the leg beneath the knee and from the ankle upwardly will likewise be supported under yieldable constant spring tension by reason of the flexible connections 25 with the rings 26 which latter are yieldably supported by reason of their connection with the yieldable supporting cord 35. The tension will therefore be uniform on the parts.

Now assuming that it is the thigh bone which has been fractured, and it is desirable to have an outward pulling upon the leg adjacent the knee. To this end, an auxiliary semi-tubular fiber or leather splint member 39^a may be provided, the same being of a shape to extend into the crotch of the limb beneath the knee portion thereof. The splint member 39^a is of a shape whereby the sides may project upwardly over the sides of the knee to a greater or less extent as may be desired. Connected to the splint member 39^a adjacent the top and bottom thereof are forwardly projecting loop members conveniently of tape, fabric, or the like 40^a adapted to loosely engage over an arm 41 of a bracket conveniently of wire having a supporting eye portion or the like 42 supported upon the connecting arm 20 of the auxiliary U-shaped bracket. The eye portion 42 is disposed intermediate the ends of arm 20 and centrally or midway between the arms 41, the bracket thereby constituting in effect an equalizer member between the connecting loops 40^a. Secured in any desired manner as by a screw-eye 43 to the supporting arms 10 projecting between the parts 1 and 3 of the splint is a suitable cord or similar member 44 which latter projects forwardly around the connecting arm 20 of the auxiliary U-shaped bracket and through the eye 42 of the wire bracket and thence to a ring or the like 44^a. The ring 44^a is adjustably connected in any suitable manner as by a cord, chain, strap or the like, the latter being illustrated, to the movable part 44^b of a spring scale balance the body portion 46 of which is connected as by a hook and eye to the opposite arm 10 projecting between the parts 1 and 3 of the main supporting frame or splint.

From the latter part of the description above it will be observed that there is a constant outward pressure in substantially the line of the thigh, and this pressure is divided, equalized or balanced by reason of the loop connections 40^a from the splint 39^a with the equalizing bracket, the tension of which latter may be readily adjusted as desired. In this way the pull or strain at the desirable point to secure the best results is provided, the pull will be even and constant, and the pull may be regulated accurately and maintained accurately adjusted by reason of the adjustable strap connection 44 and associated balance scale.

Means is also provided whereby the intracapsular fracture close to the hip joint can be adjusted and securely supported in position. The means for this purpose is shown in the drawings as comprising a curved splint member 50 constructed of leather or other suitable material and adapted to fit about the thigh close to the hip joint, the splint member 50 extends around one side and over upper and lower portions of the thigh, the ends $50'$ and 50^2 of said splint member being connected with tensioning means whereby said splint member can be adjusted and tension placed upon the same in a direction laterally of the thigh. 51 designates a rectangular shaped frame suitably secured to the member 3 of the main supporting frame, said rectangular frame projecting laterally to one side of the main supporting member 3. A spring tensioning device 52 is connected at one end to one side bar 53 of the frame 51 at the upper portion thereof, and to the lower end of said spring tensioning device 52 is connected a tensioning cord 53^a that

extends through an eye 54 and thence twice back and forth through rings 55 and 56. The tensioning cord 53^a is then looped about hook members 50^a and 50^b on the upper portion of the curved splint member 50, thence passed back through the ring 56, looped over the hook member 50^c on the lower part of the curved splint member 50, then carried back through the ring 56 and extended and secured to the hook member 50^d.

The balance scales may be of any suitable construction, and it is not thought necessary to illustrate the same in detail herein.

What I claim is:

1. In a fracture apparatus, means for supporting the leg at substantially right angles with the thigh, and means for exerting an outward forward pull upon the upper portion of the leg.

2. In a fracture apparatus, means for supporting the leg at substantially right angles with the thigh, and adjustable means for exerting tension outwardly and forwardly from the upper portion of the leg at the rear side thereof.

3. In a fracture apparatus, means for supporting the leg at substantially right angles with the thigh, means for exerting an outward forward pull upon the upper portion of the leg, and laterally adjustable means for supporting the thigh adjacent the hip joint.

4. In a fracture apparatus, means for supporting the leg at substantially right angles with the thigh, means for exerting an outward forward pull upon the upper portion of the leg at the rear side thereof, and adjustable means for supporting the thigh adjacent the hip joint and exerting tension thereon laterally thereof.

5. In a fracture apparatus, the combination of a main supporting frame, and means associated therewith to engage the limb and exert drawing tension thereon in a direction away from the main supporting frame.

6. In a fracture apparatus, the combination of a main supporting frame, means to directly engage the limb to exert drawing tension thereon in a direction away from the supporting frame, means for regulating said tension, and operatively associated indicating means whereby to determine at all times the degree of tension.

7. In a fracture apparatus, the combination of a splint member to engage the back of the leg below the knee, a foot member adapted to support the foot of the leg, and means connected to the foot member adapted to exert downward tension on the foot end of the leg, said last mentioned means being yieldable and adjustable, and means engaging the leg below the knee and adjacent thereto for exerting tension thereon in a direction substantially at right angles to the direction in which tension is exerted by said first mentioned means.

8. In a fracture apparatus, the combination of a splint member adapted to engage the back of that portion of the leg beneath the knee, a support projecting from the splint member to a point above the knee, a member engaging the leg in the crotch beneath the knee, and tensioning means for said member operatively connected with said support.

9. In a fracture apparatus, the combination of a splint member constituting a rest for the leg beneath the knee, a collar to engage the leg beneath the knee and adjacent the crotch, and means supported from a point above the knee to engage said member and support the leg at a point adjacent the knee.

10. In a fracture apparatus, the combination of a splint member forming a rest for that portion of the leg beneath the knee, a leg-engaging member below and adjacent the knee to exert an outward forward pull thereupon, a leg-engaging member adjacent the foot to exert a downward pull upon the same, and yieldable tensioning devices for said members.

11. In a fracture apparatus, the combination of a splint member forming a rest for that portion of the leg beneath the knee, a leg engaging member adjacent the foot, a leg engaging member below and adjacent the knee, and connected yieldable tensioning devices for said members, adapted to exert pulling tension to said leg engaging members in opposite directions.

12. In an apparatus of the character described the combination of a splint member forming a rest for that portion of the leg beneath the knee, a leg engaging member adjacent the foot, a leg engaging member below and adjacent the knee, and connected yieldable tensioning devices for said members, adapted to exert pulling tension to said leg engaging members in opposite directions, said devices being adjustable at will.

13. In an apparatus of the character described, the combination of a splint member to support a leg beneath the knee, said splint member having a foot extension at right angles thereto to exert a downward pull upon the leg, a leg engaging member adjacent the foot thereof, a flexible member connected to said leg engaging member and operatively connected with the foot extension, said flexible member having an associated spring scale and being adjustable at will whereby to regulate the tension on that portion of the leg engaged by the engaging member, a leg engaging member adjacent the knee and therebelow, to exert a pull thereupon in a direction different from the direction of the pull of the first mentioned leg-engaging member, said last mentioned member be-

ing operatively associated with said flexible member whereby the tension on the last mentioned leg engaging member is regulated simultaneously with the tension on the first mentioned leg engaging member.

14. In an apparatus for treating fractured legs the combination of a splint member having at the lower end an angled foot supporting part, and at its upper end an angled thigh extension, a member to engage the leg adjacent to and beneath the knee, a bracket operatively connected to the splint member and projecting forwardly to a point in front of a supported leg on the splint, and means operatively associated with the bracket and connected to said leg engaging member for exerting forward pressure on said leg engaging member at a plurality of vertically spaced points.

15. In an apparatus for treating fractured legs, the combination of a splint member having at the lower end an angled foot supporting part, and at its upper end an angled thigh extension, a member to engage the leg adjacent to and beneath the knee, a bracket operatively connected to the splint members and projecting forwardly to a point in front of a supported leg on the splint, and means operatively associated with the bracket and connected to said leg engaging member for exerting forward pressure on said leg engaging member at a plurality of vertically spaced points, said last mentioned means having an adjustable spring connection.

16. In an apparatus for treating fractured limbs, the combination of a splint member to constitute a rest for that portion of the leg beneath the knee, the splint having a lower angled extension for the foot, and an upper angled extension for the thigh, a substantially U-shaped bracket supported from the splint and adapted to overlie the knee, supporting members on said U-shaped brackets at a point above the knee a leg engaging part beneath the knee, and adjacent thereto, a leg engaging part adjacent the foot, a flexible member connected to one side of the lower leg engaging part passing beneath the foot extension of the splint and having a movable action with the opposite side of the lower leg engaging part, said flexible member thence projecting beneath said foot extension and upwardly over the supports, a connection between the upper leg engaging member and said flexible connections, and an adjustable spring support for the end of said flexible member.

17. In an apparatus of the character described the combination of a splint member having an upper angled thigh supporting part and a lower angled foot supporting member, a substantially U-shaped bracket connected to the splint member and extending above the knee, a leg support to engage beneath the knee and yieldably connected to said support.

18. In an apparatus of the character described, the combination of a splint member having a hingedly connected foot member and a hingedly connected thigh part, a substantially U-shaped member movably connected to the thigh part and extending above the knee, an auxiliary U-shaped member connected to the leg part and projecting forwardly to overlie the leg beneath the knee and supporting connections between said U-shaped members and the leg.

19. In an apparatus of the character described, the combination of a splint member having a hingedly connected foot member and a hingedly connected thigh part, a substantially U-shaped bracket movably connected to the thigh part and extending above the knee at a point in a vertical plane adjacent the vertical plane of the knee, an auxiliary U-shaped bracket connected to the leg part and projecting forwardly to overlie the leg beneath the knee, and supporting connections between said U-shaped brackets and the leg.

20. In an apparatus of the character described, the combination of a splint member having a hingedly connected foot member and a hingedly connected thigh part, a substantially U-shaped bracket movably connected to the thigh part and extending above the knee, an auxiliary U-shaped bracket connected to the leg part and projecting forwardly to overlie the leg beneath the knee and supporting connections between said U-shaped brackets and the leg, said connections being yieldable and means for regulating the tension thereof.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM S. CROUCH, M. D.

Witnesses:
P. J. PANKRATZ,
V. B. NEWELL.