

Feb. 28, 1928.

1,660,721

M. J. SCHRAG
ORTHOPEDIC APPARATUS
Filed July 2, 1926

3 Sheets-Sheet 1

Fig. 1

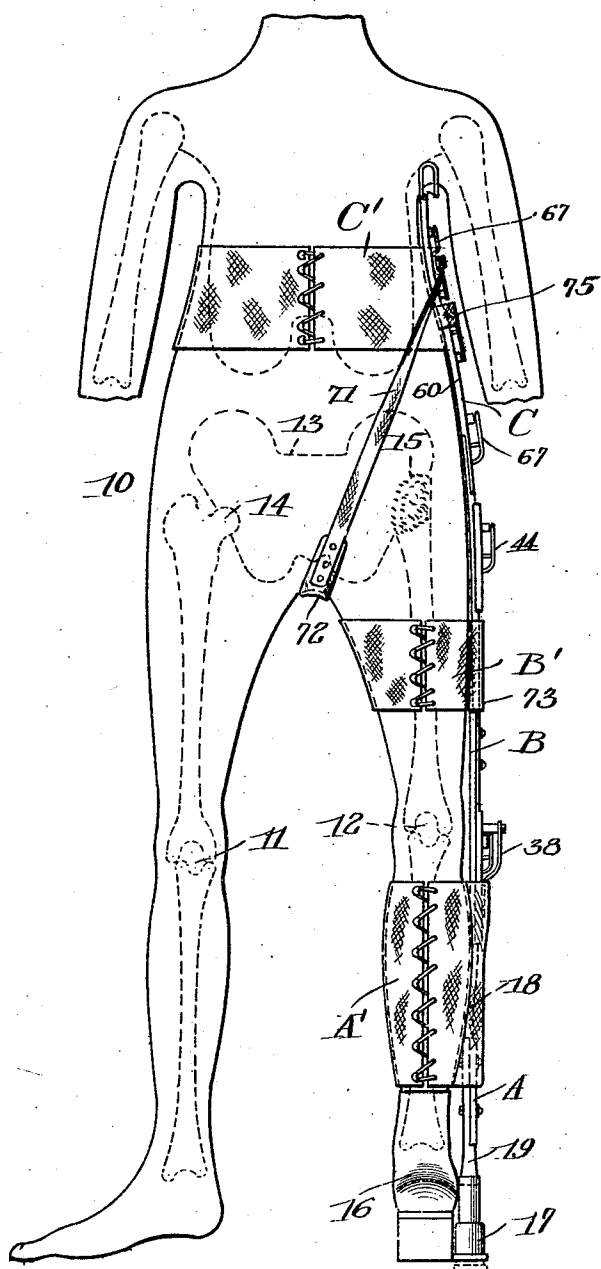
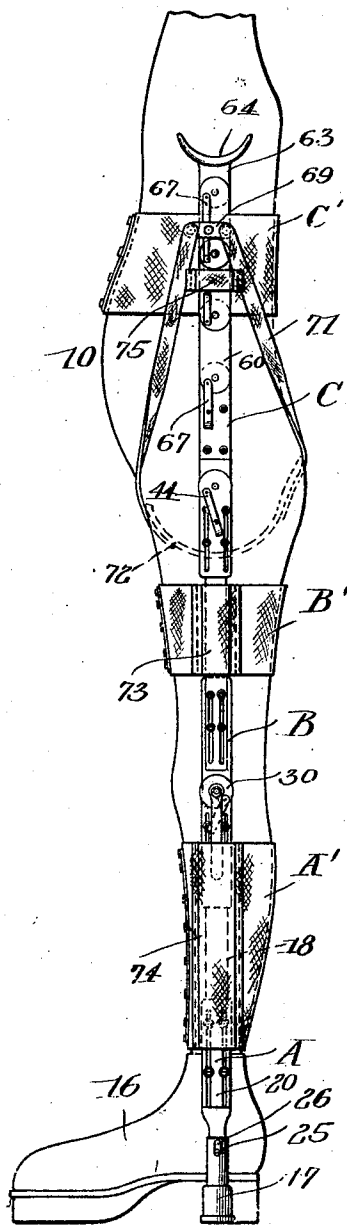


Fig. 2



INVENTOR
Martin J. Schrag
BY
Crompton & Griffith
his ATTORNEYS

Feb. 28, 1928.

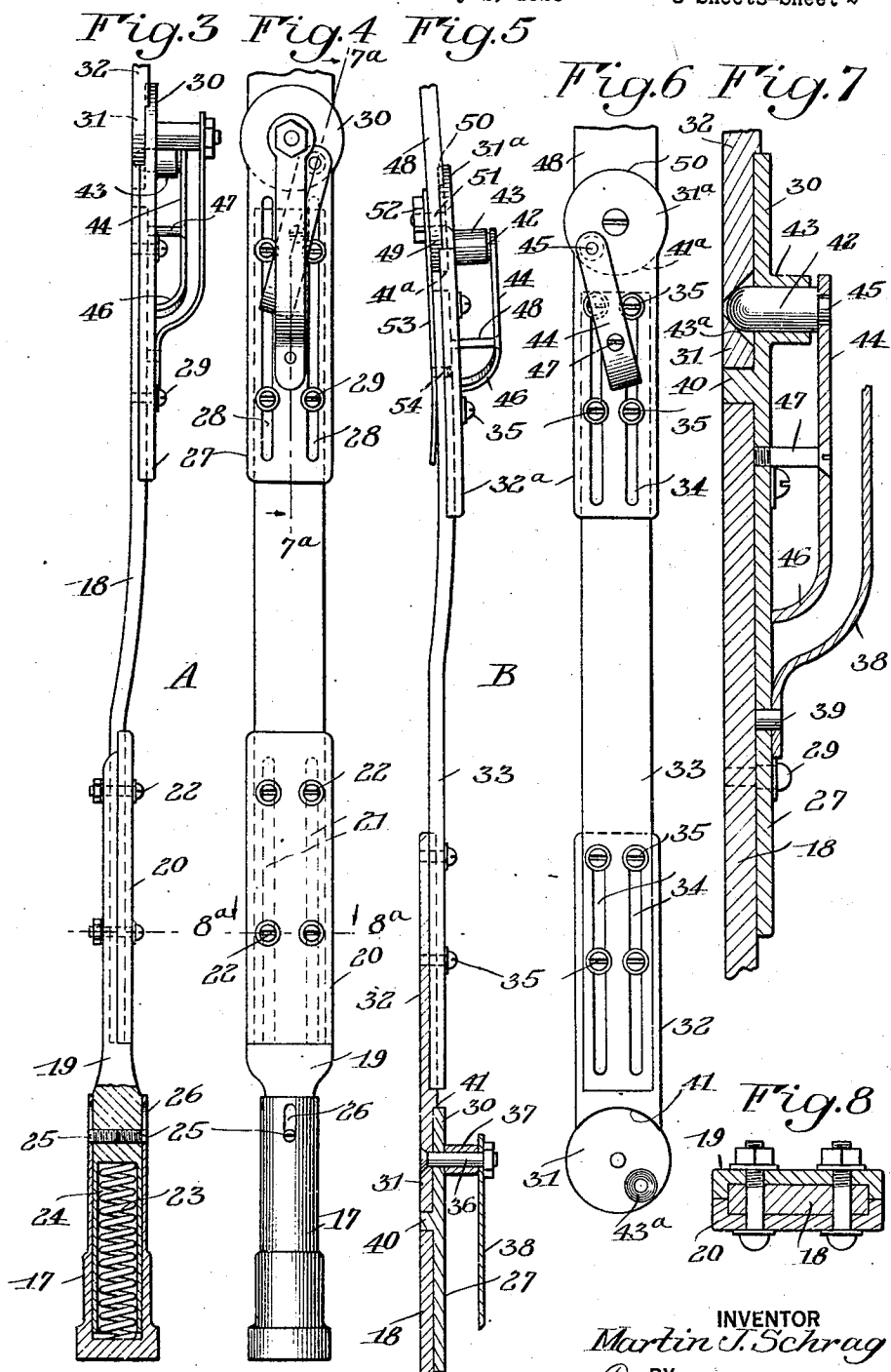
1,660,721

M. J. SCHRAG

ORTHOPEDIC APPARATUS

Filed July 2, 1926

3 Sheets-Sheet 2



INVENTOR
Martin J. Schrag
BY
Crompton & Griffith
his ATTORNEYS

Feb. 28, 1928.

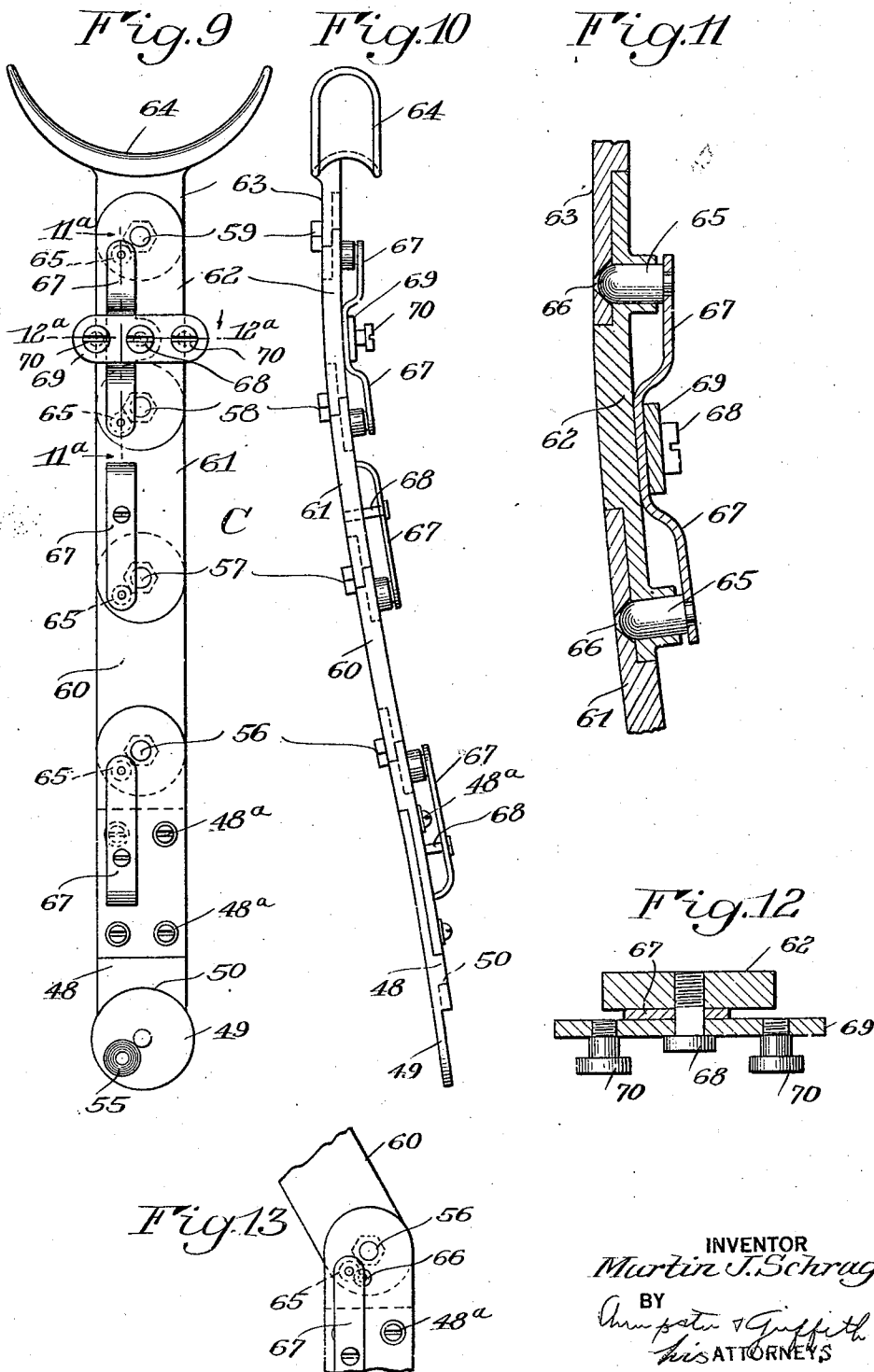
1,660,721

M. J. SCHRAG

ORTHOPEDIC APPARATUS

Filed July 2, 1926

3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE.

MARTIN J. SCHRAG, OF ROCHESTER, NEW YORK.

ORTHOPEDIC APPARATUS.

Application filed July 2, 1926. Serial No. 120,054.

The present invention relates to orthopedic apparatus and has for one object to provide improved means adapted to be applied to the human body to protect certain parts thereof which may be deformed, diseased or injured whereby correction or cure may be afforded by reducing or relieving the pressure or strain on said parts.

A further object of the invention is to provide an improved leg and body support of the flexible type for use by persons having diseases of the spine or hip, or having fractured or diseased bones or joints or other defective parts requiring rest or relief from strain.

A still further object of the invention is to provide an improved articulated crutch or body support adapted to be secured to the body in a manner to cause but little inconvenience and discomfort to the user and permitting free and easy bending of the back through the employment of a series of articulated self-locking joints between the hips and arm pits.

A still further object of the invention is to provide an improved crutch in combination with a strap or flexible member depending therefrom and forming in effect a sling adapted to extend between the legs of the user to constitute a support for the pelvis or a portion of the hip whereby to reduce or relieve strain thereon.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Figure 1 is a front elevation illustrating diagrammatically the application of the invention to the human body;

Figure 2 is a side elevation of the same;

Figure 3 is a front elevation partly in section of the lower portion of the crutch which extends from the foot to the knee;

Figure 4 is a side elevation of the same;

Figure 5 is a front elevation partly in section of the intermediate portion of the crutch which extends between the knee and the hip;

Figure 6 is a side elevation of the same;

Figure 7 is a vertical section drawn to an

enlarged scale and taken on line 7^a—7^a of Figure 4;

Figure 8 is a transverse section taken on line 8^a—8^a of Figure 4;

Figure 9 is a side elevation of the upper or body section of the crutch;

Figure 10 is a front elevation of the same;

Figure 11 is a vertical section on an enlarged scale taken on line 11^a—11^a of Figure 9;

Figure 12 is a transverse section taken on line 12^a—12^a of Figure 9, and

Figure 13 is a fragmentary side elevation illustrating the action of one of the hinged joints of the crutch.

Similar reference numerals throughout the several views indicate the same parts.

The embodiment of the invention disclosed herein by way of illustration of the principles of the invention is in the form of an articulated crutch and leg or body brace adapted to conform generally to the contour of the body at the side thereof and arranged to be connected both with the leg and the body of the user preferably in the manner shown in Figures 1 and 2.

The present illustration shows a device as used by a person having a short leg such as frequently results from hip disease, and includes the use of a built up shoe as is customary in such cases. Another important feature of the invention is the provision of a series of self-locking or clamping joints, the parts of which become automatically clamped together when returned to normal position. Furthermore, the crutch is so designed that the shoe, to which it may be secured, does not contact with the ground until a portion of the weight is transferred to the shoulder or body of the user.

Referring to the drawings, the outline of a human figure is indicated, generally, by the numeral 10. The knee joints are indicated at 11 and 12, the pelvis being outlined by the dotted line 13. A normal thigh or hip joint is indicated at 14 while a fractured or diseased hip joint is shown at 15. These joints are shown as embodying portions of the anatomy or parts of the body which when injured or diseased are benefitted by the use of the present invention. The spinal column is not shown but falls within the category of parts which may be protected

and benefitted by the improved apparatus hereinafter described.

The crutch is formed in three sections comprising the lower section indicated in Figures 3 and 4, the intermediate or thigh section shown in Figures 5 and 6 and the upper or body section shown in Figures 9 and 10.

The lower section indicated generally at A is strapped to the calf of the leg preferably by the laced legging A' and the intermediate section B is strapped to the leg at a suitable point above the knee preferably by a laced band B'. The upper section C is connected to the body by a corset or waist band C' as clearly shown in Figures 1 and 2.

The lower section A is disposed at the outside of the calf of the leg with its yieldably mounted ground engaging portion 17 normally projected a slight distance below the foot or heel of the shoe 16, as indicated by dotted lines in Figure 1, so that in walking, said portion will engage the ground in advance of the shoe to transfer a considerable portion of the pressure to the shoulder or body of the user.

The lower section A preferably comprises the upper and lower portions 18 and 19, respectively, the latter being preferably a cast member which is recessed to receive the lower end of the former to which is secured a brace bar 20 also recessed to receive the lower end of the upper section, this construction being shown in section in Figure 8. The lower end of section 18 is provided with a pair of longitudinally extending slots 21 through which extend bolts 22 which serve to connect and clamp the parts together, permitting them to be adjusted longitudinally to accommodate persons of different heights. The lower end of section 19 is preferably cylindrical in shape and projects into the ground engaging member 17 which is yieldably urged outwardly by a spring 23 in a pocket or recess 24 of the member 19, as shown in Figure 3. Movement of the ground engaging member 17 both inwardly and outwardly is limited by the screws 25 threaded into the member 19 and having their outer ends disposed in slots 26 formed in opposite sides of the member 17 as shown in Figure 3. Adjustably connected with the upper end of the member 18 is a recessed bearing plate 27 in which the member 18 is disposed, the bearing plate being slotted at 28 to receive the clamping screws 29 by which the bearing plate is held in any desired position of adjustment upon the section 18. The bearing plate 27 is provided at its upper end with a circular bearing portion 30 reduced in thickness and adapted to receive a correspondingly shaped bearing portion 31 of a bearing plate 32 constituting the lower end of the intermediate section B of the crutch. The plate 32

is recessed to receive the lower end of a bar 33 of the intermediate section of the crutch, said bar being provided with slots 34 through which project screws 35 which are threaded into the plate 32 to clamp it upon the bar. The circular bearing portions 30 and 31 are pivotally connected by a pin or stud 36 whereby to form the flexible knee joint for the crutch as best shown in Figure 5.

The stud 36 is held against rotation by being fixed to the bearing portion 31, preferably by forming a shoulder upon the stud and riveting over the head as shown in Figure 5. The stud projects through the bearing portion 30 of the bearing plate 27 and is provided with right hand threads to receive a threaded nut 37 to which is fixed a depending arm 38 bent inwardly at its lower end where it is connected to the bearing plate 27 preferably by means of a pin 39 as shown in Figure 7. The arm 38 serves to prevent turning of the nut during the bending action of the knee in which case movement of the intermediate crutch section B relative to the section A turns the stud 36 to slightly unscrew the same, thus relieving the clamping action of the nut which binds the portions 30 and 31 of the joint together when the crutch sections are in upright position, as shown in Figure 2. The bearing plates 30 and 31 are provided, respectively, with shoulder portions 40 and 41 each of which is preferably made to frictionally engage the end of the opposite plate portion, thereby forming a more rigid and effective joint which to a certain extent relieves the strain on the stud 36.

In addition to the clamping action of the nut 37, means is provided which tends to resist relative movement of the sections A and B from their normal aligned position as shown in Figure 2. This means preferably comprises a spring-pressed plunger 42 slidable in a bearing 43 formed upon the circular plate 30 at one side of the axis of the stud 36, the plunger being rounded at its inner end and being disposed in a recess of the circular plate portion 31 having an inclined surface 43^a upon which the plunger rides, as shown in Figure 7. The plunger 42 is frictionally held in engagement with the surface 43^a by a spring 44 which is provided with an opening at its upper end to receive a reduced portion 45 of the plunger at the base of which is a shoulder against which the free end of the spring is adapted to rest. The opposite end of the spring is bent inwardly at 46 and is seated upon the bearing plate 27. A screw 47 is extended through the spring intermediate its ends and is threaded into the plate 27 whereby to support the spring which serves to urge the plunger inwardly to the normal locking position shown in Figure 7. In the bending

of the knee joint by moving the intermediate crutch section B relative to the lower section A, the plunger is moved outwardly against the action of the spring by the inclined surface 43^a. On return of the crutch sections A and B to normal position, the plunger will snap back into the recess and the parts will again become locked in aligned position.

The pivotal joint between the upper section C of the crutch and the intermediate section B is substantially the same as the knee joint above described, both in operation and construction, and will only be referred to briefly except where the difference in construction of the parts is sufficient to require separate reference characters, like parts of the two joints being given the same reference numerals. At the hip joint the circular bearing portion 31^a and the bearing plate 32^a correspond to the parts 31 and 32 of the knee joint, said bearing plate being reversed at said hip joint and placed on the outside rather than the inside of the bar 33. The screws 35 take into the bar rather than into the bearing plate and the slots 34 are formed in the bearing plate rather than in the bar.

The upper section C of the crutch carries at its lower end a bar 48 having a circular bearing portion 49 which is adapted to be clamped upon the circular bearing portion 31^a, said portions being provided respectively with annular shoulders 50 and 41^a which are provided for the same purpose and which operate in the same manner as the shoulders 40 and 41 of the knee joint plates 27 and 32.

At the hip joint, the stud 51 is reversed, having its head fixed to the circular bearing portion 31^a and its inner end threaded into a nut 52 to which is rigidly secured a depending arm or plate 53 which holds the nut against turning, the plate being itself held against displacement by a pin 54 projecting into the bar 33, as shown in Figure 5. The nut 52 normally holds the circular bearing plates 49 and 31^a clamped together and upon movement of the bar 33 relative to the bar 48, as when the crutch section B is swung forwardly, the stud 51, provided with left hand threads, will be slightly unscrewed thus relieving the binding action normally afforded by the nut. At the same time the plunger 42 will move out of the conical recess 55 formed in the circular bearing plate 49, as shown in Figure 9. Upon realigning the upper and intermediate sections of the crutch the plunger 42 will move back into the recess 55 and lock said sections against accidental displacement.

The upper or body section C of the crutch is provided with a series of articulated joints similar to the knee and thigh joints described above, except that the pivot studs do not unscrew as in the case of the previously de-

scribed joints. Thus, the user of the crutch may readily bend forwardly or backwardly as desired without undue strain on the spinal column since the joints of the upper section will readily yield under the bending action of the body, the flexing of any particular joint depending upon the point of movement of the body and the pressure exerted thereby.

The upper section C of the crutch is preferably constructed to have a series of articulated sections, the pivot studs of which are shown at 56, 57, 58 and 59, as indicated in Figures 9 and 10. The sections between the pivotal studs, with the exception of the lower section, each comprises a single bar or link similarly constructed, said links being indicated at 48, 60, 61 and 62, as shown in Figures 9 and 10. The lower link preferably comprises the two parts as shown in Figure 10 which are reduced in cross section for a portion of their length and adjustably clamped together by screws 48^a whereby the body section of the crutch may be lengthened or shortened in order to accommodate persons having long or short backs. The upper link or section 62 is pivotally connected with the bearing plate 63 of the arm rest 64 as shown in Figures 9 and 10. The ends of the links, including the arm rest section 63, are milled out or shaped in the same manner as the bearing plates of the knee and hip joints described above and are free to turn on their respective pivots except for the resistance offered by the spring-pressed plungers 65, one of which is employed for each joint, said plungers each being guided by one of the sections and normally projected into a tapered recess of the other, as shown at 66 in Figure 11. The two lower plungers 65 are yieldably held in locking position by similarly constructed springs 67 having their free ends in engagement with the plungers and their opposite ends bent inwardly and adapted to rest upon the sections as shown in Figure 10. The springs are secured to the sections by screws 68 which serve to urge the free ends of the springs inwardly so that considerable resistance is offered to the flexing of the joints of the crutch section C whereby said section normally acts as a rigid support through which weight is transferred from the ground to the shoulder of the user in order to reduce or entirely relieve the injured joints or diseased parts from strain during walking.

The two upper plungers 65 are held in their respective locking positions by the opposite ends of a spring 67 secured intermediate its ends to the outer face of the link section 62 by a screw 68 which also serves as a support for a transversely extending plate 69 as shown in Figures 9 and 12. The plate 69 carries a pair of projecting studs 70 which are headed to form buttons

for the opposite ends of a strap 71 having slits or buttonholes therein permitting said ends to be buttoned upon the studs as shown in Figure 2. The strap 71 preferably includes a pad 72 for use as shown in Figures 1 and 2. By the use of the strap a portion of the weight of the injured hip or thigh is transferred to the crutch and thus the injured thigh joint 15 or other diseased portion of the hip may be considerably relieved of the strains thereon. The strap in combination with the crutch permits the user to walk with a minimum amount of pressure upon the diseased hip, so that the patient can have the use of his legs without injury to the diseased parts.

The leg and waist bands may be constructed of any suitable material and may be permanently or detachably connected with the crutch as desired. Preferably the upper and lower leg bands are provided with strips 73 and 74, respectively, which are sewed thereto to form pockets through which the crutch extends whereby the latter is braced and held in proper position upon the leg.

The corset or waist band is connected with the upper section of the crutch in any suitable manner permitting proper functioning of the jointed parts opposite thereto. Preferably, a strip 75 is extended across the outer face of the crutch as shown in Figure 2, its ends being sewed or otherwise secured to the waist band.

The several parts of the crutch are preferably made of metal, certain sections of which may be cast or stamped out and others being preferably formed of sheet metal strips either of brass or steel or any other material suitable for the purpose.

The present orthopedic device is particularly adapted for carrying the weight of the body to relieve the strain or stress on diseased or injured hips, backs and limbs. It is effective to both support and brace the body, at the same time permitting free use of all of the various joints thereof. The crutch strap or sling 71 serves to suspend a portion of the weight of the body from the crutch, thus further relieving the pressure on the injured leg or hip joint. The crutch permits the user to sit down with ease and upon arising all of the flexed or hinged sections become alined and are automatically locked in rigid relation, one with respect to another.

I claim as my invention:

1. In orthopedic apparatus, a body support comprising a plurality of articulated sections and cooperating parts serving to normally clamp the sections together and operating automatically to relieve the binding action thereon upon movement of the sections from normal position.

2. In orthopedic apparatus, a body sup-

port comprising oppositely disposed hinged sections including connecting parts adapted to frictionally clamp the sections together with a binding action and arranged to relieve the binding action thereon upon swinging of one section from a predetermined position upon the other, and means for automatically latching the sections when returned to said predetermined position.

3. In orthopedic apparatus, a body support comprising a pair of hinged sections including a pivot member therefor rigidly connected to one of the sections, a clamping member upon the other section cooperating with the pivot member in one position of the sections to clamp them together and adapted upon movement of the sections from said position to relieve the binding action of the clamping parts and a holding member for said clamping member releasably held by one of the sections.

4. In orthopedic apparatus, a body support comprising a pair of hinged sections including a pivot member therefor rigidly connected to one of the sections, a clamping member fixed upon the other section and cooperating with the pivot member in one position of the sections to clamp them together and adapted upon movement of the sections from said position to relieve the binding action of the clamping parts, and means adapted to automatically and yieldably latch the sections together when returned to said position.

5. In orthopedic apparatus, a body support comprising a pair of hinged sections including a pivot member therefor rigidly connected to one of the sections, a clamping member fixed upon the other section and cooperating with the pivot member in one position of the sections to clamp them together and adapted upon movement of the sections from said position to relieve the binding action of the clamping parts, and a spring-pressed plunger carried by one of the sections and adapted to engage the other and arranged to automatically latch and release the sections when moved to and from said clamping position.

6. In orthopedic apparatus, a body support comprising a pair of hinged sections including a pivot bolt fixed to one of the sections and a nut threaded thereon and fixed to the other section, the nut cooperating with the bolt to clamp the sections together when the latter are in normal position and automatically relieving the clamping action when one section is moved relative to the other.

7. In orthopedic apparatus, a body support comprising a pair of hinged sections, and means for automatically latching and releasing the sections when moved to and from a predetermined position comprising a spring-pressed latch carried by one of the

sections in parallel relation to the pivotal axis of the sections adapted to take into a recessed portion of the other section when said sections are moved to said predetermined position.

8. In orthopedic apparatus, a crutch formed of a plurality of articulated sections adapted to be disposed at one side of the body, means for securing the crutch to the body, clamping means for two adjacent sections of the crutch adapted to automatically release the sections when moved from a normal body supporting position, and means adapted to automatically latch said adjacent sections upon movement of one on the other to said normal body supporting position.

9. In orthopedic apparatus, a body supporting crutch adapted to be secured to one side of the body and comprising lower, upper and intermediate sections hingedly connected at the knee and hip joints, said upper section comprising a series of normally aligned articulated portions, and a spring-pressed latch for each of said portions movable automatically to and from latching position under the bending action of the body.

10. In orthopedic apparatus, a body supporting crutch adapted to be secured to one side of the body and comprising lower, upper and intermediate sections hingedly connected at the knee and hip joints, said upper section comprising a series of normally aligned articulated portions each including automatic releasable clamping devices normally maintaining said articulated portions in alinement.

11. In orthopedic apparatus, the combination with an articulated body supporting crutch including an arm rest and means adapted to secure the crutch to the body, of a

sling depending from a point on the crutch adjacent the arm rest and adapted to extend between the legs of the user to form a hip support whereby the weight of the hip is carried by the sling.

12. In orthopedic apparatus, the combination of a body support comprising an articulated crutch having spaced studs adjacent its upper end and a sling comprising a strap arranged to extend between the legs of the user to form a hip support and having its extremities carried upwardly and detachably connected with said studs.

13. In orthopedic apparatus, a body support comprising an articulated crutch adapted to be secured to the body and including a lower spring-pressed ground engaging portion movable relative to the upper portion of the crutch arranged to engage the ground in advance of the foot.

14. In orthopedic apparatus, the combination with a body supporting crutch including an arm rest and pivoted knee and hip joints, of a plurality of articulated sections between the arm rest and hip joint, a waist band connected with the crutch between the arm rest and hip joint and a sling depending from one of the articulated sections and adapted to extend between the legs of the user to form a hip support.

15. In orthopedic apparatus, a body support comprising a pair of hinged sections including a pivot member therefor rigidly connected to one of the sections, a clamping member on said pivot member engaging the other section to afford a binding action between said sections, a holding member for preventing rotation of the clamping member and means on one of the sections for releasably securing the holding member.

MARTIN J. SCHRAG.