Feb. 14, 1939. R. P. McGREW 2,146,970

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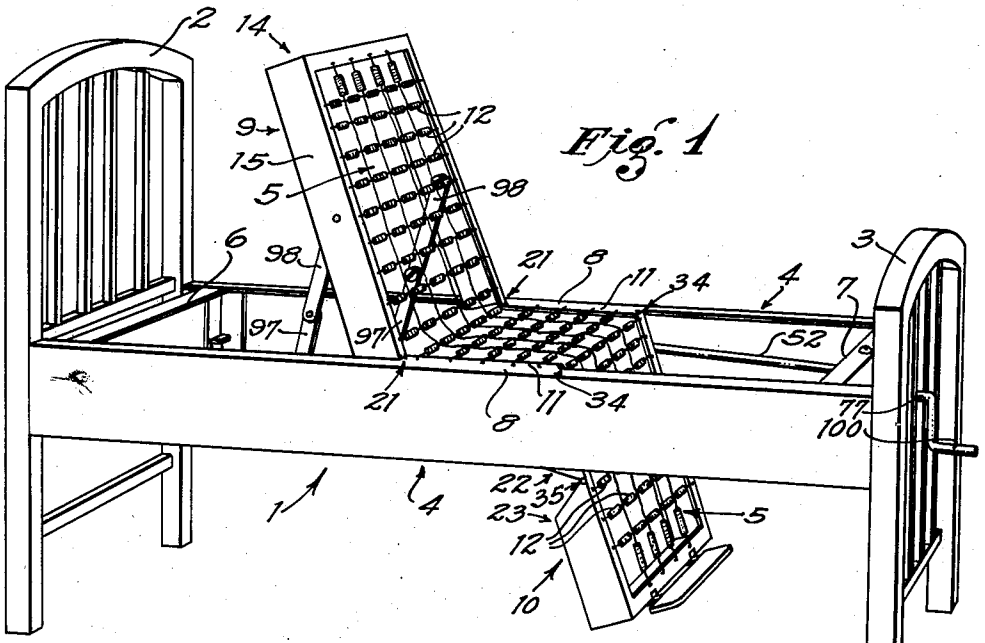


Fig. 1

Fig. 5

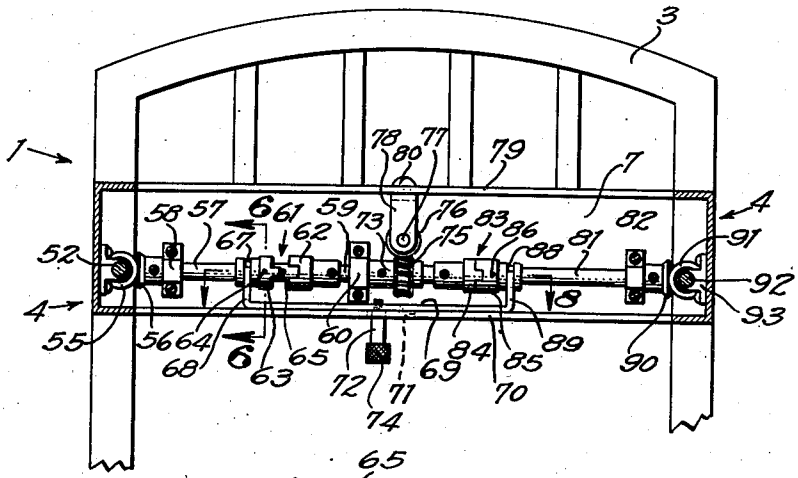
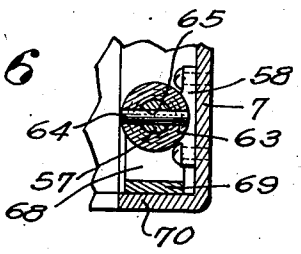


Fig. 6



INVENTOR
ROBERT P. McGREW
BY
ATTORNEY

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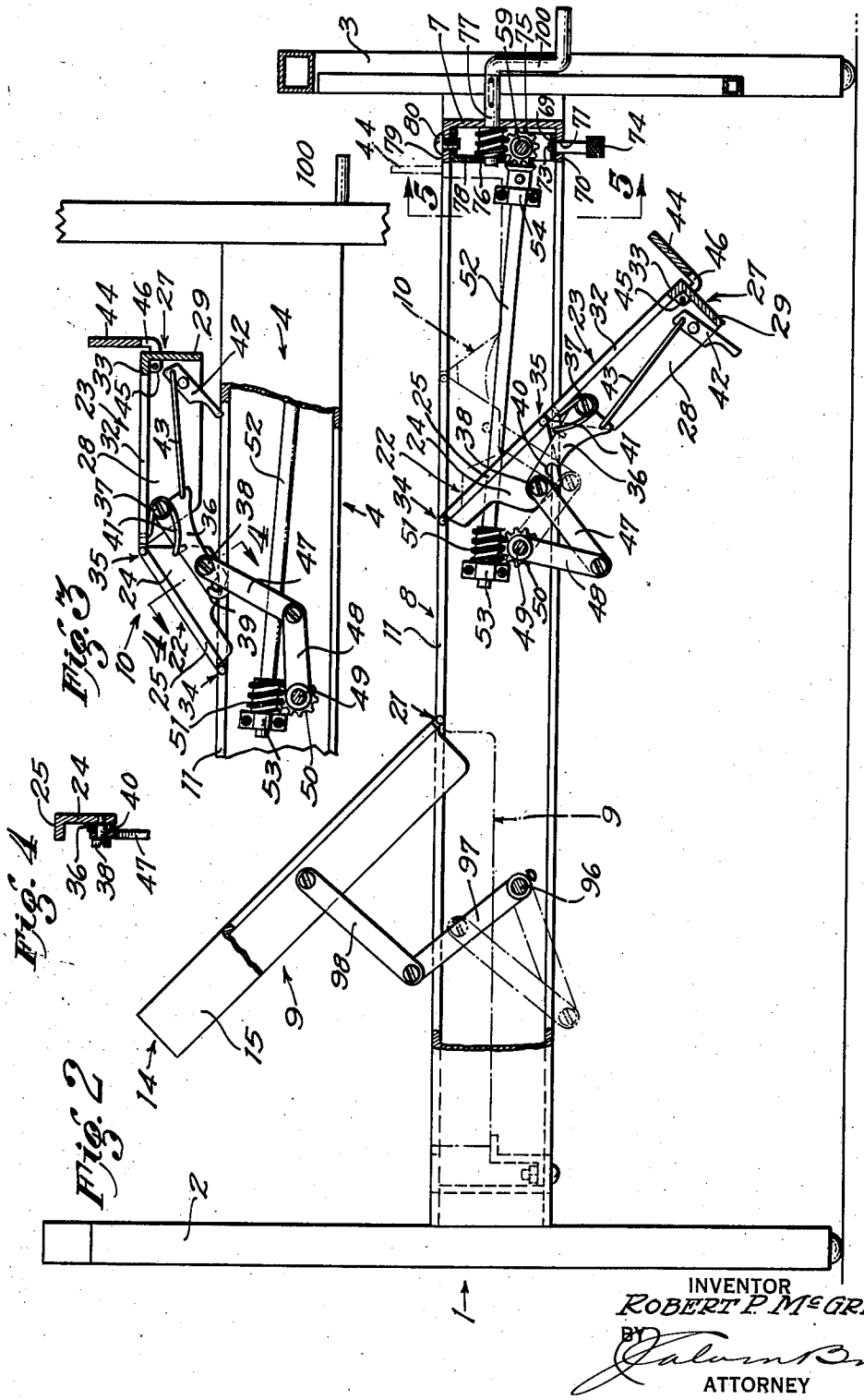


Fig. 3

Fig. 4

Fig. 2

INVENTOR
ROBERT P. McGREW
BY
ATTORNEY

Feb. 14, 1939. R. P. McGREW 2,146,970

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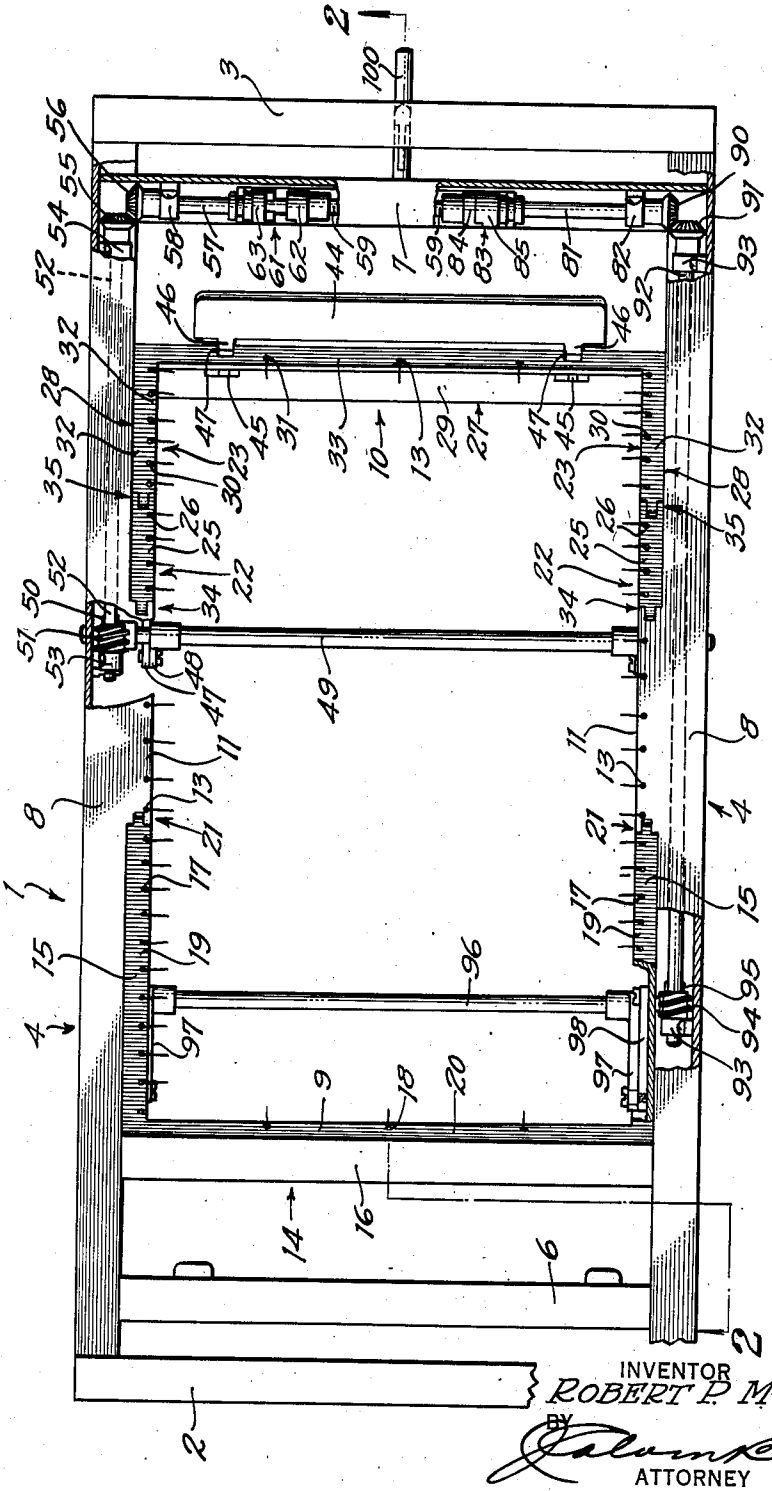


Fig. 7

INVENTOR
ROBERT P. McGREW
BY
ATTORNEY

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Fig. 10

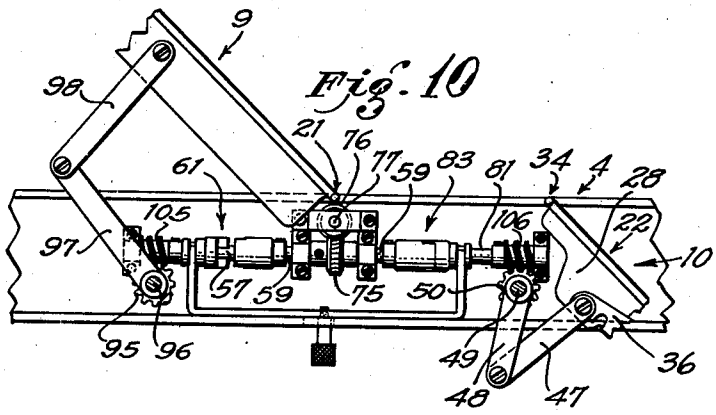


Fig. 11

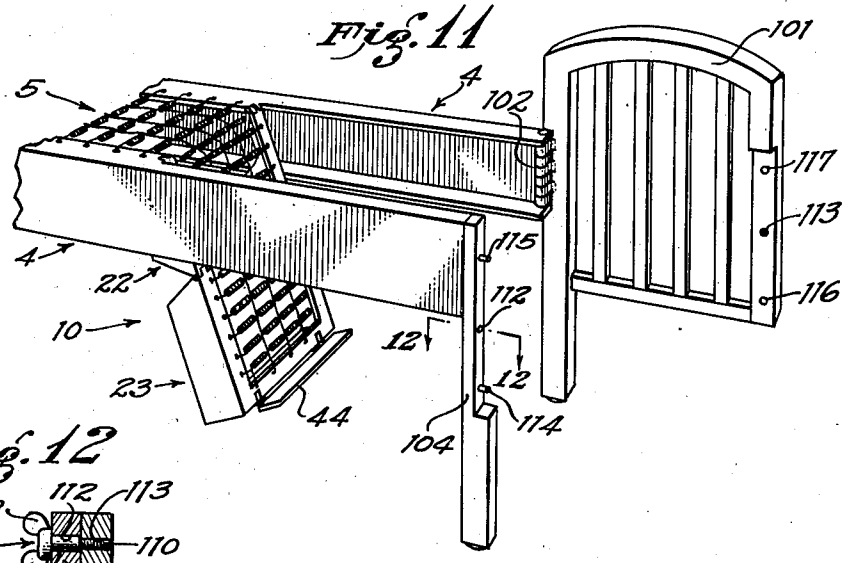


Fig. 12

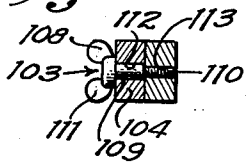
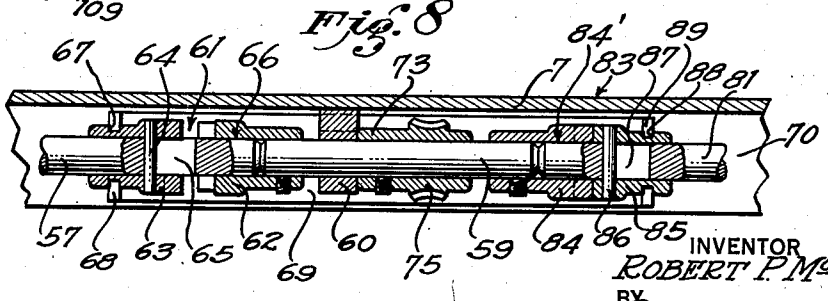


Fig. 8



INVENTOR
ROBERT P. McGREW
BY
ATTORNEY

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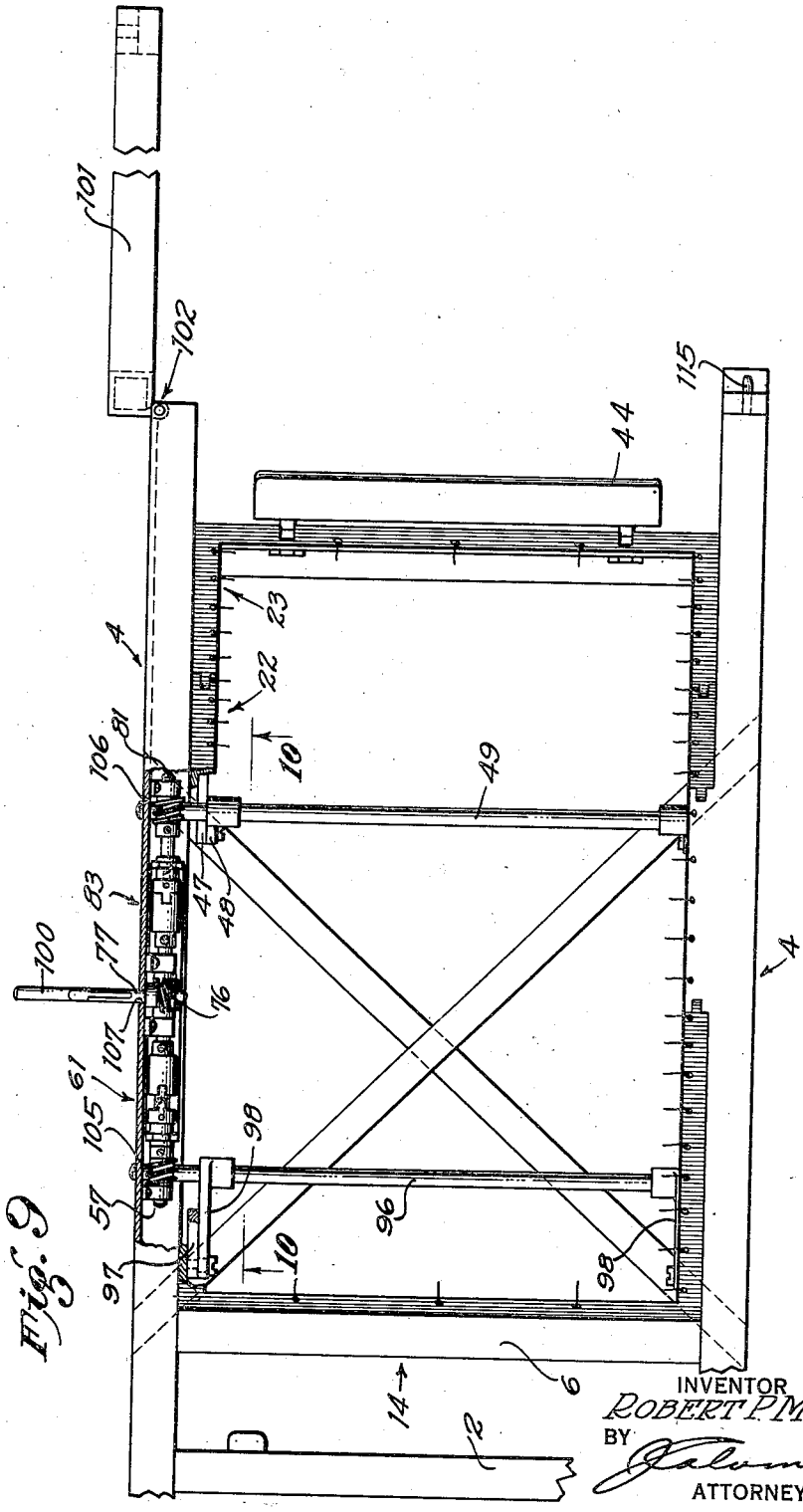


Fig. 9

INVENTOR
ROBERT P. McGREW
BY
Galvin Brown
ATTORNEY

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UNITED STATES PATENT OFFICE

2,146,970

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Robert P. McGrew, San Francisco, Calif.

Application March 9, 1937, Serial No. 129,829

5 Claims. (Cl. 5—66)

This invention relates to beds, and more particularly to an adjustable hospital bed.

The general object of the invention is to provide a bed which may be so adjusted that the back and head of an occupant of the bed may be inclined upwardly from the normal horizontal position, and the legs of the occupant may be lowered from the horizontal position or raised at an angle from the horizontal position, and, when so raised, the legs may, from the knees down, be lowered into a horizontal position.

Another object is to provide a bed of the character stated which may be operated slowly and smoothly, so as to avoid any discomfort to the occupant of the bed, while the bed is being adjusted.

A further object is to provide a bed which may be adjusted to raise the back and head, and lower the legs of an occupant of the bed, and which is constructed so that the foot member of the bed may be swung out from one side of the bed to open the foot end of the bed, when the bed is adjusted, as described, in order that the occupant may step out of the bed through said open foot end thereof.

Other objects and advantages of the invention will appear as the specification proceeds.

With the above and other objects in view, the invention consists in the novel and useful provision, formation, construction, association, and relative arrangement of parts, members and features, all as shown in a certain embodiment in the accompanying drawings, described generally, and more particularly pointed out in the claims.

In the drawings:

Figure 1 is a perspective of my bed with its spring shown adjusted for raising the head and back of an occupant of the bed at an angle and for lowering the legs of the occupant at an angle,

Figure 2 is a longitudinal vertical section of my bed taken on line 2—2 of Figure 7, showing the bed spring in full lines adjusted, as in Figure 1, and showing the adjustable sections of the spring in their normal horizontal positions in dotted lines,

Figure 3 is a fragmentary longitudinal vertical section of the bed, taken on line 2—2 of Figure 7, showing the leg-supporting section of the bed spring elevated above its normal horizontal position, with the upper leg-supporting member of said section inclined upwardly from the horizontal, and the lower leg-supporting member of said section extending horizontally from said upper leg-supporting member,

Figure 4 is a cross sectional view of a detail of construction of the leg-supporting section of the bed taken on line 4—4 of Figure 3,

Figure 5 is a transverse vertical section of the bed taken on line 5—5 of Figure 2,

Figure 6 is a cross sectional view of one of the clutches of the operating mechanism taken on line 6—6 of Figure 5,

Figure 7 is a plan view of my bed shown partly broken away and in section to illustrate certain features of the operating mechanism, the bed spring being shown in the same adjusted position as shown in Figure 2,

Figure 8 is a longitudinal section of the drive mechanism,

Figure 9 is a plan view of a modification of my bed, with one side member thereof partly broken away to show the drive mechanism for raising or lowering the back and head member, and the leg member of the bed,

Figure 10 is a fragmentary longitudinal section of said bed taken on line 10—10 of Figure 9,

Figure 11 is a fragmentary perspective of the foot and leg end portion of said modification of my bed, with the foot member of the bed hinged to the adjacent end of one of the side members of the bed and shown swung out from said side member and opening the foot end of the bed, and,

Figure 12 is a horizontal section taken on line 12—12 of Figure 11, showing the means for securing the hinged foot member of the bed in its closed position extending across the foot end of the bed.

Referring with particularity to the drawings, in which corresponding parts are designated by the same reference characters in all of the figures, 1 designates a bed in its entirety including a head member 2, foot member 3, horizontal side members 4, and a spring 5. The side members 4 are preferably in the form of channel bars with their channel sides facing inwardly. A transverse channel bar 6 connects the side members 4 near their ends which are connected to the head members 2, while a transverse channel bar 7 connects the side members 4 near their ends which are connected to the foot member 3 of the bed.

The bed spring 5 is formed with an intermediate supporting section 8, for supporting the lower portion of the body of the occupant of the bed, an adjustable head-and-back supporting section 9 for supporting the main body portion and head of the occupant, and an adjustable leg-supporting section 10 for supporting the legs of the occupant of the bed.

The intermediate supporting section 8 of the bed spring 5 comprises a pair of horizontal flange extensions 11, extending inwardly from the upper flanges of the channel side members 4, respectively, of the bed, directly opposite each other, and a portion of the coil springs 12 and connections of the bed spring proper, which coil springs are connected to said flange extensions 11 through holes 13 therein.

The head-and-back supporting section 9 of the bed spring 5 comprises a U-shaped frame 14 and

a portion of the coil springs 12 and connections of the bed spring proper, which coil springs are connected to the side arms 15 and connecting member 16, of said frame, through holes 17 and 18 in flanges 19 and 20 extending inwardly from the upper edges of said side arms and connecting member, respectively. The head-and-back supporting section 9 is hinged to one end of the intermediate supporting section 8 of the bed spring 5 by hinges 21 connecting the adjoining ends of the flanges 11 and 19 of said supporting sections.

The leg-supporting section 10 of the bed spring 5 comprises an upper leg-supporting member 22 and a lower leg-supporting member 23. The upper leg-supporting member 22 comprises a pair of links 24, formed with inturned flanges 25 along their upper edges, and a portion of the coil springs 12 and connections of the bed spring proper, which coil springs are connected to said links 24 through holes 26 in said link flanges 25. The lower leg-supporting member 23 comprises a U-shaped frame 27 and a portion of the coil springs 12 and connections of the bed spring proper, which coil springs are connected to the side arms 28 and connecting member 29 of said frame, through holes 30 and 31 in flanges 32 and 33 extending inwardly from the upper edges of said side arms and said connecting member, respectively. The upper leg-supporting member 22 of the leg-supporting section 10 is hinged at one end to the other end of the intermediate supporting section 8 by hinges 34 connecting the adjoining ends of the flanges 11 of said intermediate supporting section, and the flanges 25 of the links 24 of said upper leg-supporting member 22. The lower leg-supporting member 23 of the leg-supporting section 10 is hinged to the upper leg-supporting member 22 by hinges 35 connecting the adjoining ends of the flanges 25 of the links 24 of said upper leg-supporting member, and the flanges 32 of the side arms 28 of said lower leg-supporting member 23. The lower-leg-supporting member 23 of the bed spring is held parallel or at an angle to the upper leg-supporting member 22 by means of a pair of dogs 36, pivoted at one end at 37 to the side arms 28, respectively, of the frame 27 and screw pins 38 extending inwardly from the links 24, respectively, of the upper leg-supporting member 22, which dogs are each provided at their other ends with a pair of notches 39 and 40 in their lower edges for respectively engaging said pins 38 on said links 24. Springs 41 are coiled around the dog pivots 37, respectively, with one end of said springs secured to the flanges 32 of the side arms 28 of frame 27, respectively, and the other ends of said springs engaging the upper edges of said dogs, respectively, whereby said dogs are swung down so that the pins 38 on the links 24 will engage either the notch 39 or the notch 40 in said dogs, respectively, for holding the lower leg-supporting member 23 in straight alignment with the upper leg-supporting member 22, as shown in Figure 2 of the drawings, or for holding said lower leg-supporting member at an angle to said upper leg-supporting member and in a horizontal position, as shown in Figure 3 of the drawings. Lever arms 42 are pivoted, respectively, to the side arms 28 of the frame 27, and links 43 connect said lever arms to the dogs 36, respectively, whereby upon swinging said lever arms in one direction, said dogs are swung upwardly on their pivots to disengage either the notches 39 or 40 of said dogs from the pins 38, so that the lower leg member 23 may be swung on its hinges 35 with relation to the upper leg-supporting member 22. A foot rest 44 is hinged by hinges 45 to the under side of the flange 33 of the connecting member 29 of frame 27, there being lugs 46 formed on the lower edge of said foot rest connecting the foot rest to said hinges, which lugs extend through slots 47 in said flange 33 and the frame connecting member 29, and engage the lower ends of said slots to hold said foot rest in its raised and operative position, extending upwardly at right angles from the frame connecting member 29 for supporting the feet of the patient in the bed and also for engaging the foot end of the mattress, which is placed upon the bed spring 5 to prevent the mattress from sliding off the foot end of the bed spring when the leg-supporting section 10 of the bed spring is lowered and the head-and-back section 9 of the bed spring is raised as shown in Figure 2 of the drawings.

The pins 38 on the links 24 of the upper leg-supporting member 22, are connected to the upper ends of a pair of links 47, the lower ends of which links are connected to a pair of crank arms 48, which are secured on a crank shaft 49 extending transversely of the bed 1 and journaled at its ends in the side members 4, respectively, of the bed. Said rock shaft 49 carries a worm wheel 50, within one of the side members 4 of the bed, which worm wheel is in mesh with a worm 51 secured on one end of a transmission shaft 52, journaled in bearings 53 and 54 mounted upon and within said side member 4. On the other end of said transmission shaft 52 is secured a bevel pinion 55 in mesh with a bevel pinion 56 on one end of a second transmission shaft 57 journaled in a bearing 58 mounted on the inside of the transverse channel bar 7. A drive shaft 59 is journaled in a bearing 60 on the inner side of the transverse bar 7 and one end of said drive shaft may be clutched to the other end of the transmission shaft 57 by a clutch 61 comprising a pair of clutch members 62 and 63. The clutch member 62 is secured on said end of said drive shaft 59, while the clutch member 63 is slidably keyed on the adjoining end of the transmission shaft 57 by means of a key 64 secured at its ends in said clutch member and extending through a longitudinal slot 65 in said transmission shaft. In the outer end of the clutch member 62 is formed a bearing 66 in which is journaled the adjoining end of the transmission shaft 57. The clutch member 63 is provided with an annular groove 67 engaged by a fork 68 upstanding from one end of a clutch-operating bar 69 slidably mounted on the lower flange 70 of the transverse bar 7, whereby said clutch member 63 is shifted into or out of engagement with the clutch member 62 for clutching the transmission shaft 57 to, or unclutching said transmission shaft from, the drive shaft 59. In said flange 70 is provided a longitudinal slot 71 through which extends a stud 72, the upper end 73 of which is screw-seated in the clutch-operating bar 69, while its lower end is formed with a knurled hand grip 74 to be grasped by one's hand for shifting said clutch-operating bar 69. On the drive shaft 59 is secured a worm wheel 75 in mesh with a worm 76 secured on a crank shaft 77 extending through the transverse bar 7 and journaled in said bar and, at its inner end, in a bracket 78 secured to the upper flange 79 of said transverse bar by a screw 80. A third transmission shaft 81 is journaled in a bearing 82 mounted on the inside of the transverse bar 7, which shaft may be clutched at its inner end

to the other end of the drive shaft 59 by a clutch 83 comprising a pair of clutch members 84 and 85. The clutch member 84 is secured on said end of said drive shaft 59, while the clutch member 85 is slidably keyed on said transmission shaft 81 by a key 86 secured in said clutch member and extending through a longitudinal slot 87 in said transmission shaft. In the outer end of the clutch member 84 is formed a bearing 84' in which is journaled the adjoining end of the transmission shaft 81. In the outer end portion of the clutch member 85 is provided an annular groove 88 engaged by a fork 89 upstanding from the other end of the clutch-operating bar 69. On the outer end of the transmission shaft 81 is secured a bevel pinion 90 in mesh with a bevel pinion 91 secured on one end of a fourth transmission shaft 92 journaled in bearings 93 mounted on the inside of the other side member 4 of the bed 1. On the other end of said transmission shaft 92 is secured a worm 94 in mesh with a worm wheel 95 secured on a crank shaft 96 extending transversely of the bed 1 and journaled at its ends in the side members 4, respectively, of the bed. On said crank shaft 96 is secured a pair of crank arms 97, which are connected at their outer ends to the lower ends of a pair of links 98, respectively, the upper ends of which links are connected to the side arms 15 respectively of the frame 14 of the head-and-back supporting section 9 of the bed spring 5.

A crank 100 is detachably fitted on the outer end of the crank shaft 77 and extends outside of the foot member 3 of the bed 1 for rotating said crank shaft and the worm 76 for operating the mechanism for adjusting the head-and-back supporting section 9 and the leg-supporting section 10 of the bed spring 5.

The operation, uses, and advantages of the invention are as follows:

My bed may be used as a conventional bed when the head-and-back supporting section 9 and the leg-supporting section 10 of the bed spring 5 are in their horizontal positions in alignment with the horizontal intermediate supporting section 8, as illustrated in dotted lines in Figure 2 of the drawings.

When it is desired to raise the head and back of the occupant of my bed, an attendant grasps the hand grip 74 and shifts the clutch-operating slide bar 69 to the left (Figure 5), which, through its forks 68 and 89, shifts the clutch member 63 out of engagement with the clutch member 62 and unclutches the transmission shaft 57 from the drive shaft 59, and shifts the clutch member 85 into engagement with the clutch member 84 and clutches the transmission shaft 81 to said drive shaft 59. The crank 100 is then grasped and rotated by the attendant, which rotates the worm 76. The rotation of said worm rotates the worm wheel 75 and the drive shaft 59, and said drive shaft in turn rotates the transmission shaft 81, clutched thereto by clutch 83, and the bevel pinion 90. The rotation of said bevel pinion rotates the bevel pinion 91, transmission shaft 92 and worm 94, and said worm rotates the worm wheel 95, crank shaft 96, and crank arms 97, which crank arms through the medium of the links 98 swings the head-and-back supporting section 9 of the bed spring 5 upwardly on its hinges 21 into an upwardly inclined position, as shown in full lines in Figure 2 of the drawings, in which position and in any other position to which it may be swung, said head-and-back supporting section may be held by the engagement of the worm wheel 95 with the worm 94.

When it is desired to lower the leg-supporting section 10 of the bed spring, the clutch member 85 is shifted out of engagement with the clutch member 84, unclutching the transmission shaft 81 from the drive shaft 59, and the clutch member 63 is shifted into engagement with the clutch member 62 by means of the clutch-operating bar 69, clutching the transmission shaft 57 to the drive shaft 59. The crank 100 is then rotated, which rotates the worm 76 and said worm rotates the worm wheel 75, drive shaft 59 and the transmission shaft 57, clutched to the drive shaft, and the bevel pinion 56. Said bevel pinion in turn rotates bevel pinion 55, transmission shaft 52 and worm 51, which worm rotates the worm wheel 50, crank shaft 49 and cranks 48, and said cranks, through the medium of the links 47, swing the leg-supporting section 10 of the bed spring down on its hinges 34, at an angle to the horizontal intermediate supporting section 8, as shown in full lines in Figure 2 of the drawings.

When it is desired to raise the leg-supporting section 10 of the bed spring 5, the transmission shaft 81 being unclutched from the drive shaft 59, and the transmission shaft 57 being clutched to the drive shaft by clutch 61, as above described, the crank 100 is rotated in the opposite direction, whereupon the leg-supporting section 10, through the medium of the crank shaft 77, worm 76, worm wheel 75, drive shaft 59, clutch 61, transmission shaft 57, bevel pinions 56 and 55, transmission shaft 52, worm 51, worm wheel 50, crank shaft 49 and crank arms 48, and links 47, is swung upwardly on its hinges 34 at an angle to the horizontal intermediate section 8 of the bed spring 5, as illustrated in full lines in Figure 3 of the drawings. When the leg-supporting section 10 is thus swung upwardly, the lower leg-supporting member 23 may be swung on its hinges 35 at an angle to the upper leg-supporting member 22, or into a horizontal position, as shown in Figure 3, upon swinging the lever arms 42 and, through links 43, swinging the dogs 36 upwardly to disengage the dog notches 39 from the pins 38, and when said lower leg-supporting member is swung into such angular position with relation to the upper leg-supporting member, it may be so held by allowing the dogs 36 to swing down so that the pins 36 engage the dog notches 40. The leg-supporting section 10 is held in any position to which it is swung by the engagement of the worm wheel 50 with the worm 51.

When the head-and-back supporting section 9 is swung up and the leg-supporting section 10 is swung down, as shown in Figure 2, my bed is converted into the form of an invalid's chair, thus enabling the occupant of the bed to sit up without getting out of the bed and sitting in a chair.

The operating mechanism of my bed, including the worms and worm wheels, causes the head-and-back supporting section and the leg-supporting section to be swung up or down smoothly and slowly, so as to avoid any discomfort to the occupant of the bed.

In the modification of my bed shown in Figures 9 to 12, inclusive of the drawings, the transverse channel bar 7 is eliminated and the parts 57 to 89, inclusive, of the operating mechanism are mounted on the inside of one of the side members 4, as shown in Figures 9 and 10, while the foot member 101 of the bed is hinged at one of its side edges by a hinge 102 to the foot end

of said side member 4, and securing means 103 is provided for securing said foot member 101 at its opposite side edge to a leg 104, which is secured at its upper portion to the foot end of the other side member 4 of the bed for supporting said end of said other side member, as shown in Figures 9 and 11.

Worms 105 and 106 are secured on the ends of the shafts 57 and 81, respectively, of said parts of the operating mechanism mounted on said side member 4, which worms mesh with the worm pinions 95 and 50, respectively, as shown in Figures 9 and 10. The crank shaft 77 extends through an opening 107 in the side of said side member 4 to receive the crank 100.

The securing means 103 comprises a thumb screw 108 formed with a cylindrical portion 109, a screw shank 110 extending from one end of said cylindrical portion, and a thumb piece 111, formed on the other end of said cylindrical portion 109. The cylindrical portion 109 of said thumb screw is turnably fitted in an opening 112 extending through the leg 104, with the thumb piece 111 engaging the inner side of said leg, while the threaded shank 110 of said thumb screw is adapted to engage a threaded opening 113 in the foot member 101 near its unhinged edge, for securing said edge of said foot member to the leg 104 and holding said foot member in position extending across the foot end of the bed. Dowel pins 114 and 115 project from the leg 104 below and above the opening 112, respectively, in said leg for projecting into openings 116 and 117 in the foot member 101 near the unhinged edge of said foot member for firmly holding said edge of said foot member to the leg 104 when said foot member is swung across the foot end of the bed.

When the clutch 83 is brought into operation in the manner hereinbefore described, rotation of the crank shaft 77 by the crank 100, rotates the worm 106 through the medium of the worm 76, worm wheel 75, transmission shaft 59, clutch 83 and transmission shaft 81, and said worm 106 rotates the worm wheel 50 and rock shaft 49 which, in turn, through links 48 and 47 swings the leg-supporting section 10 up or down on its pivots 34.

When the clutch 61 is brought into operation, rotation of the crank shaft 77, by the crank 100, rotates the worm 105 through the medium of the worm 76, worm wheel 75, transmission shaft 59, clutch 61, and transmission shaft 57, and said worm 105 rotates the worm 95 and rock shaft 96, which in turn through links 97 and 98 swings the head-and-back section 9 up or down on its pivots 21.

When the leg section 10 is swung down, the thumb screw 108 may be unscrewed from the threaded opening 113 in the foot member 101 and said member swung outwardly on its hinge 102 to open the foot end of the bed, as shown in Figure 11, so that the occupant of the bed may step out of the bed through said open foot end.

I claim:

1. A bed including a head member, a pair of side members secured at one end to said head member, a foot member hinged to the other end of one of said side members to be swung across the foot end of the bed or swung outwardly from the foot end of the bed to open said end of the bed, means for securing said foot member in position swung across the foot end of the bed, a bed spring supported by said side members and formed with a horizontal section, an adjustable leg section and an adjustable back section, and means for swinging said leg section downwardly and said back section upwardly from the horizontal position of the bed spring.

2. A bed including a head member, a pair of side members secured at one end to said head member, a foot member for normally supporting the other end of said side members, means whereby said foot member may be withdrawn from the foot end of the bed to provide an unobstructed opening at the foot end of the bed, a bed spring formed with an adjustable leg section and an adjustable back section, and means for lowering said leg section and raising said back section from the horizontal position of the bed spring.

3. A bed including a head member, a pair of side members secured at one end to said head member, a foot member for supporting the other end of said side members, means whereby said foot member may be normally extended across the foot end of the bed or moved from its normal position to provide an unobstructed opening at the foot end of the bed, means intermediate the head member and foot member for holding the foot ends of said side members in properly spaced relation when said foot member is moved from across the foot end of the bed, a bed spring formed with adjustable leg and back sections and means for lowering said leg section and raising said back section from the horizontal position of said bed spring.

4. A bed including a head member, a pair of side members secured at one end to said head member, a foot member hinged to the other end of one of said side members to be swung across the foot end of the bed or swung outwardly from the foot end of the bed to open said end of the bed, a leg for supporting the other end of the other side member, against which leg fits the adjacent side of said foot member when swung across the foot end of the bed, means for releasably securing said adjacent side of said foot member to said leg, a bed spring formed with adjustable leg and back sections and means for lowering said leg section and raising said back section from the horizontal position of said bed spring.

5. A bed including a head member, a pair of side members secured at one end to said head member, a foot member hinged to the other end of one of said side members to be swung across the foot end of the bed or swung outwardly from the foot end of the bed to open said end of the bed, a leg for supporting the other end of the other side member, against which leg fits the adjacent side of said foot member when swung across the foot end of the bed, registering means carried by said leg for cooperation with the adjacent side of said foot member when swung across the foot end of the bed, means for securing said adjacent side of said foot member to said leg, a bed spring formed with adjustable leg and back sections and means for lowering said leg section and raising said back section from the horizontal position of said bed spring.

ROBERT P. McGREW.