The aforementioned hoist embodies an openwork frame structure characterized by adjustable companion sections which are cooperatively connected together in a manner that the over-all frame structure may be decreased in size to pass through relatively narrow doorways. The construction also embodies a horizontally elongated endless upper apron driven either clockwise or counterclockwise, and a companion lower apron which unloads the upper apron and whose top run is in friction-driven contact with the bottom run of the upper apron. The lower apron is adapted to work simultaneously and in conjunction with the upper apron and it travels in an opposite direction. The top run of the upper apron is adapted to engage and load and move the patient and the bottom run of the lower apron is adapted to contact the mattress in a manner to crawl or creep across the mattress or the covering thereon. The motion of the aprons is simultaneous and coordinated to move smoothly between the patient and the supporting surface. Also the structure can be extended far enough on the mattress to reach the outer side of the patient. When the patient is in proper place the operating means is stopped and the stretcher is raised so that the patient can be removed from the bed or table. Unloading the patient involves the procedure in reverse of that just stated.

Construed otherwise the invention has to do with a mobile leg supported frame structure providing a hoist which is adapted to assume a crane-like position over and enclosing a bed, table or the like in order to load, lift and otherwise handle the patient without using the attendant's hands or strength. The frame structure is adjustable to the bed and capable of being narrowed in dimension to be wheeled through a relatively narrow doorway. Track means is carried by vertical end portions of the frame structure and a horizontally disposed frame is equipped with the aforementioned aprons, said frame having headers and members slidingly supported by the track means. More specifically, channel members are fixed to the respective vertical end members of the frame structure, the channels opening toward each other and providing trackways. A rail is fixed in the bottom of each trackway and a rack bar is fixed in the upper portion of the trackway. The headers or end members of the aforementioned frame are provided with rollers which travel along rails in the trackway and with pegs which engage the teeth of the track bars. The pegs at one end of the frame structure are carried by an end roller which imparts motion to the cooperating upper apron. The upper apron in turn drives or operates the underlying lower apron, the latter being trained over idling rollers on the frame.

Other objects, features and advantages will become more readily apparent from the following description and the accompanying illustrative, but not restrictive drawings. In the drawings wherein like numerals are employed to designate like parts throughout the views:

FIG. 1 is a view in perspective illustrating the complete ready-to-use patient handling apparatus constructed in accordance with the principles of the present invention;

FIG. 2 is a view in side elevation of the same showing the apparatus in association with the bed and mattress and also showing the reclining patient in phantom lines;

FIG. 3 is a top plan view of the apparatus;

FIG. 4 is an end elevation observing the structure of FIG. 2 in a direction from left to right in which the dotted lines represent the stretcher and track assembly (which is pivoted or cradled in the hoist) swung down to a position which permits the adjustable hoist to be narrowed so that it may be passed through a narrow doorway;

FIG. 5 is a plan view on a larger scale of the frame on which the endless upper and lower aprons or belts are
mounted, said aprons being omitted for clearness of illustration;

FIG. 6 is an enlarged view taken on the plane of the line 6—6 of FIG. 5, looking in the direction of the arrows;

FIG. 7 is an enlarged sectional view with parts in elevation taken on the plane of the line 7—7 of FIG. 3;

FIG. 8 is an enlarged view with the parts in section and elevation showing the track means and how the header or end member at the end of the stretcher is operatively supported and mounted;

FIG. 9 is a sectional view on a smaller scale showing the purpose of the L-shaped track means which is to permit the stretcher to be stored in an out-of-the-way position at the beginning of the use of the device; and

FIG. 10 is a view also on an enlarged scale and appearing in section and elevation and detailing the construction of one of the tubular legs of the frame structure constituting the aforementioned hoist.

It is believed that for the most part reference primarily to FIG. 1 will provide a reasonably clear and understandable comprehension of the over-all apparatus. Reference will be made first to the mobile crane-like hoist. More specifically, this comprises an openwork frame structure which is denoted as an entity by the numeral 14. This structure may be made up of pipes or tubes as is generally evident from the drawing. The legs of one pair are denoted by the numerals 15 and 16. The legs of the other pair are denoted at 17 and 18. Horizontal rails 20 in spaced parallelism serve to join these four corner-positioned legs to each other. At the left in FIG. 1 the numeral 22 designates an auxiliary rail between the legs 15 and 17 which is primarily a brace. Between the legs at both ends transverse connecting members are provided. That is to say, a sleeve 24 is connected and extends at right angles to the upper ends of the legs 15 and 17 and this is aligned with a similar sleeve 26 which is connected with the upper ends of the legs 16 and 18. A connecting rod 28 has its end portions telescoped into the respective sleeves and this rod is fastened in place by removable headed or equivalent fasteners 30. The construction is duplicated between the median portions of the legs and the same reference numerals are employed. With this construction it will be evident that the frame structure is actually made up of left and right sections which are adjustably joined so that the over-all structure is extensible and retractable for purposes of lowering it sufficiently to pass through relatively narrow doorways which is often necessary in many hospitals.

This hoist or frame structure 14 is mounted on and carried by leg means which makes the complete device readily portable. The leg means comprises a series of four legs which are all alike. Each leg is therefore denoted by the numeral 32. The leg is provided at the bottom with a caster 34 operable in an obvious manner. Attention may now be directed to FIG. 10 wherein it will be seen that the lower end of each tubular leg is provided with a bushing 36 to permit the desired telescoping and sliding action between the leg components to be attained. Each leg is provided at a suitable point with a slot 38 adjacent to which a sheave or pulley is mounted. The outwardly and downwardly diverging cables 42 have lower end portions 44 extending through the slot and into the bore of the hollow leg where the terminal of the cable is fixedly connected to the upper end of the leg 32 as denoted at 46. The converging ends of these cables are adapted to wind or wrap as at 48 around an end portion of the horizontally disposed or hoisting shaft 50. The ends of the shaft are journaled in suitable bearings 52 on the aforementioned members 28. As seen in FIG. 1 for example, the shaft 50 is provided with a sprocket 54 to accommodate a short sprocket chain 56 receiving its motion from sprocket means at the left including a large sprocket 58. This sprocket is suitably mounted and journaled as at 60. It serves to accommodate a vertical sprocket chain 62 receiving motion from the smaller sprocket wheel 64 rotatably mounted and operated by way of a hand crank 66. It will be obvious that by rotating the hand crank and actuating the sprocket chains and sprocket wheels rotation is imparted to the shaft 50 which serves to wind the cable means thereon. It follows that the cables cradle or suspend the hoist from the legs with the legs supported by the header 14, as a unit, may be raised and lowered to the desired elevation. This hoist is equipped with all of the remaining component parts which are obviously raisable and lowerable in conjunction therewith.

The legs 15 and 16 at one end of the structure provide an end frame while the legs 17 and 18 at the other end provide a second end frame and these end frames provide support means for a number of coacting components. Reference will be made first to a horizontal elongated shaft 68 (FIG. 1) which is suitably journaled for rotation on the legs 15 and 17 and is provided at one end with a hand crank 70. Keyed on this shaft adjacent the ends thereof and near the legs are fixed sprocket wheels 72. These sprocket wheels drive endless sprocket or conveyor chains 74. The right hand end portions of these chains are trained over the sprocket wheels 76 suitably mounted on the legs 16 and 18 respectively.

Reference will now be had to the tracks. For purposes to be hereinafter explained, there are two identical tracks mounted on the aforementioned end frames and each track is L-shaped in side elevation and channel-shaped in cross section. The track is denoted in each instance by the numeral 78. The long or horizontal branch is denoted at 80 and the vertical branch at 82. The vertical branch extends upwardly and the branch 80 spans the space between the legs 15 and 16 and 17 and 18, respectively. The right hand end portion (FIG. 1) is removable on a pin in place by an insertable and removable bolt 84. The functional portion between the branches 80 and 82 is suitably hinged as at 86 (FIG. 9) on the legs. This is the aforementioned "cradling" feature. It provides the result attainable as shown in dotted lines in FIG. 4. That is to say, it is necessary under certain conditions when it is desired to narrow the hoist to release the track means at the point 84 and to allow it to swing down against the brace 22 where it has a position which does not interfere with the adjusting of the sections of the hoist 14.

It is of particular interest to note that both branches of each track have their channel portions continuous and identical, that is, toward each and these channels provide the trackways. As seen in FIG. 8 an L-shaped rack bar 88 is fixed to the upper flange of the channel iron. An L-shaped rail 90 is fixed to the lower flange thereof. The aforementioned conveyor or sprocket chain is hung by a bracket 92 directly beneath each channel iron and this construction is to accommodate the specially made stretcher, that is, the patient handling, lifting, loading, unloading and transferring stretcher device which is disposed in a horizontal position and spans the space in the hoist in the manner shown in FIG. 1. This means is characterized by a frame which is generally generally by the numeral 94 in FIG. 5. This frame has channel-like end members or headers 96 of the construction shown in FIG. 6 Mounted for rotation therebetween are the rods constituting the multiplicity of rollers. It will be noted that the end member is provided with a wood or an equivalent filler 98 which, in turn, has a number of bearing rows 100 to receive the reduced journal 102 on the ends of the roller rods 110. This construction is evident perhaps best in FIG. 8. Also, and as shown in FIG. 8, the headers are provided with free turning collars or rollers 104 which travel along the rails 90 in an obvious manner. The headers also have depending lugs 106 which are pivotally connected as best shown in FIG. 7 with the upper run 108 of the adjacent or cooperating sprocket chain. It follows that the revolv-
ing travel or movement of the sprocket chains serves to impart movement by way of the lug 106 to the headers which, in turn, bodily shift the over-all frame 94 back and forth.

As shown in FIG. 7, there are two sets of rotatable rods or roller-rolls. The set on the left is denoted by three embossed the several rods 110 over which the lower endless apron 112 is trained. This apron embodies a zipper fastener 114. The other set of rods 128 serve to accommodate the upper and main loading and unloading apron 116 which here again is provided with a zipper 118 to render the apron readily applicable and removable. The roller-rolls are disposed at the extreme right as denoted by the numeral 120 constitutes an apron tightener. It is provided with a stud 122 having a nut 124 connected thereto which makes it possible to accomplish the adjust-ment in the clearance notch 126. All of the rollers or rods 128 idle freely except the one at the left which is denoted by the numeral 130 and this is the driving or power rod for transmitting motion to the tightly fitted endless apron 116. This roller 130 has cogs or gears 134 affixed to the ends thereof which are in mesh with the teeth of the rack bars. Similar cogs 136 are provided at the ends of each of the remaining roller-rods 120 (FIG. 5) and these are idling cogs. Nevertheless, they also are in mesh with the rack teeth.

With this construction of tracks fixed to the hoist it will be evident that as the hoist is raised and lowered the tracks are also raised and lowered. By the same token the roller-equipped frame 94 with the upper and lower aprons mounted thereon and the sprocket wheels and sprocket chains are also simultaneously raised and lowered. Also with this construction it will be evident that the roller-equipped frame and aprons thereon a novel patient handling stretcher is provided. This stretcher can be shifted to the inclined out-of-the-way position shown in FIG. 9 simply by operating the crank 70. In other words, turning this crank operates the conveyor chains and the conveyor chains cause the linked stretcher to move back and forth therewith and the cooperation between the cogs and rack teeth serves to impart motion to the powering roller 130 which, in turn, operates the apron 116. The lower run of the apron 116 is in friction driving contact with the upper run of the lower apron 112 as brought out in FIG. 7 so that the upper apron operates the lower apron and the aprons, of course, travel in opposite directions as is evident.

With the first rollers as shown in FIG. 5 it is to be noted that the L-shaped tracks drop toward the floor until the long limbs strike the brace which prevents the tracks from hitting the floor all as should be evident, it is believed, to readers.

It will be noticed in FIG. 7 that the several first rollers at the left are of smaller cross-sectional and are slightly inclined in respect to the plane of the idling rollers above them and the purpose of this construction is to facilitate enabling the leading end of the aprons to work most satisfactorily and to pilot itself into place between the patient and the bed mattress.

It may be repeated that the stretcher means is in an upright position as shown in FIG. 5 at the beginning of the procedure. Turning the crank 70 will bring the stretcher down and toward the bed over and onto the mattress. When the stretcher reaches the patient the rotating apron rolls under him until he is in a position on the stretcher and the stretcher is then raised and the patient can be moved as is evident. A slight elevation of the structure has been supplied by slightly staggering the rollers in the manner illustrated in FIG. 7. Also, if desired a brace or joint 95 (FIG. 5) may be employed in connecting the several first pipes or rollers to insure rigidity and to avoid undue flexing and bending as this leading end of the device approaches the patient. With this construction the patient may be loaded or unloaded and handled in a careful and convenient manner.

It will be noticed too that the motion of both aprons is simultaneous and coordinated to move between the patient and the support surface on which he is reclining without disturbing any part of his body and in so doing, nor disturbing any part of the linens or bedding on which he is lying by virtue of the substantially non-sliding en-gagement between the stretcher and upper mattress sur-face of the bed, achieved because of the movement of the lower run of apron 112 in a direction opposite to move-ment of the stretcher. The linens may be changed on the bed while the patient is lying on the stretcher. The patient can be placed back on the bed with relatively no discomfort as mentioned before, no draw sheets are required. The powered aprons are geared to perform the function of rolling under and picking up the patient in one operation.

The question may arise in the mind of the reader as to why it is necessary to utilize tracks which are L-shaped and why the vertical branches are utilized. The purpose here is an accommodation for the stretcher. Obviously, by building the tracks straight they would be too long and the over-all structure would have to be too wide and would not pass through narrow doorways. In the starting operation the stretcher unit is stationed in the vertical part of the track. It is lowered to the level of the bed and levels off to perform the duty of moving the patient. The performance could perhaps be likened to the operation of a grain binder where the grain is elevated from the platform to the rollers, the grain going between the rollers. On this construction the rollers on the frame means is so situated that the patient and pillow has to follow the top apron. The cooperating runs of the upper and lower aprons actually contact and frictionally "hug" each other so closely that the power of the top one puts the lower one into action with the aid of some pressure on the mattress and without disturbing the sheets.

The frame structure which provides the hoist is sturdy, durable and reliable and yet is easy for the attendant to push and shove from place to place. It is believed that the cables and winding shaft in conjunction with the telescoping legs provides a novel structural arrangement wherein the frame structure is actually cradled or suspended from the telescoping legs. Any suitable means may be provided in practice for tying the hand crank 66 against movement once the adjusted height is attained. The means is not detailed here.

Without attempting to be repetitious it is to be stressed that the part identified broadly or in an over-all sense by the reference numeral 14 has already been referred to as a mobile leg-supported hoist and alternatively as a lifting and lowerable frame structure. It may be added that this means 14 could also just as well be construed or inter-preted as a conveyance since it serves to convey the various facilities from place to place. Then too, the aforementioned frame 94 may be properly construed, it is submitted, as a traveling carriage in that it carries the cooperating aprons back and forth. Also, the end members or headers in which the journals at the ends of the roller rods are turn-able and supported may themselves be referred to as car-riages in that they ride back and forth. Then too, while hand cranks are employed in experimental model for manual use, it is within the purview of the in-vention to use, if found to be practical, motors (not shown). The conveyor chains might also be referred to as
shifting and position changing means for the apron-equipped stretcher or transfer device. It has been felt necessary to include explanatory terminology as a basis for the necessary covering claims.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed is as new as is as follows:

1. For use in handling, transporting and transferring a patient; a mobile apparatus comprising a hoist mounted on supporting and transporting legs, means carried by said hoist and operatively connected with said legs for elevating and lowering the hoist relative to the legs, and patient handling means operatively mounted on said hoist and liftable and lowerable simultaneously with the hoist, said patient handling means being mechanically movable from an out-of-the-way starting position at one longitudinal side of the hoist toward and to the other longitudinal side of the hoist, and including a patient recieving fixing at a supporting bed and the patient supporting bed, powered end less apron means mounted on and movable relative to the handling means in response to movement of the handling means between said positions for patient loading and unloading purposes, a horizontally elongated endless upper apron driven either clockwisely or counterclockwisely, and a companion lower apron underlying the upper apron having a top run in friction-driven contact with a bottom run of the upper apron, said lower apron being adapted to work simultaneously and in conjunction with the upper apron and traveling in an opposite direction, the top run of said lower apron being fixed and the move and the patient and the bottom run of the lower apron being adapted to contact the mattress in a manner to crawl across the mattress.

2. An invalid hoisting, transporting and handling apparatus comprising a hoistable leg-frame, the frame providing a hoist adapted to assume a crane-like position over and enclosing a patient supporting surface or the like to load, lift and otherwise handle the patient, said frame structure being adjustable to the bed and capable of being narrowed in dimension to be wheeled through relatively narrow doorways, channel members fixed to the respective vertical ends of said frame structure, the channels thereof providing trackways, a rail fixed to the bottom of each trackway, a horizontal frame spanning a median portion of the frame structure and having end members provided with idling rollers resting atop and rollable on said rails, said means being carried by the frame structure and operatively connected with said end members to move the frame along the trackways by way of the rails and rollers travelling thereon, endless aprons operatively mounted on said frame and drivingly connected to the channel members for patient loading movement relative to the frame in response to movement of the frame, said endless aprons being drivingly connected to the channel members by a rack bar fixed in the trackway directly above the underlying rail, and pinion gears rotatably mounted on the end members operatively cooperating with said rack bars.

3. The structure defined in claim 2, and wherein the drive means includes sprocket wheels mounted for operation on vertical members of said frame structure in a plane below the plane of the apron-equipped frame, endless conveyor chains trained over their respective sprocket wheels, said end members being mechanically linked to said chains to travel in conjunction therewith.

4. A patient handling apparatus comprising a frame structure adapted to be temporarily placed in a cage-like manner around a bed or the like and embodying pairs of vertical legs at the ends of said structure, a lengthwise horizontal shaft mounted for rotation between the legs at one longitudinal side of the frame structure and provided at its respective ends with sprocket wheels keyed and to turn with the shaft, a crank for turning said shaft, complemental sprocket wheels mounted for idling on the legs at the longitudinal side of the frame structure opposite said one side, endless conveyor chains spanning the space between the left and right legs and entrained over their respective sprocket wheels, tracks fixed in a horizontal frame to the legs at the ends of said frame structure, said tracks being situated directly above the upper runs of the chains, a patient handling stretcher extending horizontally between the pairs of end legs, said stretcher embodying a frame adapted to carry and operate endless aprons, the end portions of said frame having rigid tug links to the upper runs of said sprocket links and means for moving said apron in response to movement of the stretcher, said last mentioned means embodying a plurality of rotateable rods for said aprons, at least one rod having a motion transmitting cog fixed on the ends thereof, said cogs being adapted to travel back and forth in the trackways of said tracks, and each track having a rack bar fixed therein, the teeth on said cogs meshing with the teeth of said rack bars, which are set at an angle differently disposed and having a vertical height and a horizontal height, thereby imparting a movement to the patient handling apparatus in a manner to deflect the legs of the frame structure in a manner to move the apparatus in a plane above the plane of said frame structure.
9. A patient handling stretcher device comprising, adjustable frame means positionable above a patient supporting bed, stretcher means movably mounted by the frame means for movement from a vertically inclined position along one side of the frame means to a horizontal position above the bed and under a patient, loading means movably mounted on the stretcher means for movement in a patient loading direction in response to movement of the stretcher means toward the horizontal position, bed surface engaging means movably mounted on the stretcher means and drivingly connected to the loading means to accommodate non-sliding engagement between the stretcher means and bed upon movement of the stretcher means relative to the bed.

10. A patient handling stretcher device comprising, adjustable frame means positionable above a patient supporting bed, stretcher means movably mounted by the frame means for movement to a position above the bed and under a patient, loading means movably mounted on the stretcher means for movement in a patient loading direction in response to movement of the structure means toward the horizontal position, bed surface engaging means movably mounted on the stretcher means and drivingly connected to the loading means to accommodate non-sliding engagement between the stretcher means and the bed upon movement of the stretcher means relative to the bed.

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