

**May 28, 1940.**

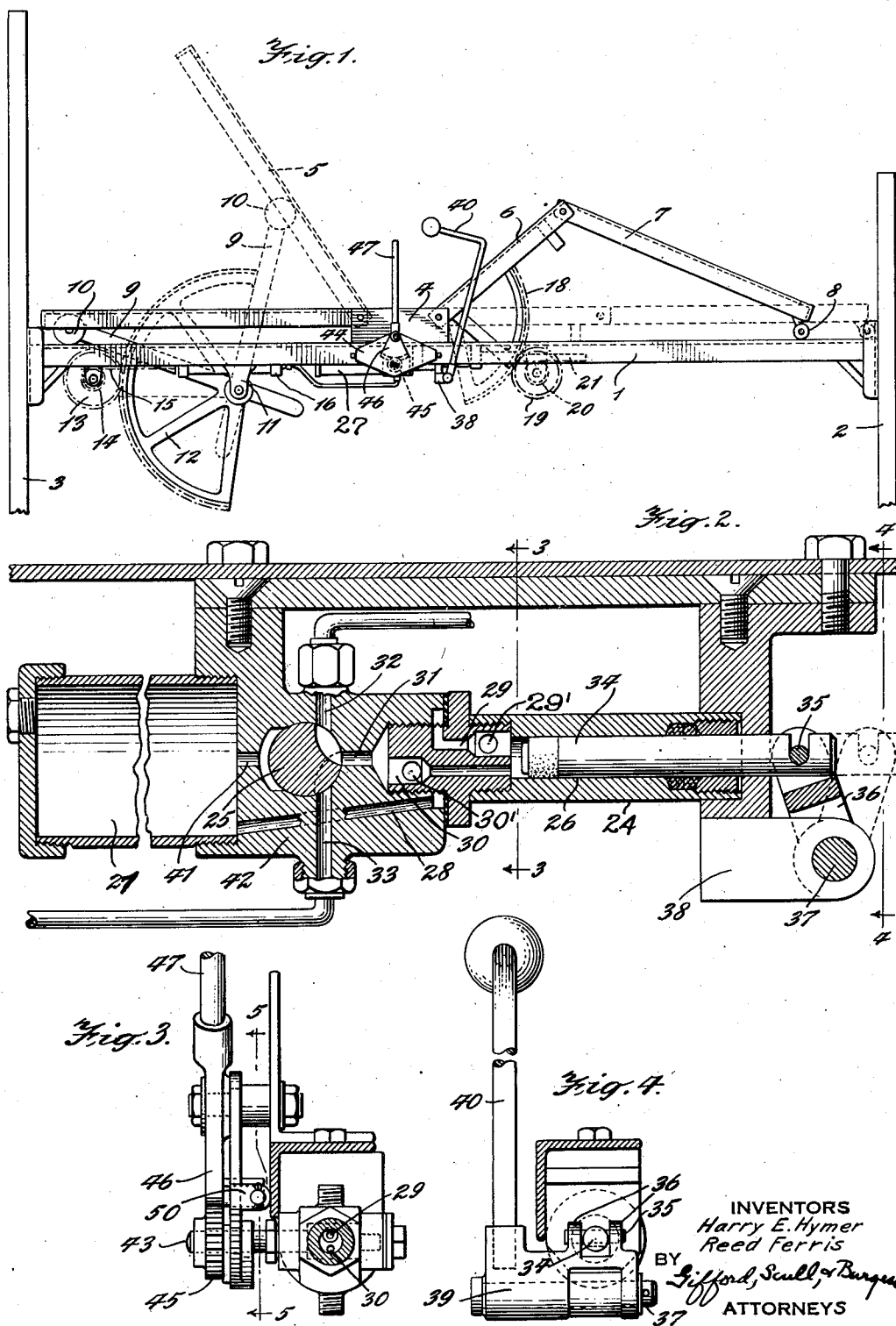
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**2,202,383**

## HYDRAULICALLY ADJUSTABLE FURNITURE

Filed Dec. 30, 1937

2 Sheets-Sheet 1



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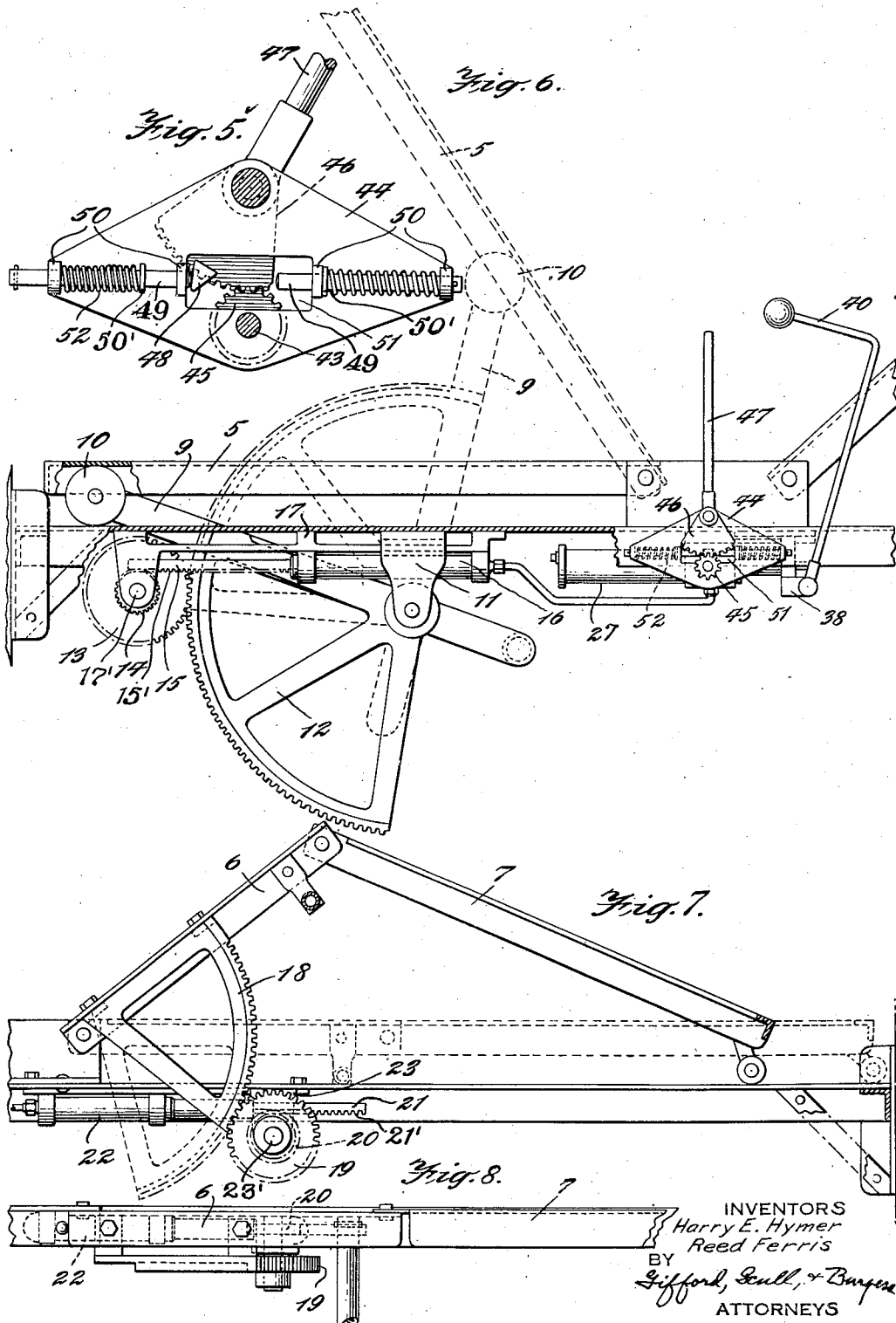
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## UNITED STATES PATENT OFFICE

2,202,383

## HYDRAULICALLY ADJUSTABLE FURNITURE

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Application December 30, 1937, Serial No. 182,444

5 Claims. (Cl. 5—69)

This invention relates to an adjustable article of furniture.

One object of the invention is to provide an adjustable bed, particularly for use in hospitals, wherein the adjustment is effected by hydraulic means. Another object is to provide an efficient and fool-proof means for operating the bed. It is a further object to provide a means which may normally be operated by the occupant of the bed with very slight exertion. It is a further object to provide an operating means which will cause no inconvenience in the use of the bed and which may be readily employed on existing structures. Further objects will hereinafter appear.

The invention will be defined in the claims ultimately appended hereto. One embodiment of the invention, for purposes of illustration, will be described with reference to the accompanying drawings which form a part of the specification and in which similar reference characters indicate corresponding parts in all the figures.

Fig. 1 is a side elevation of a bed embodying the principles of our invention.

Fig. 2 is a vertical section taken centrally through the control and pump mechanism of the bed shown in Fig. 1.

Fig. 3 is a transverse section taken along the line 3—3 of Fig. 2.

Fig. 4 is a transverse section taken along the line 4—4 of Fig. 2.

Fig. 5 is a transverse section taken along the line 5—5 of Fig. 3.

Fig. 6 is a section of the head portion of the bed shown in Fig. 1, showing the operating means located thereon.

Fig. 7 is a section of the foot portion of the bed shown in Fig. 1, showing the operating means located thereon.

Fig. 8 is a plan view of the bed as shown in Fig. 7 having the adjustable portion in a lowered position.

Referring to the drawings in detail, there is a bed frame 1 which has supports 2 and 3 at either end. Carried on said frame is a body supporting structure which for adjustability is made in four sections which are a head section 5, a central section 4, an upper foot section 6, and a lower foot section 7.

The sides of the central section 4 extend down to the bed frame 1 and are secured thereto. The head section 5 is pivotally connected to said central section and said head section may be swung upwardly about said pivotal connection so that it will be at an angle to the horizontal.

One end of the upper foot section 6 is pivotally connected to the central section 4 and its other end is hinged or pivotally connected to the lower foot section 7. This upper foot section 6 may be swung upwardly about its connection to the central section 4 so that it will be at an angle to the horizontal and in so doing it raises the upper end of the lower foot section 7 so that said section is at an angle to the horizontal, giving a bent knee characteristic to the foot section of the bed. The lower foot section 7 has a roller 8 at its lower end which rests on the bed frame 1 and permits that end of said foot section to move along said bed frame easily. When the various sections of the body supporting structure are in their lowered position, their upper surfaces are adapted to come into alignment in a horizontal plane.

To raise the head section 5 there is a lever 9. This lever 9 is a double lever having two identical arms acting on either side of the head section 5. Each end of said lever has a roller 10 which engages the head section, the point of the lever's engagement changes as said head section is raised, and said roller permits this to be accomplished readily. The lever 9 is pivotally fulcrumed in supporting brackets 11 secured on each side of the frame 1. To one arm of the lever 9 there is secured a gear segment 12. This gear segment 12 engages with a gear 13 operatively connected to a pinion gear 14. The pinion gear 14 is driven by a rack 15' formed on the end of a hydraulic ram 15 operating in a hydraulic cylinder 16. The hydraulic cylinder 16, the gear 13, and the pinion gear 14 are mounted on the bed frame 1 by a framework 17, these gears being carried by shaft 17' supported transversely of the bed frame 1 by said framework. When force is applied to the hydraulic cylinder 16, ram 15 and the rack 15' drive the pinion gear 14 and in turn the gear 13 which advances the gear segment 12 acting in conjunction with the lever 9 to raise the head-section 5.

To raise the foot section of the bed there is a gear segment 18 secured to one side of the upper foot 6. The gear segment engages with the gear 19 operatively connected to a pinion gear 20. The pinion gear 20 is driven by a rack 21' formed on the end of a hydraulic ram 21 operating in a hydraulic cylinder 22. The hydraulic cylinder 22, the gear 19, and the pinion gear 20 are mounted on the bed frame 1 by a framework 23 these gears being carried by a shaft 23' supported transversely of the bed frame 1 by said framework. When force is applied to the cylinder 22,

ram 21 and the rack 21' drive the pinion gear 20 and in turn the gear 19 which advances the gear segment to raise the upper foot section 6 and also the upper end of the lower foot section 7 giving the bent-knee effect.

The pressure to operate said hydraulic rams is supplied by a hydraulic pump 24, shown in Fig. 2, which may be connected to either of said rams selectively by a control valve comprising a body 25 rotatable in a chamber in a housing 42. The hydraulic pump 24 has a pumping cylinder 26 and a piston 34 in said cylinder. The pumping cylinder is connected to a fluid supply reservoir 27 by a passageway 28 in the housing 42 and a one-way intake valve 29 and to the hydraulic rams by a one-way outlet valve 30, controlled by ball-checks 29', and 30', respectively, the control valve 25 and passageways 31 and 32 or 33 in the housing 42.

An end of the piston 34 extends beyond the pumping cylinder 26 and is slotted to receive a pin 35 secured in integrally connected arms 36. The arms 36 are pivoted about a rock shaft 37 carried by a supporting bracket 38 extending from the bed frame 1. Said arms have an extension 39 in which provision is made to receive a pump handle 40 so that by moving said handle an oscillatory motion is transmitted to the pumping piston 34.

The control valve 25 is a four-way valve and connects the hydraulic rams selectively either to the pumping cylinder 26 as described to supply pressure thereto or to the fluid supply reservoir 27 by passageways 41 and 32 or 33 in the housing 42 to release the pressure on the selected ram. When pressure is released on either of the hydraulic rams the weight of the respective portions of the bed being supported by said ram will carry such portion to a lower position until the release of pressure is discontinued.

The control valve 25 is operated by a shaft 43 extending through the housing 42 and through a plate 44. A gear 45 is secured on said shaft at its outer end and engages with a gear segment 46 pivoted to the plate 44 and receiving a control arm 47 capable of moving said gear segment around said pivotal mounting and in turn moving the control valve 25 by means of said shaft and gear.

When the valve 25 is carried beyond a position connecting either of the two rams 16 and 22 to the pump 24 to a position where the pressure on either of said rams will be released, a lug 48 on the gear segment 46 and projecting through an opening 51 in the plate 44 engages one of the rods 49. Said rods are arranged on either side of the opening 51 and are slidably carried by projections 50 on the inside of the plate 44. Springs 52 are arranged on said rods between the outer projections 50 and abutments 50' on the rods, so as to yieldably resist any sliding movement of the rods and to automatically return said rods to a predetermined position when any force tending to hold said rods in another position is released. That is to say, when the control arm 47 is moved to an extreme position to effect a release of pressure from one of the rams, it will be automatically returned to a position where the valve 25 will be in a pumping position when the force holding said arm is released, thus preventing pumping against a closed system and safeguarding against damage that might result therefrom.

The plate 44 is mounted on the side of the bed frame 1, and the housing 42, the fluid supply

reservoir 27, and the hydraulic pump are attached to said bed frame, all being located centrally of said bed frame. The control arm 47 and the pumping handle 40 are made removable so that the operation may be restricted when desired, but when in place they extend upwardly at the side of the bed in a convenient position for use by the occupant of the bed.

It will be understood that the foregoing is in no way intended to limit our invention to a bed, but is set forth as showing one possible application. While "hydraulic" has been referred to in the specification and claims it should be understood that that term has been used broadly to cover a fluid operated mechanism and as such would include devices operated by compressed air, oil, water, etc. It will be seen that this invention can be applied to many other types of adjustable furniture, such as invalid chairs, operating tables, reading chairs, and the like.

We claim:

1. An adjustable bed comprising a stationary central section, adjustable head and foot sections on opposite sides of said central section, a pump mounted on said central section and comprising a cylinder and a piston reciprocable therein, a handle directly connected to said piston and arranged to reciprocate said piston, two hydraulic rams connected to said cylinder and arranged to raise or lower said head and foot sections, respectively, a valve controlling the connections between said cylinder and rams and having passages arranged to selectively connect said cylinder to either one of said rams or to connect either one of said rams to a pressure releasing system, a handle on said valve adjacent said first-named handle, whereby the occupant of the bed may readily operate both the valve and pump, and means automatically returning said valve to pumping position after it has been moved to either pressure releasing position.

2. An adjustable bed comprising a frame, a central stationary section forming part of said frame, adjustable head and foot sections on opposite sides of said central section, two shafts extending transversely of said frame and rotatably mounted thereon, one of said shafts being adjacent said head section and the other adjacent said foot section, pinions on said shafts, gears meshing with said pinions and operatively connected to said head and foot sections, respectively, whereby rotation of the pinions will adjust said sections, two hydraulic rams, one associated with each of said pinions and mounted on said frame on opposite sides of said central section and extending lengthwise of the frame, each ram comprising a rack engaging one of said pinions to rotate it or hold it against rotation, a pump mounted on said central section and having a piston reciprocable in a cylinder extending lengthwise of the frame, a pressure relief system, connections from said cylinder and system to said rams, a valve controlling said connections and comprising a chamber with a body rotatable therein and having passages connecting said chamber to said cylinder, to said rams, and to said system, said body having means for connecting said cylinder passage or said releasing system passage with either one of said rams, and two handles, connected respectively to said valve body and to said piston and mounted on said central section.

3. An adjustable bed comprising a frame, a central stationary section forming part of said frame, adjustable head and foot sections on opposite sides of said central section, two shafts ex-

tending transversely of said frame and rotatably mounted thereon, one of said shafts being adjacent said head section and the other adjacent said foot section, pinions on said shafts, gears meshing with said pinions and operatively connected to said head and foot sections, respectively, whereby rotation of the pinions will adjust said sections, two hydraulic rams, one associated with each of said pinions and mounted on said frame on opposite sides of said central section and extending lengthwise of the frame, each ram comprising a rack engaging one of said pinions to rotate it or hold it against rotation, a pump mounted on said central section and having a piston reciprocable in a cylinder extending lengthwise of the frame, a pressure relief system, connections from said cylinder and system to said rams, a valve controlling said connections and comprising a chamber with a body rotatable therein and having passages connecting said chamber to said cylinder, to said rams, and to said system, said body having means for connecting said cylinder passage or said releasing system passage with either one of said rams, two handles, connected respectively to said valve body and to said piston and mounted on said central section, and means normally holding said valve handle in pumping position.

4. An adjustable bed comprising a frame, a central stationary section forming part of said frame, adjustable head and foot sections on opposite sides of said central section, two shafts extending transversely of said frame and rotatably mounted thereon, one of said shafts being adjacent said head section and the other adjacent said foot section, pinions on said shafts, gears meshing with said pinions and operatively connected to said head and foot sections, respectively, whereby rotation of the pinions will adjust said sections, two hydraulic rams, one associated with each of said pinions and mounted on said frame on opposite sides of said central section and extending lengthwise of the frame, each ram com-

prising a rack engaging one of said pinions to rotate it or hold it against rotation, a pump mounted on said central section and having a piston reciprocable in a cylinder extending lengthwise of the frame, a pressure relief system, connections from said cylinder and system to said rams, a valve controlling said connections and constructed and arranged to establish a connection between said cylinder or said releasing system and either one of said rams, and means to operate said valve and said pump.

5. An adjustable bed comprising a frame, a central stationary section forming part of said frame, adjustable head and foot sections on opposite sides of said central section, two shafts extending transversely of said frame and rotatably mounted thereon, one of said shafts being adjacent said head section and the other adjacent said foot section, pinions on said shafts, gears meshing with said pinions and operatively connected to said head and foot sections, respectively, whereby rotation of the pinions will adjust said sections, two hydraulic rams, one associated with each of said pinions and mounted on said frame on opposite sides of said central section and extending lengthwise of the frame, each ram comprising a rack engaging one of said pinions to rotate it or hold it against rotation, a pump mounted on said central section and having a piston reciprocable in a cylinder extending lengthwise of the frame, a pressure relief system, connections from said cylinder and system to said rams, a valve controlling said connections and constructed and arranged to establish a connection between said cylinder or said releasing system and either one of said rams, two handles, connected respectively to said valve and to said piston to operate the same, said handles being mounted on said central section and extending upwardly whereby the occupant of the bed may readily operate both the valve and the pump.

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