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W. R. BLACK ETAL

3,217,339

HOSPITAL BED

Filed March 4, 1963

3 Sheets-Sheet 1

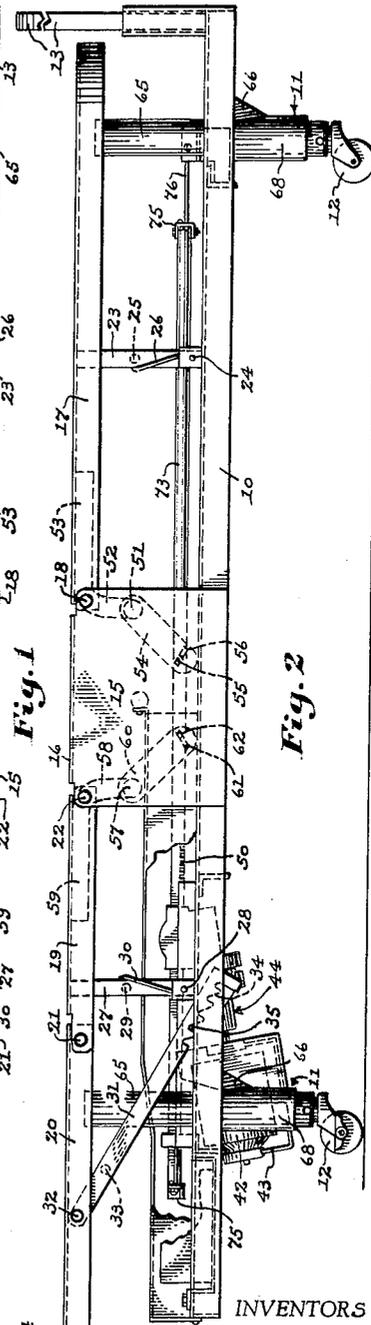
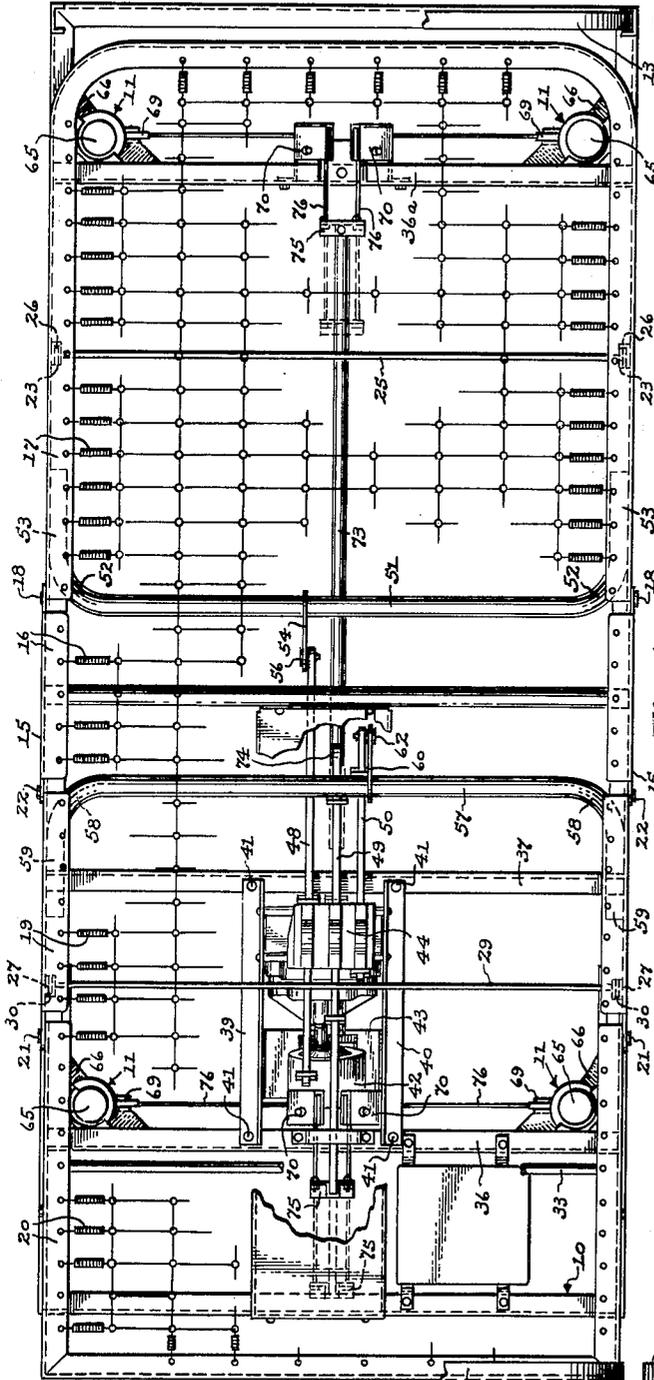


Fig. 1

Fig. 2

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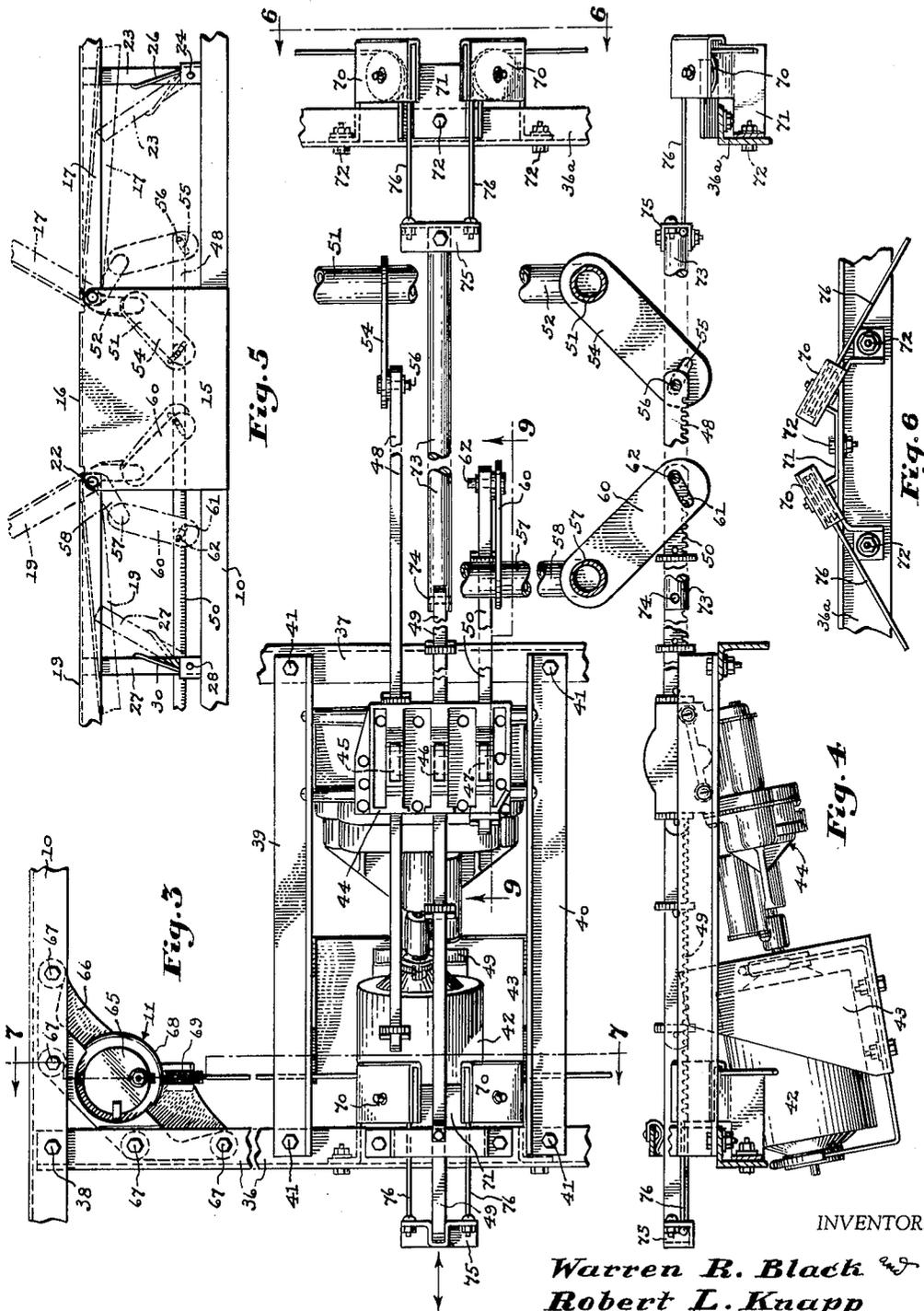
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HOSPITAL BED

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The present invention relates to Hospital Beds and more particularly to motorized beds having mechanism for automatically raising and lowering the bed and for separately raising and lowering the head and knee sections of the bed.

The primary objects of the invention are to provide improved mechanism for raising and lowering a hospital bed supported on four telescoping pedestals which are extended or contracted by means of cables which are taken up for raising the bed and payed out for lowering the bed, and to provide such pedestals, cables and sheaves for directing the cables which are identical in form thus lowering the cost of the bed; to provide such a mechanism in which the four supporting pedestals operate in perfect unison; to provide improved mechanisms for raising and lowering the head and knee sections of the bed; and in general to provide such a motorized hospital bed which is quiet and efficient in operation, simple, sturdy and economical in construction, and attractive in appearance.

Illustrative embodiments of the invention are shown in the accompanying drawings, wherein:

FIGURE 1 is a top plan view of a hospital bed, without mattress, and with certain parts thereof shown fragmentarily;

FIGURE 2 is a side elevational view of the same;

FIGURE 3 is a fragmentary top plan view of parts of the actuating mechanism of the bed;

FIGURE 4 is a side elevational view of the parts shown in FIGURE 3;

FIGURE 5 is a fragmentary side elevational view of parts of the bed with certain operating parts thereof illustrated in different positions;

FIGURE 6 is a fragmentary elevational view of parts of the operating mechanism as viewed from line 6—6 of FIGURE 3;

FIGURE 7 is a fragmentary vertical sectional view of parts of the bed, taken on line 7—7 of FIGURE 3;

FIGURE 8 is a further enlarged horizontal sectional view taken on line 8—8 of FIGURE 7;

FIGURE 9 is a fragmentary vertical sectional view of other parts of the bed, taken on line 9—9 of FIGURE 3;

FIGURE 10 is a fragmentary top plan view of certain operating parts shown in a modified form; and

FIGURE 11 is a fragmentary side elevational view of the modification shown in FIGURE 10.

Referring now in detail to these drawings, the bed generally comprises a rectangular bed frame 10 constructed of angle iron or the like and supported by four pedestals 11 near the four corners of the bed frame, the pedestals having casters 12 at their lower ends. A headboard 13 and footboard 14 are mounted at the opposite ends of the frame 10, these being shown fragmentarily in FIGURES 1 and 2. Upstanding side plates 15 secured as by welding to the opposite sides of the bed frame 10, support a seat spring section 16 of the bed. A head spring section 17 has its front end pivotally connected at 18 to the side plates 15, thus being associated with the seat spring section 16 swingably about a horizontal axis. The knee assembly of the bed spring comprises a thigh spring section 19 and a foot spring section 20 which are pivotally connected together at 21, and the thigh spring section 19 has its rear end pivotally connected at 22 to the side plates 15, thus being associated with the seat spring section 16 swingably about a horizontal axis.

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When the several spring sections 20, 19, 16 and 17 are in their positions of horizontal alignment as seen in FIGURES 1 and 2, the head section 17 is supported by a pair of arms 23 pivotally mounted at 24 on opposite sides of the bed frame 10 and connected by a rod 25. Springs 26 normally urge the arms 23 to upright positions. The thigh section 19 is supported by arms 27 pivotally mounted at 28 on opposite sides of the bed frame and connected by a rod 29. Springs 30 normally urge these arms 27 to upright positions. The foot section 20 is supported in horizontal position by bars 31 pivotally mounted at 32 on opposite sides of the foot section and connected by a rod 33, the lower ends of which bars 31 have series of notches 34 engageable with pins 35 on the bed frame to support the foot section 20 in a number of turned positions including horizontal.

The power actuator for articulating the various spring sections of the bed and for raising and lowering the bed is not shown nor described herein in great detail inasmuch as it is not being claimed per se herein. This actuator is mounted on the bed frame 10 by means of spaced bars 36, 37 which span the bed frame 10 from side to side and are secured to the frame as by means of bolts 38, and other spaced bars 39, 40 which extend forwardly-rearwardly between the bars 36, 37 and are secured thereto as by means of bolts 41. A single motor 42 is mounted on a bracket 43 dependingly secured to bars 39, 40. This motor drives mechanism within a housing generally designated 44, which mechanism is not shown except that three pinions 45, 46, and 47 inside the housing 44 are illustrated in dotted lines in FIGURE 3, and it will be understood that other mechanism within the housing may be remotely controlled so that any one of the three pinions 45, 46 and 47 can be driven in either direction by the motor 42. These pinions in turn mesh with three racks 48, 49 and 50 which pass through the housing, for driving any one of the racks either forwardly or rearwardly. Remote control means (not shown) may be provided for selecting the rack to be moved and the direction of its movement.

The head spring section 17 has a crossbar 51 of metal tubing which spans this section from side to side near the front end thereof. The body of the crossbar 51 is disposed well below the head spring section and the ends of the crossbar 51 at opposite sides of the bed are turned upwardly at 52 and thence rearwardly at 53, the portions at 53 being welded to the sides of the head spring section 17. A crank arm 54 is rigidly secured as by welding to the crossbar 51 near the center of the crossbar and depending therefrom. The lower end of the crank arm 54 has a slot 55 through which passes a pin 56 on the rearward end of the rack 48. It will readily be seen that, by this arrangement, as the rack 48 is driven rearwardly by pinion 45, the head spring section 17 of the bed will be elevated to a position of rearward-upward inclination as indicated by dot and dash lines in FIGURE 5, and that when rack 48 is again moved forwardly this head section 17 may be lowered again to horizontal position resting on arms 23.

The thigh spring section 19 has a crossbar 57 of metal tubing which spans this section from side to side near the rear end thereof. The body of the crossbar 57 is disposed well below the thigh spring section and the ends of this crossbar 57 at opposite sides of the bed are turned upwardly at 58 and thence forwardly at 59, the portions at 59 being welded to the sides of the thigh spring section 19. A crank arm 60 is rigidly secured as by welding to the crossbar 57 near the center of this cross bar and depending therefrom. The lower end of the crank arm 60 has a slot 61 through which passes a spin 62 on the rearward end of the rack 50. It will readily be seen that, by this arrangement, as the rack 50 is driven forwardly

by pinion 47, the thigh spring section will be elevated to a position of forward-upward inclination as also indicated by dot and dash lines in FIGURE 5, and that the foot spring section 20 will be carried by the thigh spring section to an elevated position of forward-downward inclination (not shown). When the rack 50 is again moved rearwardly, the thigh and foot spring sections which comprise the knee assembly will again be lowered.

As seen in FIGURE 9, the housing 44 which is mounted on the bed frame has a slot 63 therethrough which is so formed as to permit limited swinging movement of the rack 50 relative to the pinion 47 during its forward-rearward reciprocating movements, and a spring 64 presses the rack 50 into mesh with pinion 47. Rack 48 is mounted in an identical manner at the other side of the housing.

When it is desired to lower the head section 17 of the bed to a position of rearward-downward inclination, as is done in the "Trendelenburg" treatment position, arms 23 are manually pushed forwardly-downwardly, as indicated by double-dot and dash lines in FIGURE 5. This will permit the head section 17 to be lowered to its position of rearward-downward inclination which is also indicated by double-dot and dash lines in FIGURE 5. The slot 55 in crank arm 54 permits this lowering of the head section.

When it is desired to lower the knee assembly of the bed to a position of forward-downward inclination, as is done in the "Reverse Trendelenburg" treatment position, arms 27 are manually pushed rearwardly-downwardly, as also indicated by double-dot and dash lines in FIGURE 5. This will permit the thigh section 19 to be lowered, and at the same time adjustment of the foot section 20 to align it with the thigh section is made by adjusting the notched bars 31 on the pins 35. Slot 61 in crank arm 60 permits lowering movement of the thigh section.

The mechanism for raising and lowering the bed will now be described. As best seen in FIGURES 3, 7 and 8, each of the four supporting pedestals 11 comprises a tubular metal floor-supported post 65 on the lower end of which a caster 12 is mounted, and a cast metal sleeve bracket 66 secured to the bed frame 10 by bolts 67 and having a depending sleeve 68 telescoping with the post 65 for vertical movement thereon. The bed frame is thus mounted on the four posts 65 for raising and lowering movement.

Near the lower ends of the four sleeves 68 there are mounted four laterally inwardly facing sleeve sheaves 69 which are rotatable about horizontal axes. Four frame sheaves 70 are mounted on brackets 71 secured by bolts 72 to the cross-bars 36 and 36a of the bed frame. These frame sheaves 70 are rotatable about upwardly extending, slightly canted axes. An elongated bar is mounted on the bed frame in the longitudinal center thereof for longitudinal reciprocation thereon. This elongated bar comprises the middle rack bar 49 which is reciprocated by the pinion 46 of the actuator mechanism, and an extension rod 73 which is connected at 74 to the rearward end of the rack bar 49. This elongated bar terminates at its opposite ends short distances in the same direction, and as shown toward the foot of the bed, from the pairs of frame sheaves 70 at opposite ends of the bed. A cable-attachment crosshead is mounted at each end of the elongated bar.

Four identical cables 76 are provided, a pair of these being connected to each of the cross-heads 75. Each cable 76 passes around the adjacent frame sheave 70 and thence downwardly-outwardly (see FIGURE 7), and then around the adjacent sleeve sheave 69 and thence upwardly through an opening 77 in the sleeve 68 (see FIGURE 8), and the upper end of each cable 76 is finally secured to the upper end of the adjacent floor-supported post 65.

It will readily be seen that when the elongated bar, 49 and 73, is moved toward the foot of the bed as indicated in dotted lines in FIGURE 1, all four of the cables 76 will be simultaneously taken up thus to move the four sleeves 68, in unison, upwardly on the posts thus to raise the bed. When the elongated bar is again moved toward the head of the bed, the cables 76 will be simultaneously paid out thus permitting the bed to descend. Upward and downward movement of the sleeves 68 on the posts 65 is guided by a key 78 on each post 65 extending into a keyway 79 in the sleeve 68 mounted thereon. It will be noted that movement of the elongated bar, 49 and 73, is entirely within the confines of the bed frame so that no moving parts extend beyond the bed frame to constitute a hazard.

In the modification of the invention shown in FIGURES 10 and 11, a different and entirely independent actuator mechanism is illustrated for use in taking up and paying out the four cables 76, while the arrangement of the cables around the sheaves and to the telescoping pedestals would remain the same as that previously described. In these views, the angle bar 100 and the metal tube 101 are transverse elements of the bed frame. The elongated bar comprises a tubular bar-section 102 longitudinally slidably mounted in bearings 103 and 104 set in brackets 105, 106 secured to the angle bar 100 and the tube 101 respectively, and a second tubular bar-section 107 secured to the rearward end of the bar-section 102 by means of a bolt 108. The cable-attachment crossheads 109 at opposite ends of the elongated bar are similar to the cross-heads 75 previously described.

A screw 110 has its opposite ends journaled in bearings 111 and 112 mounted in the angle bar 100 and the tube 101 respectively. A reversible gear-motor 113 is mounted on the angle bar 100 and is operatively connected to the screw 110 for turning the screw in either direction. A nut 114 is mounted on the screw in threaded engagement therewith and is secured by screws 115 to the upstanding arms 116 of a yoke 117 which is secured as by welding to the bar-section 102.

It will readily be seen that as the screw 110 is turned by the gear-motor 113 in one direction or the other, the nut 114 will be moved longitudinally in one direction or the other and will impart this longitudinal movement to the elongated bar by reason of the rigid connection of said bar to the nut. The cables 76 will thus be taken up for raising the bed or paid out for lowering the bed.

It will thus be seen that the invention provides a motorized hospital bed in which the various operating parts have been minimized in number and standardized in form, thus providing a highly efficient bed at minimum cost, and while but two specific embodiments of the invention have been herein shown and described it will be understood that numerous details thereof may be altered or omitted without departing from the spirit of the invention as defined by the following claims.

We claim:

1. In a hospital bed: a rectangular bed frame; four supporting pedestals for the bed frame near the four corners thereof, said pedestals each comprising telescoping members capable of being extended to raise the bed frame or contracted to lower said frame and consisting of floor-supported posts and sleeves secured to the bed frame and telescoping with said posts; means for extending said pedestals including cables having their one ends connected to the posts of said pedestals and passing around sheaves which direct the cables laterally inwardly to points near the longitudinal center of the bed frame and thence longitudinally toward one end of the bed; an elongated bar mounted on the bed frame in the approximate longitudinal center thereof for longitudinal reciprocation thereon, said bar having connected to its opposite ends the other ends of the pairs of cables at opposite ends of the bed; and means for reciprocating said bar.

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2. A hospital bed according to claim 1 in which the reciprocating bar remains at all times within the confines of said bed frame.

3. In a hospital bed: a rectangular bed frame; four supporting pedestals for the bed frame near the four corners thereof, each pedestal comprising a floor-supported post and a sleeve secured to and depending from the bed frame and telescoping with said post whereby the bed frame is mounted for raising and lowering movement; four sleeve sheaves mounted on the lower ends of said sleeves and facing laterally inwardly and rotatable about horizontal axes; four frame sheaves mounted on the bed frame in pairs near opposite ends of said frame and near the longitudinal center of said frame, said frame sheaves being rotatable about upwardly extending axes; an elongated bar mounted on the bed frame in the longitudinal center thereof for longitudinal reciprocation thereon, said bar terminating at its opposite ends short distances in the same direction from said pairs of frame sheaves respectively; a pair of cables connected to each end of said bar, each cable passing around the adjacent frame sheave, then around the adjacent sleeve sheave, and then upwardly and having its other end secured to the upper end of the adjacent post whereby longitudinal movement of said bar raises or lowers said bed frame with the sleeves moving up or down in unison; and means for reciprocating said bar.

4. In a hospital bed: a rectangular bed frame; four supporting pedestals for the bed frame near the four corners thereof, said pedestals each comprising telescoping members capable of being extended to raise the bed frame or contracted to lower said frame; means for extending said pedestals including cables having their one ends connected to said pedestals and passing around sheaves which direct the cables laterally inwardly to points near the longitudinal center of the bed frame and thence longitudinally toward one end of the bed; an elongated bar mounted on the bed frame in the approximate longitudinal center thereof for longitudinal reciprocation there-

on, said bar having connected to its opposite ends the other ends of the pairs of cables at opposite ends of the bed; and means for reciprocating said bar and comprising a rack on the bar, a pinion mounted on the bed frame in mesh with said rack, and means for rotating said pinion in either direction.

5. In a hospital bed: a rectangular bed frame; four supporting pedestals for the bed frame near the four corners thereof, said pedestals each comprising telescoping members capable of being extended to raise the bed frame or contracted to lower said frame; means for extending said pedestals including cables having their one ends connected to said pedestals and passing around sheaves which direct the cables laterally inwardly to points near the longitudinal center of the bed frame and thence longitudinally toward one end of the bed; an elongated bar mounted on the bed frame in the approximate longitudinal center thereof for longitudinal reciprocation thereon, said bar having connected to its opposite ends the other ends of the pairs of cables at opposite ends of the bed; and means for reciprocating said bar, said last-mentioned means comprising a nut rigidly associated with said bar and a screw mounted on the bed frame and passing through said nut, the axes of said screw and nut being parallel to said bar, and means for rotating said screw in either direction.

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