Aug. 28, 1962 S. N. MANN ET AL 3,050,744

BED CONSTRUCTION

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Fig. 1.

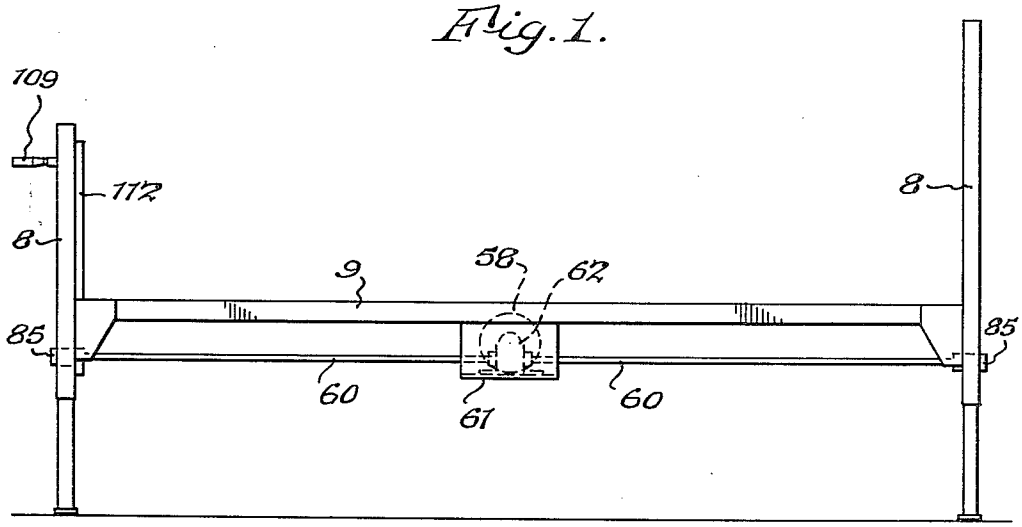
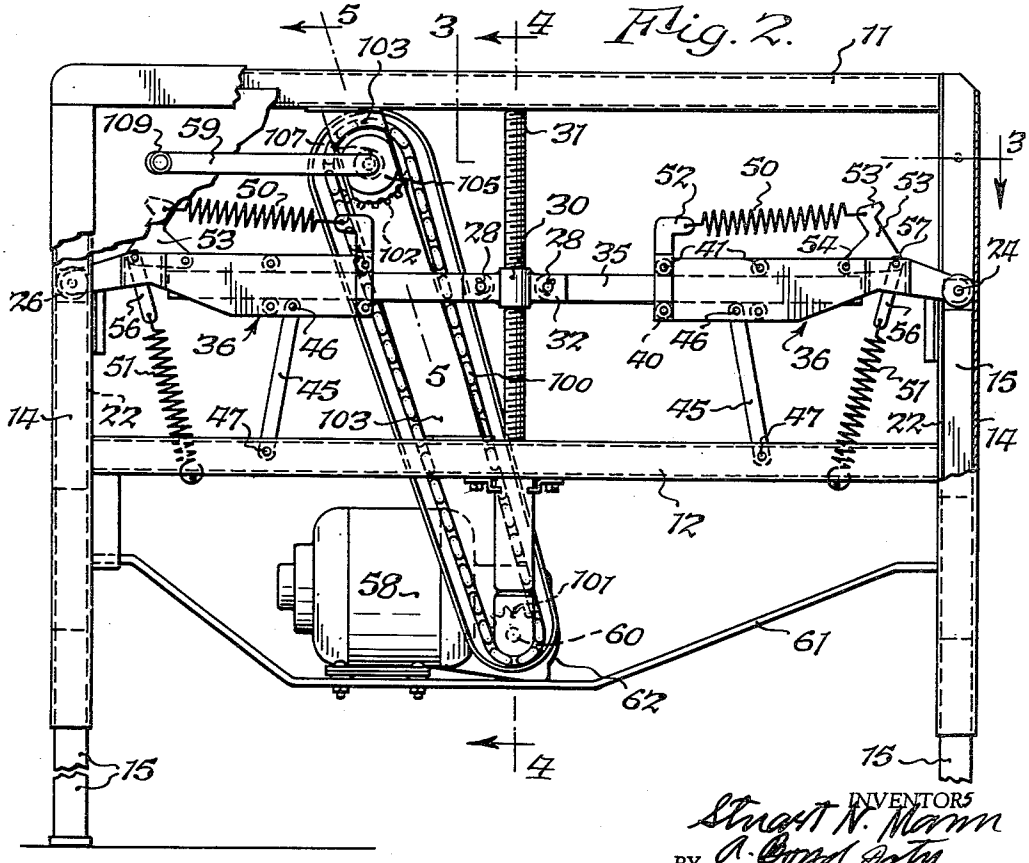


Fig. 2.



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Fig. 3.

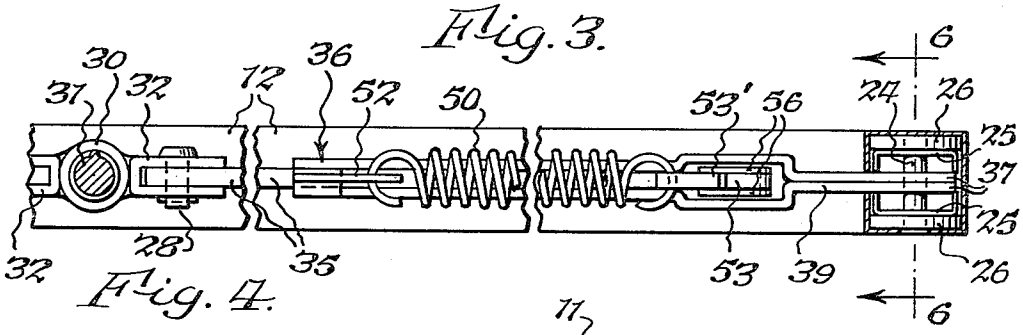


Fig. 4.

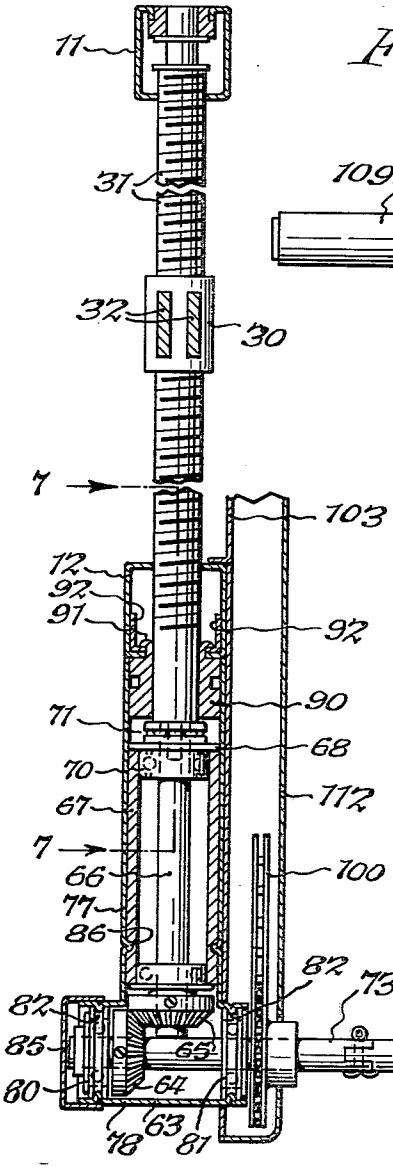


Fig. 5.

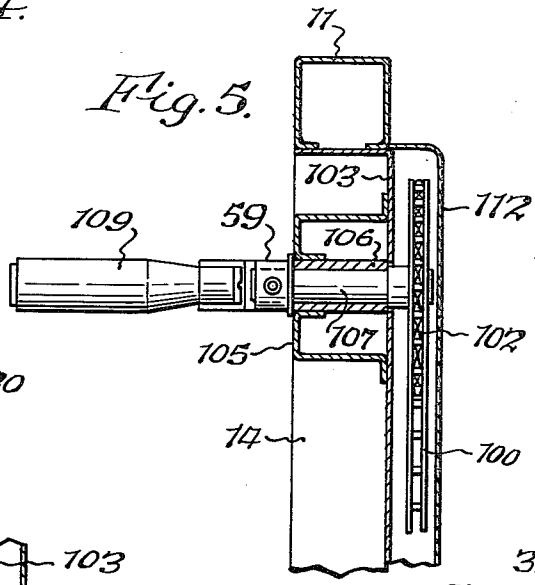
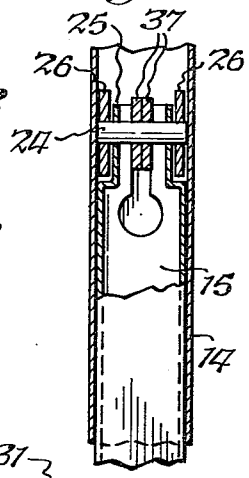


Fig. 6.



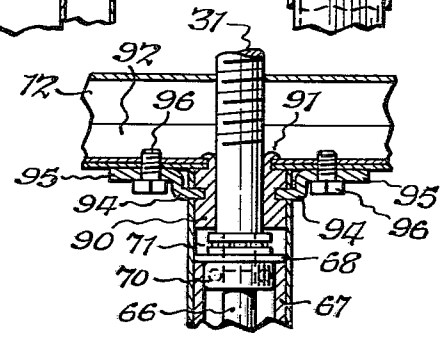


Fig. 7.

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Fig. 8.

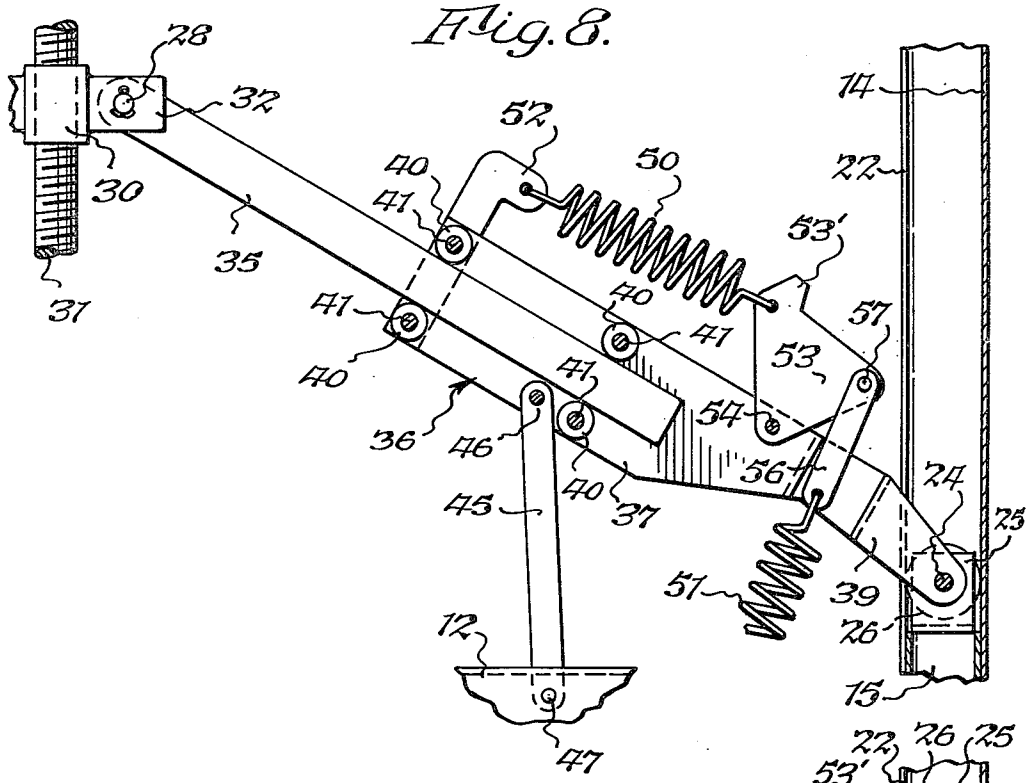
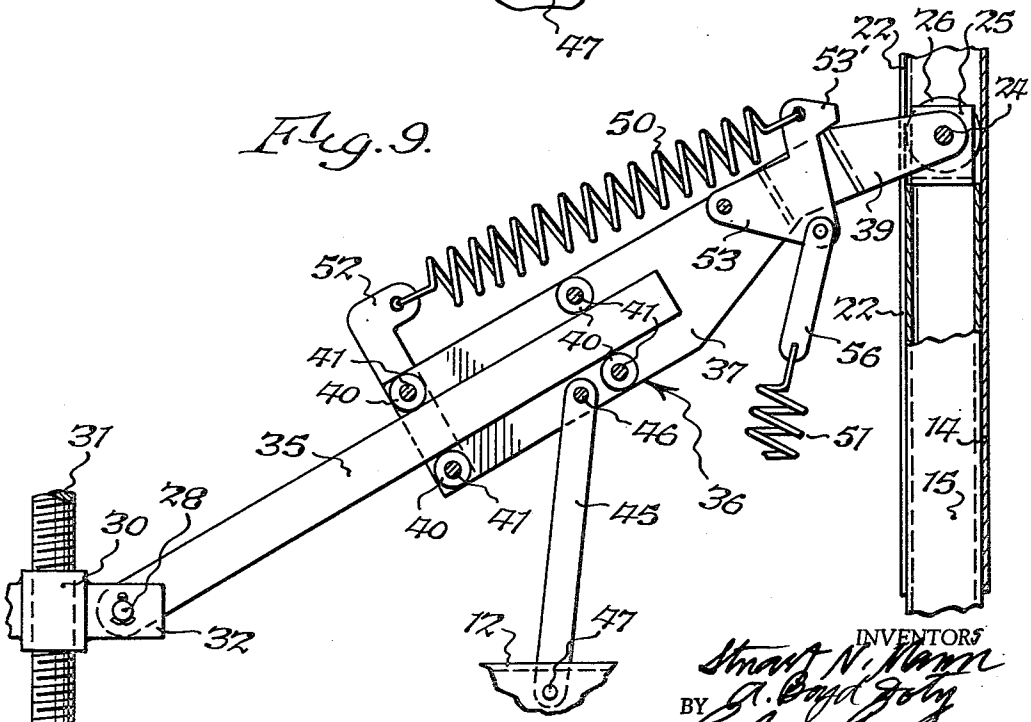


Fig. 9.



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3,050,744

BED CONSTRUCTION

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Filed June 16, 1959, Ser. No. 820,637
5 Claims. (Cl. 5—63)

This invention relates to beds of the type which may be adjusted to various heights above the floor. Beds of this type are particularly desirable for use in hospitals since they may be lowered to a position in which the bed frame would be approximately at the height of a bed in a home, or to an elevation convenient for examination or treatment of a patient by doctors or nurses. It is also desirable to have beds of this kind constructed so that they may be raised and lowered by power or manually.

One of the objects of this invention is to provide a bed of this type with improved simplified construction which will provide the maximum comfort for a patient and which may be raised and lowered without shock, noise or vibration.

Another object is to provide beds of this kind with improved counter-balancing springs to compensate at least in part for the weight of the bed. A further object is to provide a bed of this type which may be raised and lowered manually or by power.

It is also an object of this invention to provide a mechanism arranged in a bed and which is readily accessible for inspection, adjustments or repair. Another object is to provide an improved gear box or housing containing a part of the drive by means of which the bed is raised and lowered.

In the accompanying drawings:

FIG. 1 is a side elevation of a bed provided with raising and lowering mechanism embodying this invention.

FIG. 2 is an end elevation of a bed on an enlarged scale with a panel removed to show the raising and lowering mechanism.

FIG. 3 is a fragmentary sectional plan view thereof on lines 3—3, FIG. 2.

FIG. 4 is a sectional elevation thereof on line 4—4, FIG. 2.

FIG. 5 is a fragmentary sectional view thereof on line 5—5, FIG. 2.

FIG. 6 is a fragmentary sectional view thereof on line 6—6, FIG. 3.

FIG. 7 is a fragmentary sectional elevation on line 7—7, FIG. 4.

FIGS. 8 and 9 are fragmentary elevations with certain parts removed of the improved mechanism embodying this invention showing the positions of the parts near opposite portions of their paths of movement.

The bed may be of any usual or suitable construction, that shown by way of example including end frame members 8 connected by side rails or bars 9 on which a mattress-supporting frame or spring of any desired type may be mounted.

The end frame members 8 may be of any desired type, and in the particular construction shown by way of example, each has the usual upper and lower transverse members 11 and 12, the opposite ends of which are connected to upper leg parts 14. The legs of the bed each comprise two parts 14 and 15 slidably arranged relative to each other, those shown being telescopically arranged one within the other, the lower parts 15 in the construction shown resting on the floor and the parts 14 together with the transverse members secured thereto being adjustable vertically relatively to the leg parts 15.

It will be obvious from the foregoing description that

by raising and lowering the upper leg members or parts 14 relative to the parts 15, the bed will be raised or lowered.

The raising and lowering of the end frames relative to the leg parts 15 is preferably accomplished by similar mechanisms located in each end member and consequently the mechanism of only one end member will be described. This mechanism includes a pair of levers which lie within the end members and which are pivoted intermediate of their ends on the bed frame. These levers have their outer ends pivotally connected to the upper ends of the lower legs 15 within the other leg members or parts 14. For this purpose the upper ends of the legs 14 have slots or recesses 22 formed in the inner walls or surfaces thereof through which the outer ends of the levers extend during the up and down movement of these leg parts 14 relatively to the ends of the levers. The pivot connections between the levers and the leg members 15 may be made in any suitable or desired manner, for example, as shown in FIG. 6, 8 and 9 in which the outer ends of the levers extend through the slots 22 in the upper leg members 14 and have pivot pins 24 extending through upwardly extending parts 25 of the lower leg members 15. Wheels or rollers 26 are pivoted to rotate about the pivot pins 24 and to extend into close proximity to the opposite walls of the upper leg members 14 to facilitate vertical movement of the outer ends of the levers and to guide these ends of the levers in their movement and to guide the said leg members in their relative movements.

The inner ends of the levers are pivoted at 28 to nuts 30 which have threaded engagement with upright screw shafts 31. These nuts have outwardly extending flat arms or webs, a pair of these webs 32 being provided as shown in FIG. 3 at each side of each nut. The inner ends of the levers extend between these pairs of webs and are pivoted thereto by means of the pivot pins 28.

Since the distance between the nut 30 and the ends of the levers varies depending upon the angular positions of the levers with reference to the screw 31, means are provided for compensating for this variation in the lengths of the lever. In the construction shown for this purpose each lever is made in two parts, an inner part 35 being connected with the pivot pin 28 and the nut 30 and the other or outer part 36 of the lever being connected with the pivot pin 24 and the lower leg member, as has been described. These two parts of each lever are slidably arranged relatively to each other, and in the construction shown for this purpose the lever part 36 is formed of two sides 37 which are arranged at opposite sides of the lever part 35, and the lever part 35 may move lengthwise within the space between the two lever sides 37. In order to reduce the friction between the two parts of the lever, the part 36 is provided with a plurality of wheels or disks 40 arranged between the two sides 37 of this lever part and mounted to rotate on pivots or bolts 41 which also serve to connect the sides 37 of this lever part. The outer ends of the two sides of the lever part 36 are preferably bent into contact to extend through the slot in the upper leg part 14 as shown at 39. Any other construction for providing a slidable connection between the two lever parts may be provided.

Each lever is pivoted intermediate of its ends to a fixed part of the bed, and in the construction shown for this purpose a link 45 is provided which is connected to the lever part 36 by means of a pivot 46 and the other end of the link 45 is pivoted at 47 to a lower transverse member 12 of the bed frame.

By means of the lever construction described, the two parts of each lever move relatively to each other with the minimum of friction and with a smooth and uniform

motion, free from jerking or uneven motion which would be annoying to a patient occupying the bed.

As a result of this construction, it will be obvious that as the nut **30** is moved up and down by rotation of the screw **31**, each lever will be swung about its pivot **46** to move the bed end up and down with relation to the lower leg **15** and during this swinging the two lever parts **35** and **36** will slide relatively to each other.

In order to counteract to a certain extent the weight of the bed, I have provided a pair of springs **50** and **51** cooperating with each lever. The upper spring **50** is connected at one end thereof to an upwardly extending arm or bracket **52** secured to the lever part **36** and at its opposite end to one arm of the bell crank lever **53** pivoted at **54** on the lever part **36**. The other or lower spring **51** is pivoted at its lower end to the transverse frame member **12** and the upper end of this spring is connected to a link **56** pivoted at **57** to the other arm of the bell crank lever **53**. By means of these two springs and their connections with the bell crank lever **53**, the two part lever exerts a continuous downward pressure on the lower leg **15** during all positions of the lever.

The swinging of the bell crank about its pivot is limited by a projection **53'** which contacts the portion **39** of the lever part **36**, which prevents the bell crank lever from moving into dead center relation to the spring **50**.

By means of the arrangement of the springs **50** and **51** and bell crank lever **53**, it will be obvious that the spring **51** will exert a downward pull on the outer end of the two-piece lever at all times, thus exerting an upward force on the bed. When the outer end of this lever is in its lowest position so that the lower spring **51** would normally be reduced in length, the upper spring **50** will pull the bell crank into the position shown in FIG. 8, thus tending to materially lengthen the spring **51** and enable it to exert downward pressure on the outer end of the lever to a much greater extent than would be possible if the upper spring and the bell crank lever were not employed.

The screw shaft **31** may be rotated either by means of a motor **58** or by a hand crank **59**. Since similar raising and lowering mechanism must be applied to both bed ends, the mechanisms in the two bed ends are connected by means of a longitudinal shaft **60** arranged under the bed. The motor is preferably mounted on a supporting strip or intermediate transverse frame member **61** connected at its opposite ends to the side rails or bars **9**. The motor **58** may be connected with the shaft **60** to rotate the same in either direction in any suitable or usual manner, the motor preferably having a gear reduction mechanism **62** mounted adjacent to one end thereof and which connects with the longitudinal shaft **60**.

Each end of the shaft **60** has an extension **73** which extends into a gear box **63** and is connected by means of a pair of bevel gears **64** and **65** with an upright shaft **66**, the upper end of which is suitably connected with the screw shaft **31** in any suitable or desired manner. For example, the shaft **66** extends upwardly through an upright sleeve **67** having a disk or plate **68** covering the upper end thereof and radial bearings **70** are provided at the upper and lower ends of the sleeve **67**. A thrust bearing **71** is provided which rests on the disk or plate **68** and supports the lower end of the screw shaft **31**. The screw shaft is of larger diameter than the upright shaft **66** and consequently the part of the screw shaft which extends outwardly beyond the upright shaft rests upon the thrust bearing. The lower end of the screw shaft has a flat sided extension which extends into a slot in the upper end of the upright shaft **66**, thus forming a driving connection between these two shafts and also making it readily possible to disconnect the two shafts. A similar slotted connection is provided between the shaft **60** and its extensions **73**, one of which is shown at the lower end of FIG. 4.

The various parts of the drive connections between the longitudinal shaft **60** and the screw shafts **31** are preferably housed within tubular housing members or shells, each including an upright tubular part **77** and a horizontally extending lower tubular part **78**, both of these parts being preferably integral with each other. The horizontally extending part **78** has a pair of radial bearings **80** and **81** arranged therein for the shaft extension **73** and these radial bearings are preferably held in place by inwardly driven projections or beads **82** which cooperate with parts of the radial bearings **80** and **81** to secure them in place. An end cap **85** is provided to exclude dust and foreign matter from this bearing housing.

The upwardly extending tubular part of this bearing housing preferably also has inwardly extending projections **86** which extend into recesses of the tube or sleeve **67** to hold the same in place on the bearing housing.

The tubular housing for the bearings and bevel gears is suspended from a sleeve or stud **90** which is suitably secured to the traansverse frame member **12** in any desired manner, for example, by turning or flanging over portions **91** of this sleeve or collar against the interior of the frame member **12** which, if desired, may be provided with reinforcing channel or insert **92**, FIGS. 4 and 7. The stud or sleeve **90** is provided with an annular recess or groove and the upwardly extending tubular housing part **77** is provided with apertures facing the recess so that keys **94** may extend through these holes into the recess in the sleeve or stud **90**. The keys are suitably held against turning and in turn hold the tubular housing against turning. In the particular construction shown for this purpose, the keys are provided with offset extensions **95** secured by means of cap screws **96** to the frame member **12**. This construction also forms a secure support for the drive mechanism contained in this tubular housing, and facilitates removal of this part of the mechanism by removing the keys **94**, whereupon the tubular housing may be moved downwardly out of engagement with studs **90** for inspection and repairs. Similarly the construction described greatly facilitates the assembly of the drive mechanism on a bed. The detachable connections between the upright shaft **67** and screw shaft **31** and between the main drive shaft **60** and the extension **73** thereof facilitate this removal.

As before stated, the main longitudinal shaft **60** and the screw shafts in the bed ends may be rotated manually if desired, in which case a sprocket chain **100** is provided whihc meshes at its lower end with a sprocket gear **101** having a hub mounted on one of the shaft extensions **73**, preferably with the one at the foot end of the bed. The sprocket chain cooperates with another sprocket gear **102** journalled on a bracket **105** secured to an inner panel **103** of the foot end of the bed, which in turn is secured to the upper, transverse frame member **11**. This bracket, as shown in FIG. 5, has a bearing sleeve **106** secured thereto in such a manner that the bracket **105** and the panel **103** support this sleeve to form a bearing for a crank shaft **107** to which the sprocket gear **102** is secured. The crank arm **59** is also secured to this shaft **107** and is provided at the outer end thereof with a handle **109** for turning the upper sprocket wheel **102** and actuating the chain to rotate the shaft **60** through the medium of the lower sprocket wheel **101**. A guard **112** may be arranged about the sprocket chain and gears and is suitably secured to panel **103** at the lower bed end.

It will be understood, of course, that either the motor drive for the shaft **60** or the hand-operated drive may be omitted in case it is not desired to provide both of these parts on a bed. The crank **59** is preferably removable when the bed is to be operated by motor, but may be readily inserted in place in case of power failure. When the mechanism is to be actuated only by hand, the motor **58** is omitted. When the bed is to be operated only by power, the lower sprocket wheel **101** is removed or omitted from the shaft extension **73** and the other parts of the hand drive are also omitted.

The mechanism described has the advantage that less

friction is present when the mechanism is actuated and there is very little tendency of the mechanism to bind. The springs have the advantage of greatly facilitating the raising of the bed by requiring less torque for this purpose. Also the arrangement of the springs and the bell crank levers to which they are attached cause the springs to exert the greatest force when the mechanical advantage of leverage is the least.

It will be understood that various changes in the details, materials and arrangements of parts, which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art, within the principle and scope of the invention, as expressed in the appended claims.

We claim:

1. In a vertically adjustable bed comprising a bed frame including bed ends having legs each of which comprises two connected parts slidable vertically relatively to each other, one part of each leg resting on the floor and the other part being secured to a bed end, that improvement which includes a pair of levers pivoted to each other on each end frame in spaced relation to said legs, and extending from the middle of the bed end in opposite directions to said legs, each lever comprising two parts slidably connected with each other to vary the length of the lever and held in alinement with each other, one end of the lever being connected with the leg part resting on the floor, means for raising and lowering the other end of said lever, and a pivoted link for each lever, said link having a pivotal connection with the bed end and a pivotal connection with its lever.

2. A bed end for an adjustable bed including a pair of legs formed in two telescopically arranged parts, one of which is formed to stand on the floor and the other of which is secured to said bed end, a pair of levers pivoted intermediate of their ends on said bed end and each comprising two parts slidably connected with each other, one of said lever parts having one end thereof pivotally connected with a leg part formed to rest on the floor, mechanism connected with the other lever part for swinging said lever to raise and lower said bed end, said leg parts standing on the floor being arranged within the other leg parts, antifriction rollers pivoted on the upper end of said leg part which stands on the floor in its movement within said other leg part and having a rolling contact with said other leg part, and a pivot member which connects said leg part which stands on the floor with said lever and on which said rollers are pivotally mounted to guide said lever in its movement.

3. In a vertically adjustable bed comprising a bed frame including bed ends having legs each comprising two connected parts slidable vertically relatively to each other, the first of said parts resting on the floor and the other part being secured to a bed end, that improvement which includes a pair of levers pivotally mounted on each bed end and each having an end thereof connected with said first leg part, means for moving the other ends of said levers to swing about their pivotal connections for raising and lowering said bed, and spring means connecting said bed end with the end of the lever adjacent to the first mentioned leg part, said spring means including a spring secured at one end to said lever and extending substantially parallel to said lever, a bell crank lever pivoted on said first mentioned lever and having said spring connected to an arm thereof, and another spring connected with the other arm of said bell crank lever and with said bed end.

4. A bed construction according to claim 3, in which said lever comprises two parts slidable relatively to each other, one of said parts being connected with said first mentioned leg part, said first mentioned spring and said bell crank lever being mounted on said first mentioned lever part.

5. In a vertically adjustable bed comprising a bed frame including bed ends having legs each of which comprises two connected parts slidable vertically relatively to each other, one part of each leg resting on the floor and the other part being secured to a bed end, that improvement which includes a pair of levers pivoted on each end frame in spaced relation to said legs and extending from the middle of the bed and in opposite directions to said legs, each lever comprising two parts slidably connected with each other to vary the length of the lever and held in alinement with each other, one end of the lever being connected wtih the leg part resting on the floor, means for raising and lowering the other end of said lever, one of the parts of said lever having two sides between which the other lever part slides, and rollers pivoted between the sides and engaging the upper and lower edges of the other lever part.

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