

March 31, 1936.

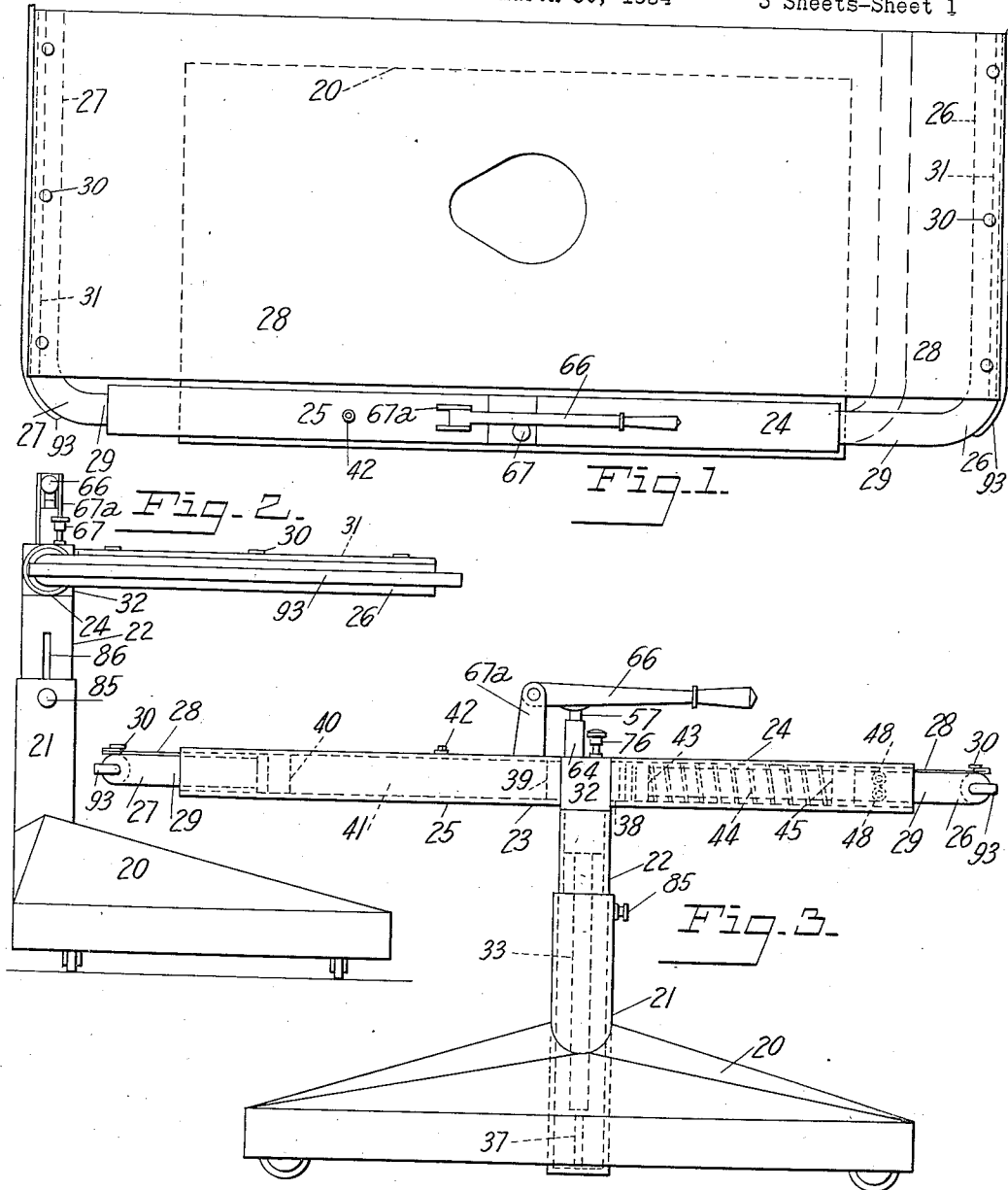
R. H. SECHRIST ET AL

2,035,840

INVALID LIFTING APPARATUS

Filed March 30, 1934

3 Sheets-Sheet 1



INVENTORS.
ROY H. SECHRIST.
IVAN C. HOWARD.

by
Edward L. Reed

their ATTORNEY.

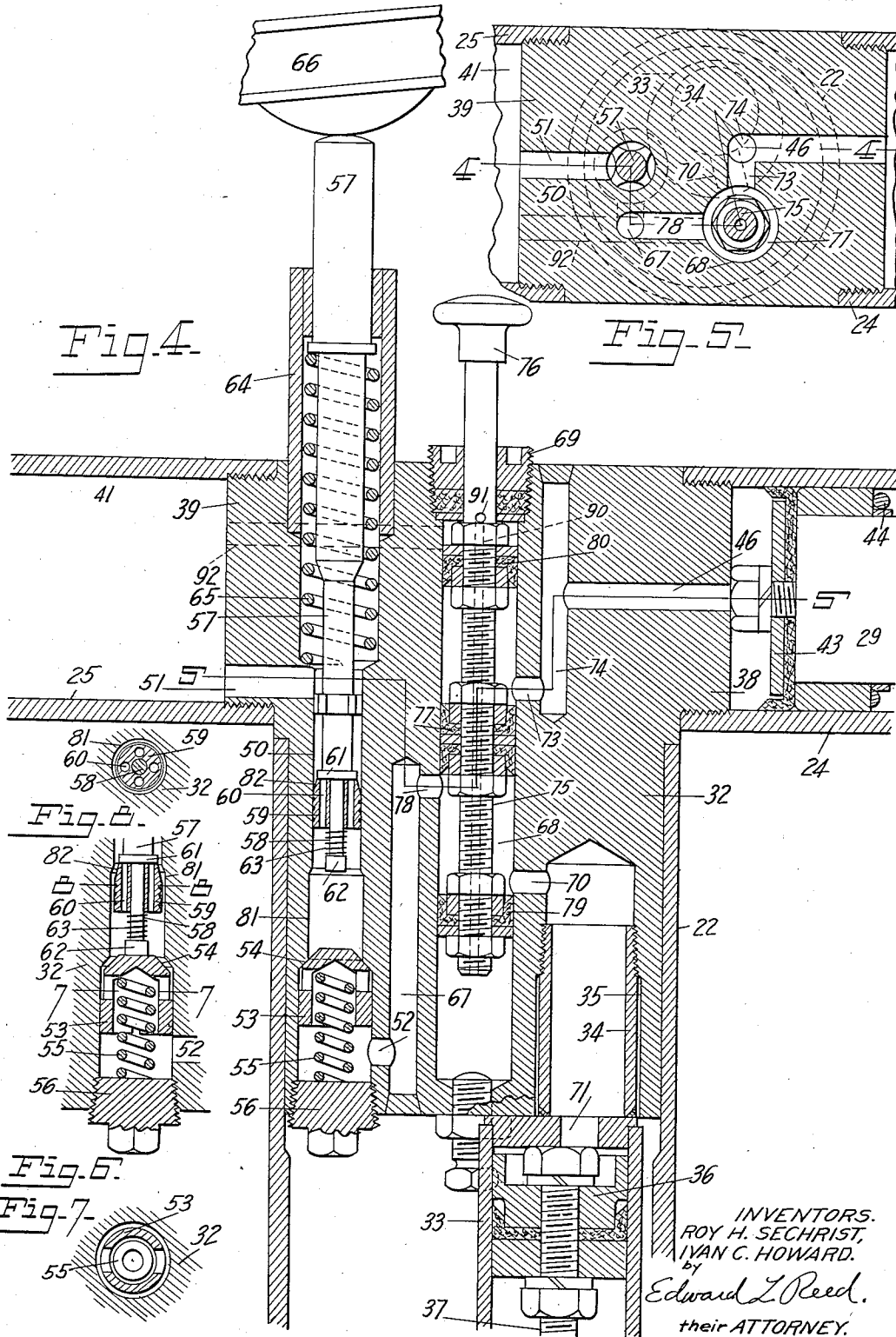
March 31, 1936.

R. H. SECHRIST ET AL
INVALID LIFTING APPARATUS

2,035,840

Filed March 30, 1934

3 Sheets-Sheet 2



INVENTORS.
ROY H. SECHRIST,
IVAN C. HOWARD.
by
Edward L. Reed,
their ATTORNEY.

March 31, 1936.

R. H. SECHRIST ET AL
INVALID LIFTING APPARATUS

2,035,840

Filed March 30, 1934

3 Sheets-Sheet 3

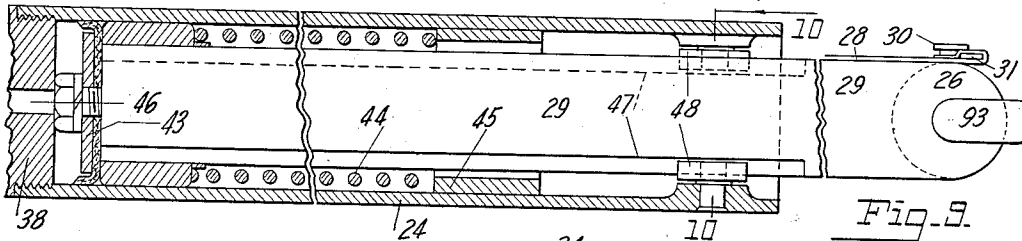


Fig. 9.

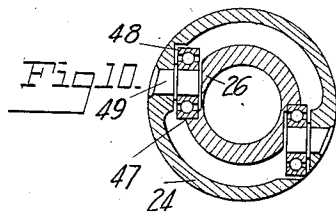


Fig. 10.

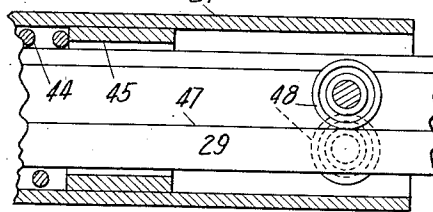


Fig. 11.

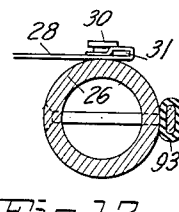


Fig. 12.

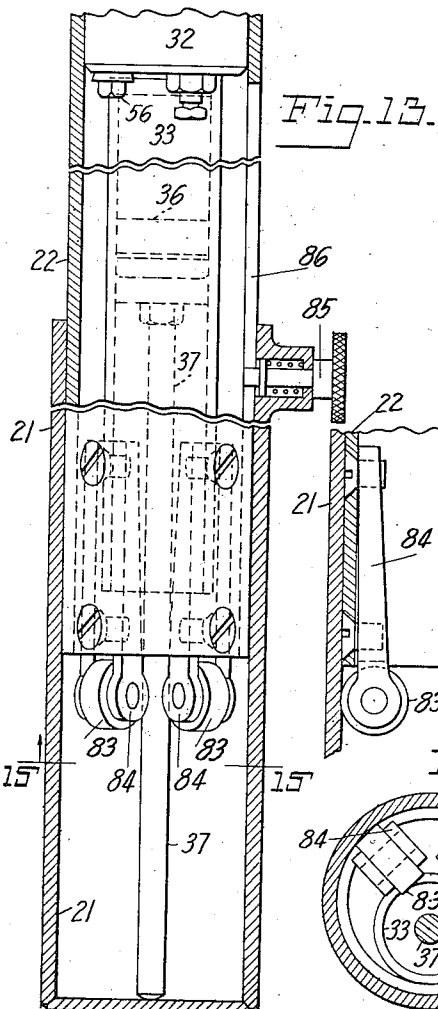


Fig. 13.

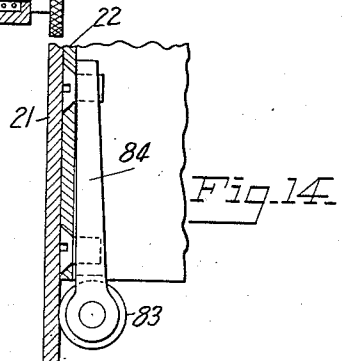


Fig. 14.

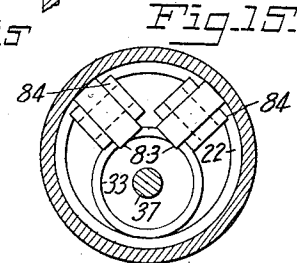


Fig. 15.

INVENTORS.
ROY H. SECHRIST,
IVAN C. HOWARD.

by
Edward L. Reed.

their ATTORNEY.

UNITED STATES PATENT OFFICE

2,035,840

INVALID LIFTING APPARATUS

Roy H. Sechrist, near Marion, and Ivan C.
Howard, Marion, Ohio; said Howard assignor
to said Sechrist

Application March 30, 1934, Serial No. 718,170

21 Claims. (Cl. 5—86)

This invention relates to an apparatus for handling invalids and is designed more particularly for use in homes and hospitals for lifting a patient from the bed to enable bedding to be changed or for transferring the patient from one place to another.

One object of the invention is to provide a strong compact apparatus for this purpose which can be quickly placed in operative position and easily operated.

A further object of the invention is to provide such a lifting mechanism having a body supporting member which can be quickly and easily placed beneath the patient and connected with the lifting element.

A further object of the invention is to provide such a lifting mechanism having a flexible body supporting member and adjustable supporting means for said member to control the endwise slack therein, so that it may be stretched taut or may be permitted to sag, as desired.

A further object of the invention is to provide such a lifting mechanism with a single actuating device for imparting vertical movement to the lift and for stretching the body supporting member.

A further object of the invention is to provide such a lifting mechanism which will be hydraulically operated.

A further object of the invention is to provide a hydraulically operated lift of this kind in which the pressure creating and controlling means will be compactly arranged within a part of the lifting element.

A further object of the invention is to provide such a lifting mechanism in which the lifting element will be rotatable to permit the patient to be swung from one side of the apparatus to the other.

Other objects of the invention will appear as the apparatus is described in detail.

In the accompanying drawings Fig. 1 is a plan view of a lifting mechanism embodying our invention; Fig. 2 is an end elevation of the same; Fig. 3 is a rear elevation of such a lifting mechanism; Fig. 4 is a sectional detail view of the upper portion of the lifting element taken on the staggered line 4—4 of Fig. 5; Fig. 5 is a transverse section taken on a staggered line 5—5 on Fig. 4; Fig. 6 is a sectional detail view of the pump showing the piston in its pressure releasing position; Fig. 7 is a transverse section taken on the line 7—7 of Fig. 6; Fig. 8 is a transverse section taken on the line 8—8 of Fig. 6; Fig. 9 is a longitudinal sectional view taken through a por-

tion of the supporting frame and showing the operating means for the adjustable arm; Fig. 10 is a transverse section taken on the line 10—10 of Fig. 9; Fig. 11 is a longitudinal section of a portion of the supporting frame showing the guide rollers for the adjustable arm; Fig. 12 is a transverse section taken through one of the arms, showing the means for attaching the body supporting member thereto; Fig. 13 shows a vertical section, partly in elevation, of the lifting element and its guideway; Fig. 14 is a detail view of the anti-friction rolls for the lifting element; and Fig. 15 is a transverse section taken on the line 15—15 of Fig. 13.

In these drawings we have illustrated one embodiment of our invention and have shown the same as hydraulically operated. It will be understood, however, that the mechanism may be operated in any suitable manner and that it may take various forms. In the particular device here shown the mechanism as a whole comprises a base 20 which is provided with a vertical guideway 21, preferably in the form of a cylindrical tube extending through the base near one edge thereof and projecting some distance above the base. Slidably mounted in the vertical guideway 21 is a lifting element which preferably comprises a tubular outer member 22 within which various parts of the operating mechanism are mounted, as will be hereinafter explained. Rigidly secured to the upper end of the lifting element 22 is a frame 23 which, in the present instance, comprises two members 24 and 25 rigidly secured to and extending in opposite directions from the upper part of the lifting element, these frame members preferably extending in the direction of the greatest length of the base 20. Mounted near each end of the frame 23 and extending laterally therefrom are transverse members or arms 26 and 27 which are supported in substantially horizontal positions and are adapted to have secured thereto a body supporting member 28, which is preferably formed of flexible material, such as canvas or the like. In the present device, the frame members 24 and 25 are tubular in form and the arms 26 and 27 have parts 29 extending at right angles to the length of the arms and mounted in the tubular ends of the frame members. One, or both, of the arms is adjustable lengthwise of the frame 23 to enable the slack in the body supporting member or canvas 28 to be controlled and means are provided for adjusting the movable arm or arms and for maintaining the same in their adjusted positions, so that the body supporting member

may be stretched tight and maintained in a substantially horizontal position when the patient is lifted thereby, or it may be provided with sufficient slack to support the patient in a desired inclined position. The body supporting member or canvas being supported at its ends only has no rails or other supporting means at its lateral edges and is entirely flexible so that when detached from the arms it can be easily slipped beneath the patient, after which the lifting mechanism is moved to a position to project the arms 26 and 27 across the bed near the ends of the canvas and the canvas is then attached thereto and the mechanism operated to adjust the canvas and to lift the same. The body supporting member or canvas may be secured to the arms by any suitable means which will permit the same to be readily detached therefrom. In the present instance each arm is provided with a series of studs 30 and the ends of the body supporting member are provided with apertures arranged to engage over the respective studs. Preferably the end portions of the body supporting member are reinforced by bars 31 to prevent the same from tearing under the weight of the patient.

The hydraulic mechanism for elevating the lift and adjusting the body supporting member is located entirely within the lifting element 22 and in the longitudinal frame. In the particular construction here shown there is secured in the upper end of the tubular member 22 of the lifting element a head block or casting 32 to the lower end of which is rigidly secured a lifting cylinder 33 which extends downwardly from the head block and is open at its lower end. This cylinder may be secured to the head block in any suitable manner but, as here shown, it has rigidly secured thereto, by welding or brazing, a vertical tubular extension 34 which is rigidly mounted in an opening 35 in the lower part of the head block, preferably by screwing the same into the opening. Mounted within the lifting cylinder 33 is a stationary piston or ram 36 which may be held against movement in any suitable manner, as by means of a rod 37 rigidly secured thereto and extending downwardly through the cylinder 33 and engaging the bottom of the cylindrical guideway 21. Fluid under pressure may be supplied to the lifting cylinder 33 in any suitable manner, as will be hereinafter described.

The frame which carries the arms 26 and 27 may be mounted on the lifting element in any suitable manner. As has been stated, this frame preferably comprises two tubular members 24 and 25 and, as here shown, the head block 32 projects above the tubular member 22 of the lifting element and is provided with lateral extensions 38 and 39 on which the tubular members 24 and 25 are mounted, preferably by screw threading the same thereon, or in some other manner which will provide a fluid tight joint. Where, as in the present instance, one arm only is adjustable one of the tubular members is utilized as a fluid reservoir and we have shown the tubular frame member 25 as provided with a closure or partition 40 spaced some little distance from the outer end of the member and forming between the closure 40 and the part 39 of the head block a reservoir 41 which is provided with a filling opening normally closed by a suitable closure or plug 42. That portion of the member 25 which extends outwardly beyond the closure 40 constitutes a socket to receive the part 29 of the arm 27, this part being rigidly mounted in the socket

in such a manner as to hold the same against rotation therein, as by means of a suitable key. The part 29 of the arm 26 which extends into the tubular frame member 24 is slidably mounted therein and has at its inner end a part forming a piston 43. A spring 44 is confined between the piston 43 and a stop or collar 45 rigidly secured to the tubular member within the same, and this spring tends to normally hold the piston in its innermost position. Fluid pressure is admitted to the tubular member 24, which constitutes a cylinder for the piston 43, through a port 46 and serves to force the piston outwardly and thus move the arm 26 in a direction to stretch the body supporting member. The part 29 of the arm 26 may be held against rotation in the tubular member 24 in any suitable manner, as by means of a spline, but in order to reduce the frictional contact between the part 29 of the arm and a tubular member the cylinder or part 29, which is of a diameter somewhat less than the interior diameter of the tubular member, has its opposite side portions cut away to form tracks 47 which face in opposite directions and which engage rollers 48 mounted within the tubular member, near the outer end thereof, on studs 49. These rollers may be of any suitable character but we have here shown them in the form of anti-friction bearings, the outer rings of which engage the tracks on the part 29 of the arm.

It is desirable that the apparatus should be self-contained and should be as compact as it is practical to make it and we therefore prefer to furnish fluid under pressure to the operating cylinders for the lifting element and for the adjustable arm by means of a pump which is mounted within the lifting element and so arranged that it may be easily operated and the flow of the fluid easily controlled. As shown in Figs. 4 and 5, the head casting 32 is provided with a vertical bore 50 spaced some distance laterally from the cylinder 33 and forming a pump cylinder. This cylinder is in open communication with the reservoir 41 by means of a port 51 extending through the part 39 of the head block. The lower portion of the pump cylinder is provided with an outlet 52 which is adapted to be connected either with the lifting cylinder 33 or with the cylinder in the tubular member 24. This outlet is formed in the bore some distance below the cylinder proper and this lower part of the bore is enlarged to receive a check valve 53 which is held normally in engagement with a valve seat 54 by means of a spring 55 confined between the valve and a closure 56 for the lower end of the bore. Mounted in the upper part of the bore is a pump rod 57, the lower portion of which extends into the cylinder 50 and has a lower portion of reduced diameter, as shown at 58, on which is slidably mounted a piston 59 which is provided with one or more longitudinal passageways 60. At the upper end of the reduced portion 58 the pump rod is provided with a part, such as a collar 61, arranged to engage the upper end of the piston and close the passageways 60, this collar 61 thus functioning as a valve. A stop 62 on the lower end of the pump rod prevents the piston from dropping off of the same and a light spring 63 is confined between this stop and the lower end of the piston to move the same normally into engagement with the collar or valve member 61. The upper end of the pump rod projects above the head block and, in the present instance, a tubular guide 64 is mounted in and extends above the head

block and forms a guide for the upper portion of the pump rod. A spring 65 acts on the pump rod to move the same upwardly and the pump rod is moved downwardly, against the action of the spring, by a handle or operating lever 66, which is here shown as mounted on a bracket 67a carried by the frame member 25. When the handle 66 is released the pump rod and piston will be moved upwardly but the fluid which has entered the cylinder through the port 51 will retard the upward movement of the piston, thus opening the passageways 60 and permitting the fluid to flow into the lower part of the cylinder. As soon as the upward movement of the piston rod is interrupted the spring 63 will move the piston into engagement with the collar 61, so as to close the passageways 60, and the downward movement of the pump rod, by the handle 66, will force the fluid past the check valve 53 and through the outlet 52. If the piston has not moved into engagement with the collar 61 so as to close the passageways before the pump rod begins its downward movement a very slight movement of the pump rod will be sufficient to close these passageways.

The pump outlet 52 may be connected with the lifting cylinder 33 and the cylinder formed within the frame member 24 in any suitable manner but means should be provided whereby these connections may be separately established, because it is preferable that the arm should be actuated to stretch the body supporting member before lifting movement is imparted thereto. In the particular arrangement here shown the pump outlet 52 is connected by a conduit 67 with an elongated valve chamber 68, which is formed in a bore in the head block 32 and is closed at its upper end by a suitable closure or plug 69. The lower part of this valve chamber is connected by a port 70 with the lifting cylinder 33, the connection being in the present instance through the tubular extension 34 and through an opening 71 leading from that extension into the cylinder. The upper portion of the valve chamber is connected by a port 73 with a conduit 74 which is connected with the passageway 46 leading to the interior of the tubular member 24. Mounted within the valve chamber is a piston valve comprising a valve rod or stem 75 which extends upwardly through the closure 69 and is provided with an operating handle 76. A valve member or piston 77 is rigidly secured to the valve rod and so located thereon that it may be moved to a position on either side of the port 78 which connects the conduit 67 with the valve chamber. When the valve member 77 is above the port 78, as shown in Fig. 4, the pump is connected with the lifting cylinder 33, and when the valve member is moved below the port 78 the pump is connected with the cylinder in the frame member 24. If desired, the valve rod may be provided at its lower end with a piston 79 and at its upper end with a piston 80, these pistons being so located that the piston 79 will be located below and close to the port 70 when the valve is in its upper position and the piston 80 will be located just above the port 73 when the valve is in its lower position. Thus it will be apparent that the movement of the valve from one position to the other does not relieve the pressure in the cylinder which was first connected with the pump, and when the piston in either cylinder has been actuated it is retained in its operative position until the pressure is relieved, as hereinafter described.

It is also desirable to provide means for pre-

venting any fluid which may leak about the pistons 79 and 80 from accumulating in the chamber 68 in sufficient quantities to interfere with the movements of the pistons or from escaping about the valve rod to the exterior of the apparatus. For this purpose the valve rod 75 is provided with a small longitudinal bore 90 which communicates with the chamber 68 below the piston 79 and is connected by a port 91 with the chamber above the piston 80 when the latter is in its lower position. The chamber 68 is connected with the reservoir 41 by a conduit 92 which enters the chamber at a point near the top thereof, so that it will not communicate with the chamber below the piston 80 when the latter is in its uppermost position. Thus any fluid leaking about the pistons will be returned to the reservoir.

Any suitable means may be provided for releasing the pressure on the pistons when the lift is to be lowered and the arm retracted. In the present organization we have provided means whereby this is accomplished by permitting the reverse flow of the fluid through the pump cylinder 50. For this purpose the bore in the head block just below the pump cylinder is enlarged, as shown at 81, and the pump rod 57 is capable of a downward movement sufficient to carry the piston out of the cylinder and into the enlarged portion of the bore and to cause the lower end of the pump rod to open the check valve 53, thus permitting the fluid to flow in a reverse direction about the piston. If desired, the upper portion of the piston may be slightly tapered, as shown at 82, so that the passage of the fluid about the same, when it is moved to its lowest position, will begin slowly and gradually increase, thus permitting the downward movement of the lift to be gradually started.

The arrangement is such that the load is imposed upon the lifting element wholly at one side thereof and this naturally has a tendency to impart a tilting movement to the lifting element which may cause the same to bind in its guideway. To prevent such binding and reduce the frictional contact between the tubular member 22 and the guideway 21, the tubular member is provided on that side thereof opposite the arms 26 and 27 with anti-friction rollers 83. These rollers may be mounted in the tubular member in any suitable manner. As here shown, arms or brackets 84 are mounted in the lower portion of the tubular member and have bifurcated lower portions projecting below the tubular member and the rollers 83 are rotatably mounted in the bifurcated portions of the respective arms. If desired, the rollers may be in the nature of ball bearings, as shown in Fig. 10.

In the arrangement here shown the lifting element and its guideway are mounted close to one side of and between the ends of the base 20, thus causing the base to project a considerable distance from the lifting element in three directions, so as to firmly support the load, which overhangs the base. This arrangement permits the base to be moved under a bed so that the arms will be arranged above the bed as above explained. Further, this arrangement enables the operator to stand close to the lifting mechanism for the purpose of operating the pump or otherwise manipulating the apparatus, and it also permits the apparatus, when not in use, to be moved flat against the wall so that it will occupy a relatively small amount of space. The lifting element is rotatable within its guideway but is held nor-

mally against rotation by a spring pressed plunger 35 mounted in the upper portion of the guideway 21 and extending into a slot 36 in the tubular member 22. The rotation of the lifting element 5 permits the arms to be swung from one side of the lifting element to the other side and thus enables the patient to be transferred from one bed to another without turning the entire apparatus. Of course some means must be provided 10 for supporting the load on the lift when the latter has been rotated to move the load to that side thereof opposite the base. This may be conveniently done by making the base heavy enough to counterbalance the load or by providing 15 and suitable means for bracing the guideway 21 against tilting movement. The arrangement of the guideway close to one side of the base also has the advantage of enabling the apparatus to be moved close to the side of a structure under 20 which the base cannot extend, such as an operating table. When the patient is to be transferred from a bed to an operating table he is lifted in the usual manner and the apparatus as a whole moved to the operating table with the rear or flat side thereof adjacent to the table 25 and the lifting element is then rotated to move the patient above the table.

If desired, the arms 26 and 27 may be provided with buffers to prevent the marring of the head 30 board or foot board of the bed in the event one of the arms should contact therewith, and, as here shown, each arm has secured to the outer side thereof a strip of yieldable material 33, such as soft rubber, which extends for the full length 35 of the arm.

While we have shown and described one embodiment of our invention we wish it to be understood that we do not desire to be limited to the details thereof as various modifications may occur 40 to a person skilled in the art.

Having now fully described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. In an invalid lifting apparatus, a vertically 45 movable lifting element, a flexible body supporting member, a frame carried by said lifting element and extending lengthwise of said body supporting member on one side only thereof, transverse members mounted at one end only on said 50 frame near the respective ends thereof, at least one of said transverse members being adjustable lengthwise of said frame, means for connecting the ends of said body supporting member with the respective transverse members, and means 55 for actuating said adjustable transverse member to control the slack in said body supporting member, and for actuating said lifting element to elevate said frame and said body supporting member.

2. In an invalid lifting apparatus, a vertically 60 movable lifting element, a flexible body supporting member, a frame carried by said lifting element and extending lengthwise of said body supporting member near one edge thereof, transverse 65 members mounted on said frame near the respective ends thereof, at least one of said transverse members being adjustable lengthwise of said frame, means for connecting the ends of said body supporting member with the respective 70 transverse members, an actuating device, and means for connecting said actuating device either with said adjustable transverse member or with said lifting element.

3. In an invalid lifting apparatus, a base having 75 a vertical guideway, a tubular lifting element

movably mounted in said guideway, a substantially horizontal frame carried by said lifting element and having a tubular portion, arms extending laterally from said frame, one of said arms being movable and having a part slidably mounted 5 in the tubular portion of said frame, a flexible body supporting member connected at its ends with said arms, an actuating device mounted in said tubular lifting element, and means for operatively connecting said actuating device 10 either with said movable arm or with said lifting element.

4. In an invalid lifting apparatus, a base having a vertical guideway, a lifting element movably mounted in said guideway, means for actuating 15 said lifting element, a substantially horizontal frame mounted between its ends on said lifting element, arms extending laterally from one side of said frame, one of said arms being movable lengthwise of said frame, hydraulic mechanism 20 for actuating said movable arm, a flexible body supporting member, and means for connecting said body supporting member at its ends with the respective arms.

5. In an invalid lifting apparatus, a base having 25 a vertical guideway, a lifting element movably mounted in said guideway, a cylinder and a piston for actuating said lifting element, a substantially horizontal frame carried by said lifting element and having a part forming a cylinder, 30 arms extending laterally from said frame, one of said arms being movable lengthwise of said frame and having a part mounted in the cylinder of said frame and forming a piston, a flexible body supporting member, means for connecting 35 said body supporting member with said arms, and means for delivering fluid under pressure to either of said cylinders at the will of the operator.

6. In an invalid lifting apparatus, a base having 40 a vertical guideway, a lifting element movably mounted in said guideway, a cylinder and a piston for actuating said lifting element, a substantially horizontal frame carried by said lifting element and having a part forming a cylinder, 45 arms extending laterally from said frame, one of said arms being movable lengthwise of said frame and having a part mounted in the cylinder of said frame and forming a piston, a flexible body supporting member, means for connecting said 50 body supporting member with said arms, a pump having its inlet connected with a source of fluid supply, and means for connecting said pump with either of said cylinders.

7. In an invalid lifting apparatus, a base having 55 a vertical guideway, a lifting element movably mounted in said guideway, a cylinder and a piston for actuating said lifting element, a substantially horizontal frame carried by said lifting element and having a part forming a cylinder, 60 arms extending laterally from said frame, one of said arms being movable lengthwise of said frame and having a part mounted in the cylinder of said frame and forming a piston, a flexible body supporting member, means for connecting 65 said body supporting member with said arms, a pump mounted in said lifting element and having its inlet connected with a source of fluid supply, operating means for said pump arranged exteriorly of said lifting element, conduits leading 70 from said pump to the respective cylinders, a valve to control the flow of fluid through said conduits and means for actuating said valve.

8. In an invalid lifting apparatus, a base having 75 a vertical guideway, a tubular member slid-

ably mounted in said guideway, a vertical cylinder mounted in said tubular member for movement therewith, a stationary piston mounted in said cylinder, a pump carried by said tubular member and having an inlet connected with a source of fluid supply, means for connecting the outlet of said pump with said cylinder, a rigid frame carried by said tubular member and having parts extending in opposite directions therefrom, transverse arms projecting laterally from the respective parts of said frame, a flexible body supporting member, and means for connecting said body supporting member at its ends with the respective arms.

9. In an invalid lifting apparatus, a base having a vertical guideway, a tubular member slidably mounted in said guideway, a head block fixed in the upper end of said tubular member, a cylinder carried by said head block, a stationary piston in said cylinder, a pump cylinder formed in said head block, means for connecting said pump cylinder with the first mentioned cylinder, a pump piston in said pump cylinder, means for actuating said pump piston to deliver fluid under pressure to the first mentioned cylinder, a frame secured to said head block and having parts extending in opposite directions therefrom, substantially horizontal arms extending laterally from the respective parts of said frame, and a flexible body supporting member connected at its ends with said arms.

10. In an invalid lifting apparatus, a base having a vertical guideway, a tubular member slidably mounted in said guideway, a head block fixed in the upper end of said tubular member, a cylinder carried by said head block, a stationary piston in said cylinder, a pump cylinder formed in said head block, means for connecting said pump cylinder with the first mentioned cylinder, a pump piston in said pump cylinder, means for actuating said pump piston to deliver fluid under pressure to the first mentioned cylinder, a frame secured to said head block and having parts extending in opposite directions therefrom, one of said parts being tubular, arms extending laterally from the respective parts of said frame, one of said arms having a portion mounted in the tubular part of said frame and constituting a piston, selective means for connecting said pump cylinder with either the first mentioned cylinder or said tubular part of said frame, and a flexible body supporting member connected at its ends with the respective arms.

11. In an invalid lifting apparatus, a base having a vertical guideway, a tubular member slidably mounted in said guideway, a head block fixed in the upper part of said tubular member, a cylinder secured to and depending from said head block, a stationary piston mounted in said cylinder, a pump cylinder formed in said head block, means for connecting the respective ends of said pump cylinder with a source of fluid supply and with the first mentioned cylinder, a pump rod mounted in said pump cylinder, a piston slidably mounted on said rod and having a passageway through the same, a part carried by said rod and arranged to close the passageway in said pump piston when said rod is moved in one direction and to open said passageway when said rod is moved in the other direction, a check valve interposed between said pump cylinder and the first mentioned cylinder, a frame carried by said tubular member, arms extending laterally from said frame, a body supporting member, and

means for connecting said body supporting member with said arms.

12. In an invalid lifting apparatus, a base having a vertical guideway, a tubular member slidably mounted in said guideway, a head block fixed in the upper end of said tubular member, a cylinder secured to and depending from said head block, a stationary piston mounted in said cylinder, a pump cylinder formed in said head block, means for connecting said respective ends of said pump cylinder with a source of fluid supply and with the first mentioned cylinder, a pump rod mounted in said pump cylinder, a piston slidably mounted on said rod having a passageway through the same, a part carried by said rod and arranged to close the passageway in said pump piston when said rod is moved in one direction and to open said passageway when said rod is moved in the other direction, a check valve interposed between said pump cylinder and the first mentioned cylinder, said head block having a chamber arranged between said pump cylinder and said check valve and of greater diameter than said pump cylinder, and said pump rod being movable a distance sufficient to move the pump piston out of its cylinder and into said chamber and to open said check valve, a frame carried by said tubular member, arms extending laterally from said frame, a body supporting member, and means for connecting said body supporting member with said arms.

13. In an invalid lifting apparatus, a base, a lifting element mounted for vertical movement on said base, a cylinder carried by said lifting element, a stationary piston mounted in said cylinder, a frame carried by said lifting element and having a part forming a cylinder, arms extending laterally from said frame, one of said arms being movable lengthwise of said frame and having a part mounted in said frame cylinder and constituting a piston, a pump arranged within said lifting element, a selecting valve arranged within said lifting element comprising a valve chamber connected with the outlet of said pump and having ports leading respectively to said cylinders, and a movable valve member, means arranged exteriorly of said lifting element for actuating said pump, and a body supporting member carried by said arms.

14. In an invalid lifting apparatus, a base, a lifting element mounted for vertical movement on said base and comprising a tubular member, a head block mounted in said tubular member, tubular frame members secured to the opposite sides of said head block, laterally extending arms carried by the respective frame members, one of said arms having a part slidably mounted in the adjacent tubular frame member, said slidable part having a portion forming a piston in said tubular frame member, the other of said tubular frame members being closed to form an oil reservoir, a cylinder connected with said head block and extending downwardly therefrom, a stationary piston mounted in said cylinder, said head block having a bore forming a pump cylinder and having a second bore forming a valve chamber, and also having means for connecting one end of said pump with said oil reservoir, for connecting the other end of said pump cylinder with said valve chamber and for connecting said valve chamber with the tubular frame member in which said arm piston is mounted and with said vertical cylinder, a piston mounted in said pump cylinder, means for actuating said piston, a check valve interposed between said piston and said

valve chamber, a valve member mounted in said valve chamber and movable to connect the outlet for said pump cylinder with either said tubular frame member or said vertical cylinder, and a body supporting member carried by said arms.

15. In an invalid lifting apparatus, a base, a lifting element mounted for vertical movement on said base and comprising a tubular member, a head block mounted in said tubular member, tubular frame members secured to the opposite sides of said head block, laterally extending arms carried by the respective frame members, one of said arms having a part slidably mounted in the adjacent tubular frame member, said slidable part having a portion forming a piston in said tubular frame member, the other of said tubular frame members being closed to form an oil reservoir, a cylinder connected with said head block and extending downwardly therefrom, a stationary piston mounted in said cylinder, said head block having a bore forming a pump cylinder and having an enlarged portion below said pump cylinder, said head block also having a bore forming a valve chamber, the first mentioned bore having an outlet port arranged below the enlarged portion thereof and to connect said pump cylinder with said valve chamber, means for connecting the upper end of said pump cylinder with said oil reservoir, a check valve interposed between the enlarged portion of said first mentioned bore and said outlet, a pump rod slidably mounted in said head block and having a portion extending into said pump cylinder, a piston slidably mounted on said pump rod within said pump cylinder and having a longitudinal passageway through the same, a part carried by said pump rod to actuate said piston and close said passageway, a spring acting on said piston to move the same toward said part of said pump rod, said pump rod being movable a distance sufficient to move said piston into the enlarged portion of said bore and to cause said rod to engage and open said check valve, said head block having passageways to connect said valve chamber with said vertical cylinder and with the tubular frame member in which said arm piston is mounted, a valve member mounted in said valve chamber to connect said pump outlet with either of said passageways, and a body supporting member carried by said arms.

16. In an invalid lifting apparatus, a lifting element, means for actuating said lifting element, a frame carried by said lifting element and having a tubular end portion, arms extending laterally from said frame, one of said arms having a part slidably mounted in the tubular portion of said frame, said part of said arm having oppositely facing longitudinal tracks, rollers mounted in said tubular portion of said frame and engaging the respective tracks, means for actuating said movable arm, and a body supporting member connected with said arm.

17. In an invalid lifting apparatus, a base having a vertical guideway, a lifting element movably mounted in said guideway, a single substantially horizontal frame member supported between its ends by said lifting element, substantially horizontal arms extending laterally from said frame member near the respective ends thereof and each secured at one end only to said frame member, means for moving one of said arms lengthwise of said frame and for retaining the same in adjusted positions with relation thereto, a flexible body supporting member arranged between and connected with the respective arms, whereby said

body supporting member is supported at its ends only, and means for actuating said lifting element.

18. In an invalid lifting apparatus, a lifting element, a substantially horizontal frame member supported by said lifting element and having a tubular end portion, substantially horizontal arms extending laterally from said frame member near the respective ends thereof, each arm being connected at one end only with said frame member, one of said arms having a part mounted in the tubular end portion of said frame member for movement lengthwise thereof, a flexible body supporting member connected at its ends with the respective arms, and means for adjusting said arm with relation to said frame member to control the slack in said body supporting member and for actuating said lifting element.

19. In an invalid lifting apparatus, a flexible body supporting member adapted to lie flat on a bed, a lifting mechanism movable to a position alongside of said bed and comprising a vertically movable lifting element, a pair of substantially parallel arms spaced one from the other, projecting laterally from said lifting element and adapted to be positioned above said bed near the ends of said body supporting member, each arm being connected at one end only with said lifting element and being held against downward movement with relation thereto, means for connecting said arms with the respective ends of said body supporting member after the latter has been placed on said bed, means for adjusting one of said arms with relation to the other arm to control the longitudinal slack in said body supporting member, and means for actuating said lifting element.

20. In an invalid lifting apparatus, a single vertically movable lifting element adapted to be moved to a position at one side of a bed, means for imparting vertical movement to said lifting element, a frame member extending transversely to said lifting element and supported between its ends thereon, a pair of substantially horizontal arms projecting laterally from one side of said frame member near the respective ends thereof, at least one of said arms being movable toward and from the other arm, a flexible body supporting member separate from said arms and adapted to lie flat on said bed, means for connecting said arms with the respective ends of said body supporting member after the latter has been placed on said bed, and means for adjusting said movable arm to control the longitudinal slack in said body supporting member.

21. In an invalid lifting apparatus, a single vertically movable lifting element movable bodily to a position alongside of a bed, means for imparting vertical movement to said element, a flexible body supporting member adapted to lie flat on a bed, a frame member mounted between its ends on said lifting element and arranged to extend lengthwise of said body supporting member when said lifting element is positioned alongside of said bed, parts carried by said frame member, projecting laterally therefrom above said bed and having means for connecting the same with the respective ends of said body supporting member after the latter has been placed on said bed, at least one of said parts being movable with relation to the other part to control the longitudinal slack in said body supporting member, and means for actuating said movable part.

ROY H. SECHRIST.

IVAN C. HOWARD.