

March 10, 1953

G. W. GILLELAND
PATIENT TRANSFER DEVICE

2,630,583

Filed Nov. 4, 1949

4 Sheets-Sheet 1

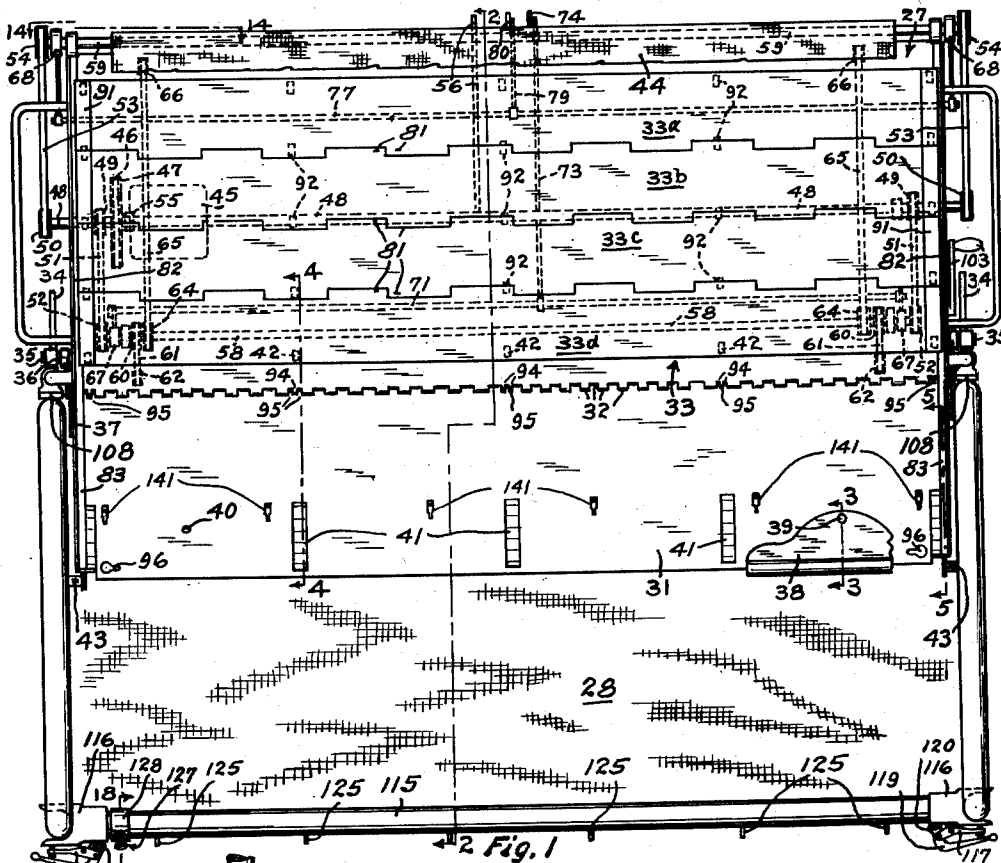
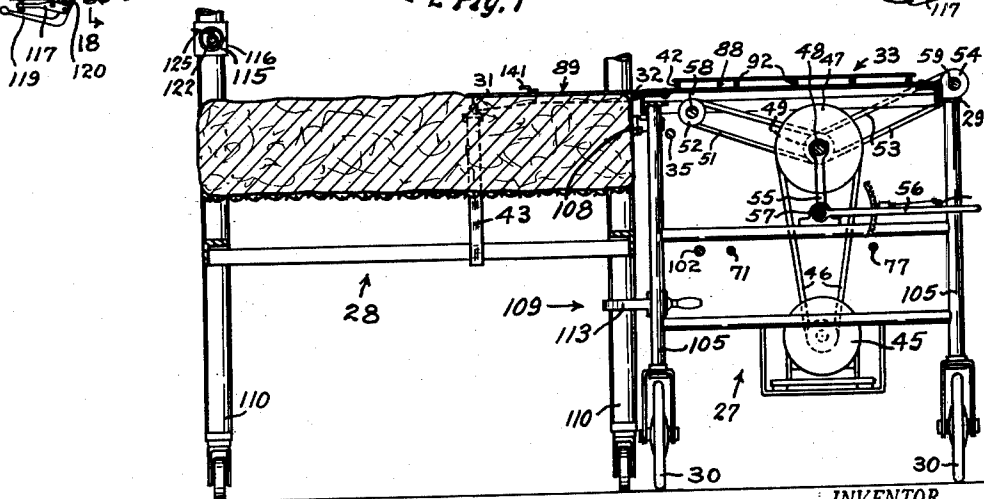
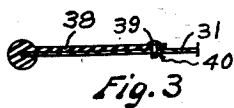


Fig. 2

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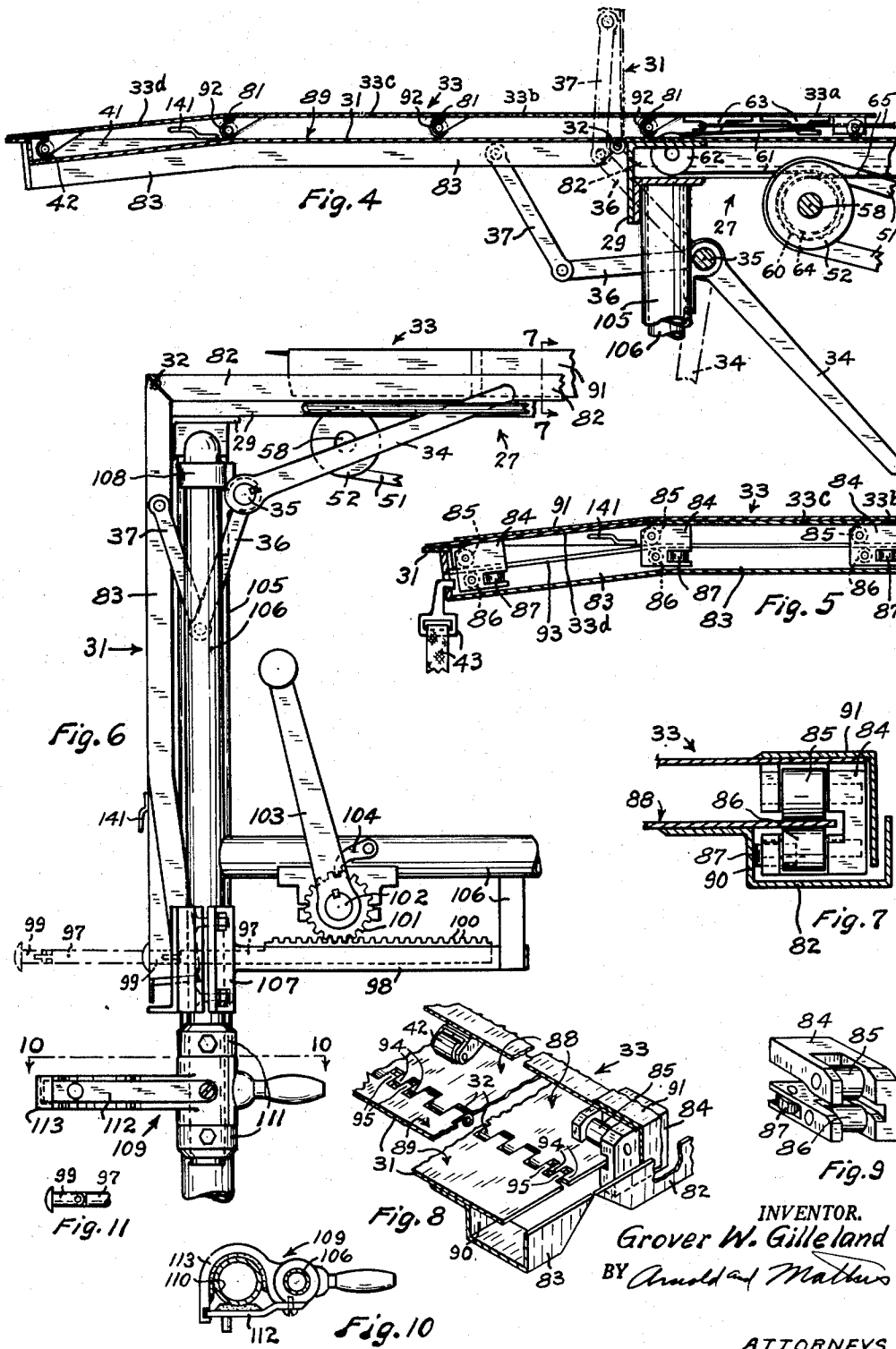
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4 Sheets-Sheet 2



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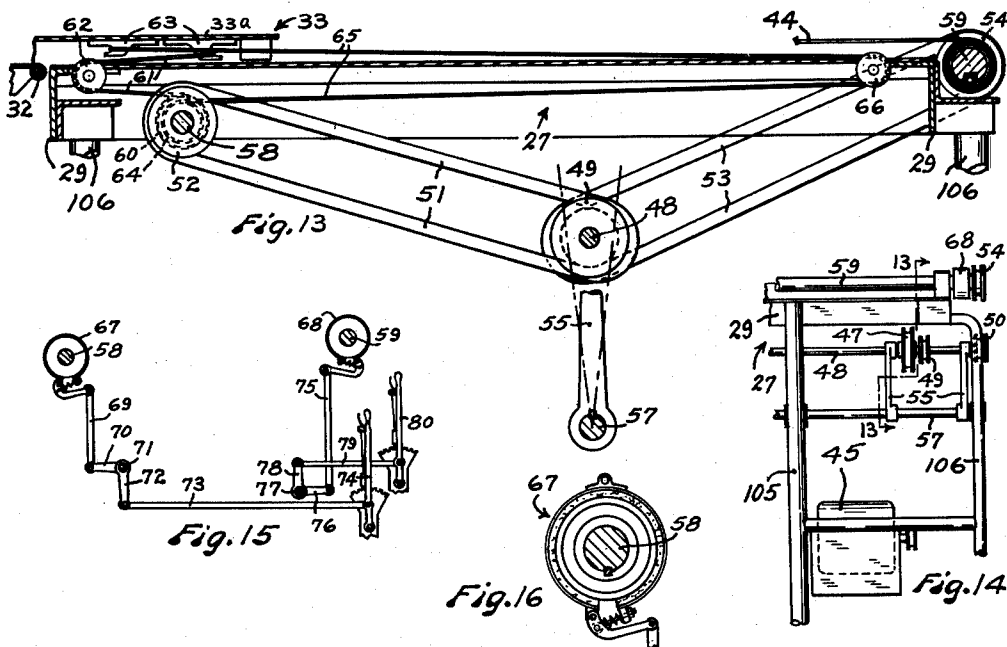
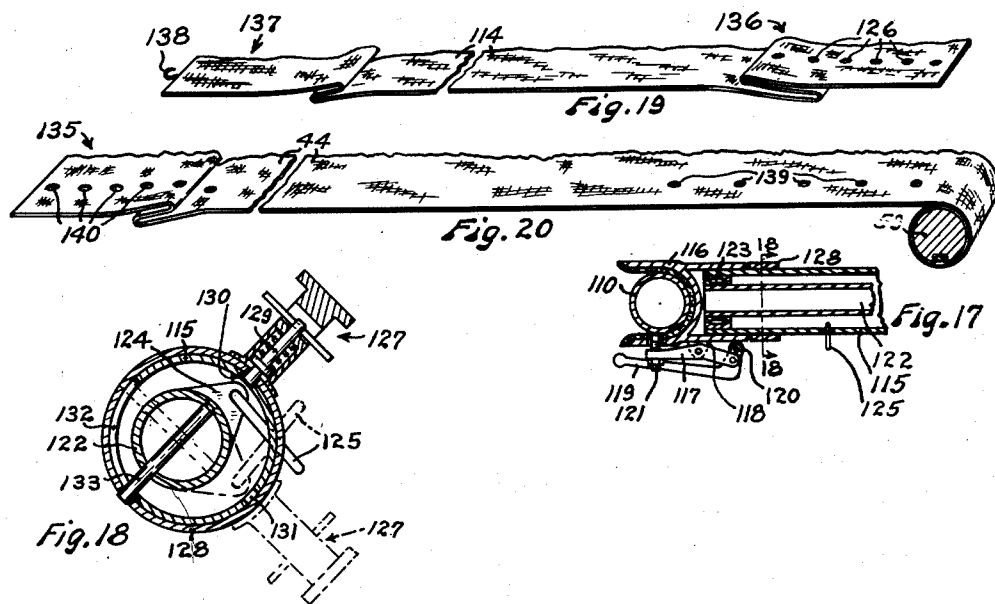
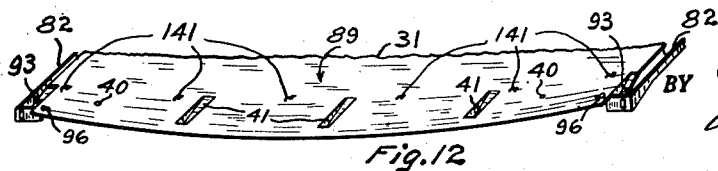
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4 Sheets-Sheet 3



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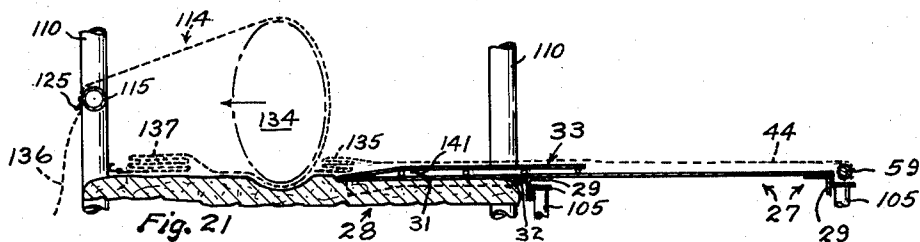
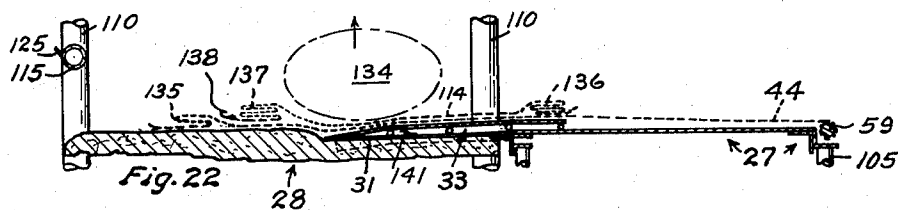
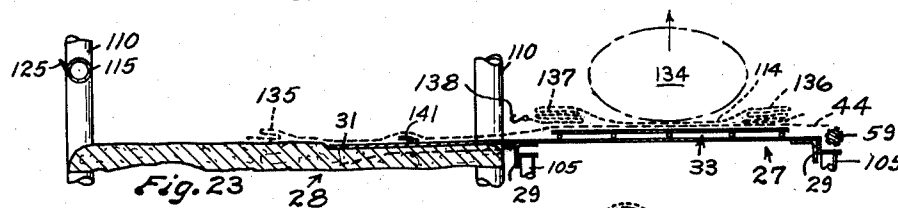
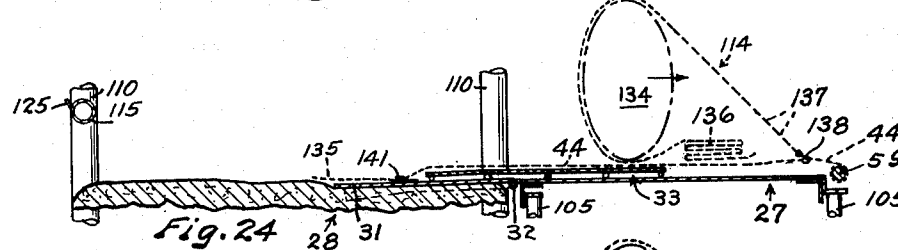
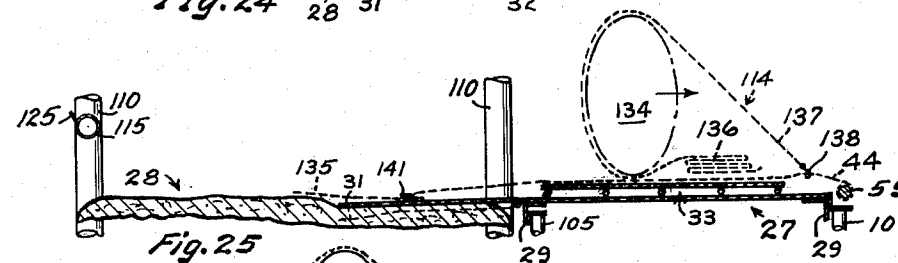
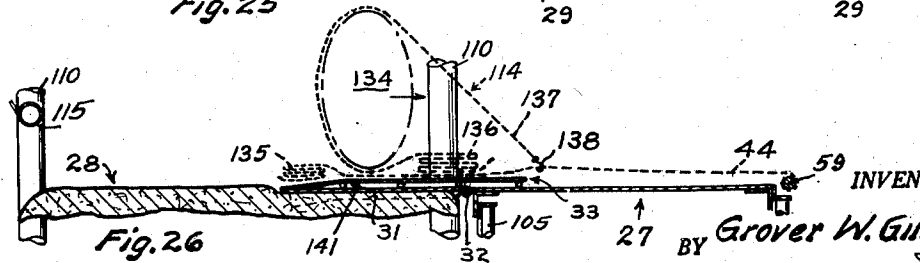
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2,630,583

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,630,583

PATIENT TRANSFER DEVICE

Grover W. Gilleland, Tacoma, Wash.

Application November 4, 1949, Serial No. 125,449

7 Claims. (Cl. 5—81)

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My invention relates to a wheeled stretcher for transferring patients from or to a bed, operating table or other support, and to or from said stretcher. More particularly, the wheeled stretcher of my invention is characterized by transferring a patient to or from said wheeled stretcher with a minimum possible harm or discomfort to the patient and with a minimum of effort on the part of the person or persons handling the stretcher apparatus.

This invention is in the nature of an improvement on the invention disclosed in my co-pending application, Serial No. 729,161, now Patent Number 2,528,048.

In transferring a patient from a bed or operating table to a stretcher, or from a stretcher to a bed or operating table, it was heretofore common procedure to either roll the patient from one support onto the other or to manually move the patient by two or more persons. Either of such methods of transfer was objectionable, not only because of the tedious work involved, but because of possible harm to the patient resulting from such type of handling. In this, more than needless discomfort and minor suffering were involved, as often serious injuries to the patient resulted from the handling incident to such type of transfer of the patient from one support to another.

It is an object of my present invention to provide simple, efficient and improved means for transferring a patient to or from a wheeled stretcher, all with a minimum of movement, bending, flexing or pressure to or of the patient.

Another object of my present invention is to provide a wheeled stretcher having improved transfer means which are efficient, certain in operation, simple in construction, and durable.

Another object of my invention is to provide a transfer leaf or apron, hinged to a deck portion of a patient support, as a wheeled stretcher, to facilitate transfer of the patient between the same and a fixed support, as a bed.

It is another object of my invention to provide a power driven crawler or mobile patient supporting means, so that the patient may be moved by said crawler in transferring the patient between one fixed support, as a stretcher, and a second fixed support, as a bed.

Another object of my invention is to provide, in combination with a power driven crawler or mobile patient supporting device, a power driven belt or canvas so that, by appropriate manipulation of the crawler and of the apron, a patient can be moved to or from the stretcher.

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Another object of my invention is to provide means to secure a wheeled stretcher to and alongside of a fixed support, as a bed, to insure efficient and foolproof transfer of the patient to or from the stretcher.

Another object of my invention is to provide an apron or transfer leaf which tends to conform and follow the upper surface of a bed and which functions as an efficient support over which a power driven crawler may travel in transferring a patient to or from such bed.

Still other general objects of my invention include: patient handling mechanisms for transferring a patient to or from a stretcher and which mechanisms can be readily manipulated by one operator and which manipulation requires a minimum of physical exertion on the part of the operator; the provision of belt type patient transfer means which may be power driven and employed to transfer a patient, and which may be secured to appropriate supports to maintain a patient in predetermined positions; readily releasable belt engaging means to insure prompt and efficient handling of the patient with certainty of safety; and other more specific objects which will be apparent or inherent in my invention as herein described and illustrated.

The above mentioned general objects of my invention, together with others inherent in the same, are attained by the devices illustrated in the accompanying drawings, throughout which like reference numerals indicate like parts.

Figure 1 is a plan view of a wheeled stretcher constructed in accordance with my invention, showing the same positioned alongside of a bed with the apron of the stretcher resting on the bed, and with parts of a stretcher power-operated transfer belt and head guard being broken away;

Fig. 2 is a sectional view, with parts in elevation, taken substantially on broken line 2—2 of Fig. 1;

Fig. 3 is a somewhat enlarged fragmentary sectional view, taken substantially on broken line 3—3 of Fig. 1, showing a head guard used on the stretcher apron or leaf;

Fig. 4 is a fragmentary sectional view, with parts in elevation, taken substantially on broken line 4—4 of Fig. 1, on a larger scale than Fig. 1, and showing a pivotally connected stretcher apron or leaf in a horizontal position and a transversely movable crawler in an operative position different than in Fig. 1 and wherein said crawler is extended on the stretcher leaf;

Fig. 5 is a fragmentary sectional view taken

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substantially on broken line 5—5 of Fig. 1 and showing further details of the apron and crawler structure, the parts being shown substantially in the same positions as in Fig. 4;

Fig. 6 is a fragmentary end view, with the crawler structure retracted and with the stretcher apron secured to and extending vertically alongside of the stretcher;

Fig. 7 is a fragmentary sectional view through one of the track means on the end portions of the stretcher table and crawler, taken substantially on broken line 7—7 of Fig. 6, on a larger scale than Fig. 6, and showing parts in elevation;

Fig. 8 is a fragmentary isometric view showing parts of the stretcher table, apron, and crawler;

Fig. 9 is a detached isometric view of a roller carrying mounting block which cooperates in supporting a movable crawler member on the stretcher table and apron;

Fig. 10 is a view partly in section and partly in plan, taken substantially on broken line 10—10 of Fig. 6, and showing means used to secure the stretcher to a bed;

Fig. 11 is a fragmentary detached elevational view of a part of the mechanism shown in Fig. 6, which is used to hold the apron in a downwardly extending vertical position adjacent to the stretcher frame;

Fig. 12 is a detached fragmentary perspective view of the stretcher apron;

Fig. 13 is a fragmentary cross sectional view, taken substantially on broken line 13—13 of Fig. 14, with parts in elevation, showing parts of the stretcher table, apron and crawler, and showing power transmitting means for the crawler moving means and the winding means for the transfer belt;

Fig. 14 is a fragmentary side view, looking in the direction of broken line 14—14 of Fig. 1, and showing frame means and motor supporting means and portions of driving means (with the driving belts omitted);

Fig. 15 is a detached diagrammatic view illustrating parts of brake devices used on the crawler moving means and the transfer belt winding means;

Fig. 16 is a detached view, partly in section and partly in elevation, of one type of brake means which may be used on the crawler moving means and transfer belt winding means;

Fig. 17 is a fragmentary view in horizontal section showing means which may be used to attach one end portion of a horizontal canvas or belt holding bar to a bed post; said bed post also being shown in Fig. 2;

Fig. 18 is a cross sectional view on a larger scale than Fig. 17, taken substantially on broken lines 18—18 of Fig. 17 and 18—18 of Fig. 1, and showing readily releasable canvas or belt holding means;

Fig. 19 is a detached fragmentary perspective view of a canvas or belt used in connection with this stretcher to facilitate handling of patients;

Fig. 20 is a detached fragmentary perspective view of a power-operated transfer belt or canvas which is wound on a driven roll carried by the stretcher; and

Figs. 21 to 26, inclusive, are diagrammatic views, partly in section, illustrating operations of this stretcher in handling a patient.

In Figs. 1 and 2 of the drawings a stretcher numbered generally 27 of my invention is shown alongside of a hospital bed which is numbered generally 28. The stretcher 27 is provided with

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main frame structure 29, supported by a plurality of wheels 30, at least two of which may be of the caster type for usual purposes.

Referring to Figs. 1, 2 and 4, an apron 31 is pivoted to the main frame structure 29 of the stretcher 27 by a piano type hinge means 32 extending longitudinally of the stretcher 27. The apron 31, by means hereinafter explained, serves as a trackway for a crawler or mobile patient supporting device numbered generally 33. The crawler 33 may extend over and be supported by apron 31 as indicated in Figs. 4 and 5 of the drawings, or said crawler 33 may be retracted and be supported by the stretcher 27 as indicated in Figs. 1, 2 and 6 of the drawings.

The apron 31 may assume a substantially horizontal position as indicated in Figs. 1, 2 and 4 of the drawings so the said apron may rest upon and be supported by the upper surface of a bed 28; the apron may extend downwardly in a vertical direction as is indicated in Fig. 6 of the drawings; or the apron may extend upwardly in a vertical position as is indicated by the fragment thereof shown by dot-and-dash lines in Fig. 4 of the drawings. Operating lever means to cause the apron to assume such positions and intermediate positions comprises a hand lever 34 rigidly secured to a shaft 35 which extends longitudinally of stretcher 27. Shaft 35 is rotatively supported by the main frame structure 29 of the stretcher 27. In order to make the shaft 35 angularly movable by lever means at either end of the stretcher, hand levers 34 are disposed at opposite ends of the shaft 35 (see Fig. 1). Longitudinally spaced apart links 36 (one of which is shown in Figs. 4 and 6) rigidly connect with shaft 35. Each link 36 is pivotally connected with a link 37, and each link 37 is pivoted to the apron 31.

When a hand lever 34 is in the position indicated by full lines in Fig. 4, the apron 31 is substantially in a horizontal position so that the apron 31 may be caused to rest upon the upper surface of a bed 28, as indicated in Figs. 1 and 2 of the drawings. When the apron 31 extends downwardly, the levers 34 assume the position illustrated for the lever 34 in Fig. 6. If the hand lever 34 is moved from the position indicated in Fig. 6 to the full line position of said lever as indicated in Fig. 4, then the apron 31 will be in substantially a horizontal position. The apron 31 will not be at rest in this position and will tend to swing downwardly. However, if the apron 31 extends over an object such as a bed 28, then the apron 31 will rest upon said bed 28 and said apron will be in a horizontal position and supported by the bed, as indicated in Figs. 1 and 2 of the drawings. This same position is shown in full lines in Fig. 4 but the bed is omitted in the interest of clarity of the drawings. If it is desired to extend the apron upwardly in substantially a vertical plane, the hand lever 34 may be moved from the full line position indicated in Fig. 4 to the dot-and-dash line position shown in said figure, and the links 36 and 37 and the apron 31 will assume the dot-and-dash line position shown in Fig. 4. Previous to moving the parts 34, 36, 37 and 31 from their full line positions to their dot-and-dash line positions in Fig. 4, the crawler 33 must be retracted from the position shown in Fig. 4 to the position shown in Figs. 1, 2 and 6. The said dot-and-dash line position of the apron 31 and parts associated therewith, permits the stretcher 27 to be moved alongside of or away from a bed 28, as may be

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desired. If the apron 31 is in said position and the stretcher 27 is moved alongside of a bed, then by operation of the hand lever 34 the said apron and parts associated therewith may be lowered so that the apron 31 may be caused to rest upon the upper surface of a bed 28. If the apron 31 is resting on a bed 28 and thus the apron 31 is in full line position shown in Fig. 4, then by use of one or both of the hand levers 34, the apron 31 and parts associated therewith may be caused to move to the dot-and-dash line position shown in Fig. 4. When said apron 31 is in said dot-and-dash line position, it will tend to remain in said position due to the fact that the links and levers employed pass through their centers of movement so that the weight of the apron 31 and parts associated therewith tend to move the parts as viewed in Fig. 4 of the drawings in a clockwise direction and urge the hand levers 34 against a stop provided by parts of the main frame structure 29 of the stretcher 27.

A pad 38 (see Figs. 1 and 3) is detachably connected with an outer end portion of the apron 31, as by a snap fastener 39, which snap fastener 39 enters into a suitable opening 40 in the apron 31. Preferably an opening 40 is provided in each end portion of the apron 31. The pad 38 functions as a head guard for the patient, to protect the head of a patient before the apron is secured to the bed and while the end portions of the apron are bowed upwardly as indicated in Fig. 12. After the apron 31 has been lashed down or secured as shown in Figs. 1 and 2, the guard or pad 38 may be removed so it will not interfere with operation of the crawler 33. The head pad 38 can be changed from one end to the other of the stretcher (depending upon the opening 40 used) and the selected position will depend upon the direction toward which the head of the patient extends.

A plurality of spaced apart depressions 41 are disposed in the outer edge portion of the apron 31 (see Figs. 1, 4 and 12). Rollers 42, supporting the outer or bed side of the crawler 33, roll over the apron 31 and when said rollers 42 enter the depressions 41, the outer end portion of the top of the crawler 33 is substantially flush with the outer end portion of the top of the apron 31. The outer or bed side of the apron 31 is concavo-convex as illustrated in Fig. 12 of the drawings, and thus the lower side of the central outer portion of apron 31 first contacts the upper surface of the bed 28. Strap means 43 (Figs. 1, 2 and 5) connect between the bed 28 and end portions of the apron 31, thus causing the apron 31, when tied down to the bed 28, to somewhat flatten although it is still concave. This maintains the central portion of the apron 31 somewhat depressed and thus the hips of a patient (which pass over such portion) more readily are moved over the apron 31 and crawler 33 thereon. The crawler 33 comprises a plurality of hinged together sections 33a, 33b, 33c, and 33d and these sections are longitudinally concaved to interfit with the concaved apron 31. The degree of curvature gradually increases in the said sections in the order above given. Likewise, the curvature in apron 31 increases toward the free end portion thereof. Without such concave characteristics to the outer or bed side of the apron 31, the said apron 31 would tend to assume a convex form when its ends portions are tied down to the bed and the central portion would be too high and thus interfere with easy transfer of a patient off and on crawler 33.

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In my present invention, I desire to provide power means to move the crawler 33 toward the right and toward the left (as viewed in Figs. 2 and 4), so that said crawler may be moved by power into or out of the retracted position shown in Figs. 1, 2 and 6 of the drawings, and may be moved by power into and out of the extended position shown in Figs. 4, 5 and 13, of the drawings.

The means to power actuate said crawler 33 (see Figs. 1, 2, 4, 13 and 14) and also to power actuate a canvas sheet 44 (see also Figs. 1, 13 and 20) comprises a prime mover, such as an electric motor 45, which is carried by the main frame structure 29 of the stretcher 27. The electric motor 45 is preferably of the reversible type and may be caused to angularly turn in either direction by suitable control means (not shown). Power from electric motor 45 is transmitted by any suitable means, as endless belt 46, to a driven sheave 47. The relative sizes of sheave 47 and that carried by the shaft of motor 45 will provide for suitable speed reduction or speed change. Sheave 47 is mounted on shaft 48, and shaft 48 carries sheaves 49 and 50 (see particularly Figs. 2, 13 and 14). A belt 51 is threaded over sheaves 49 and 52, and belt 53 is threaded over sheaves 50 and 54. Shaft 48 is carried by arm means 55, and arm means 55 cooperates with lever 56 (Fig. 2) to form a bell crank pivoted about a shaft 57. When the lever 56 (see Fig. 2) is raised, belt 53 will be tightened on sheaves 50 and 54 and belt 51 will be driven. When lever 56 is lowered, belt 51 will be tightened on sheaves 49 and 52 and belt 53 will be driven. When the arm means 55 is in the center position indicated in Figs. 2 and 13, the parts are in neutral and motor 45 may be driving belt 46, sheave 47 and shaft 48 but belts 51 and 53, and sheaves 52 and 54 will not be driven.

A shaft 58 extends lengthwise of the stretcher 27 (see Fig. 1) and carries the sheave 52 shown in Figs. 2 and 13. Preferably, there is a sheave 52 at either end of shaft 58 as shown in Fig. 1, and each sheave 52 is driven by a belt 51 which is threaded over a sheave 52 on shaft 58 and on a sheave 49 on shaft 48. By providing for a drive at either end of the stretcher, duplicate drive is employed for safety's sake. Also the shaft 59, which mounts the sheave 54 shown in Fig. 2, also mounts two sheaves 54 as indicated in Fig. 1 and there is a belt 53 between each sheave 54 on the shaft 59 and sheaves 50 on the shaft 48. The shafts 58 and 59 are mounted for rotary movement. Duplicate drives to the shaft 59 are provided for the same purpose as duplicate drives to the shaft 58.

As the electric motor 45 is a reversible motor, and as I provide, in effect, a clutch mechanism or selective drive by lever 56, shaft 58 may be driven in either direction as desired while shaft 59 is idle. Also shaft 59 may be driven in the desired direction when shaft 58 is idle. As will hereinafter appear, I desire to drive shaft 59 in a selected direction when shaft 58 is idle, and I desire to drive shaft 58 in either direction when shaft 59 is idle.

Shaft 59 mounts patient transfer sheet or belt 44 and thus when shaft 59 is driven in the desired direction sheet 44 may be power driven and wound onto shaft 59 or on a drum carried by such shaft.

Shaft 58 carries longitudinally spaced apart drums 60 (see Figs. 1, 4 and 13) and tension cables, as steel tapes 61 are wound on said drums

60. The tapes 61 pass around idle sheaves 62 and thence are connected to brackets 63 carried by one end portion of the crawler 33. The shaft 58 also carries spaced apart drums 64. Steel tapes 65, similar to tapes 61, are wound on drums 64 and in the opposite direction to which tapes 61 are wound on drums 60. Tapes 65 pass over idle sheaves 66 and are connected to other brackets 63 carried by the other end portion of crawler 33 (see Fig. 13). Thus when the shaft 58 is driven in one direction, the steel tape 65 will exert a pull, tending to move the crawler 33 out of the position shown in Fig. 13 of the drawings and to the right. At the same time steel tape 61 will be fed from drums 60. When the shaft 58 is driven in the opposite direction, a pull will be exerted on tape 61, moving the crawler 33 toward the left and into the position shown in Fig. 13 of the drawings and at the same time tape 65 will be fed from drum 64. As best indicated in Fig. 1 of the drawings, there is preferably duplicate drives at the respective ends of stretcher 27—thus duplicate tapes 61 and 65 and drums therefore are provided.

The foregoing description is to be taken as an illustration and an example of means to cause the crawler 33 to be power driven in either direction while the shaft 59 mounting the sheet 44 is idle and also means to power drive the shaft 59 to wind sheet 44 thereon while the crawler 33 remains idle.

In order to insure that the crawler 33 does not move when so desired, and likewise to insure that shaft 59 does not move when so desired, I provide brake means for shafts 58 and 59. The brake means for said shafts 58 and 59 may be any conventional brakes having conveniently positioned brake operating levers. As an illustration thereof I have shown two spaced apart brakes 67 on shaft 58 and two spaced apart brakes 68 on shaft 59 (see Figs. 1, 15 and 16). Said brakes may employ drums and external brake bands or drums with internal brake bands, such as are common in the automobile art, and as an illustration thereof I have shown, in Figs. 15 and 16, brakes employing an external brake band. In view of the development of the brake art, the brake mechanism is generally illustrated and not completely described in detail. In Fig. 16, a view is shown of brakes 67 on shaft 58. Suitable link and lever mechanism is employed so that the brakes 67 and 68 may be operated from a convenient position. Such link and lever mechanism may comprise for brake 67, links 69 and levers 70. Levers 70 are rigid with a shaft 71 so that angular movement of shaft 71 will set or release both brakes 67. Means to angularly move shaft 71 may comprise levers 72 and links 73. Links 73 are connected to a hand lever brake operating means 74. Similar operating mechanism may be provided for brake 68, which may comprise links 75 and levers 76 corresponding to links 69 and levers 70; shaft 77 corresponding to shaft 71; levers 78 and links 79 corresponding to levers 72 and links 73; and hand lever brake operating means 80 corresponding to hand lever brake operating means 74.

The details of the crawler 33 and parts cooperating therewith are best illustrated in Figs. 1, 2, 4, 5, 6, 7, 8 and 9 of the drawings. As the leaf or apron 31 is hinged to the stretcher 27, the crawler is required to pass over an angular trackway portion formed by the stretcher 27 and apron 31, when the apron 31 is raised or lowered above the horizontal plane of a trackway formed on the top of the stretcher 27. Also the trackway

on the apron 31 is not a continuous level trackway, particularly due to the depressions 41 in the apron 31, which have been previously described. The crawler 33 comprises a plurality of articulated or hinged together sections 33a, 33b, 33c and 33d, which may be hinged by longitudinally extending hinges 81 of the piano type. To support the crawler 33 for traveling movement over the top of the stretcher 27 and over the apron 31, roller means are provided to vertically support crawler 33 and other roller means are provided to take end thrust. The ends of the stretcher 27 support and position channels 82 and similar channels 83 are carried by the apron 31 (see Figs. 4 and 8 for both channels and Fig. 7 for channel 82 of the stretcher 27). Each section of the crawler 33 at each end portion thereof carries brackets 84, which brackets mount rollers 85 and 86. Rollers 85 and 86 rotate about horizontal axes and the brackets 84 also carry rollers 87 which rotate about a vertical axis. The rollers 85 roll upon and are supported by the top 88 (Fig. 8) of the stretcher 27, or by the top 89 of the apron 31. Also the rollers 86 roll below the same surfaces and prevent the crawler 33 from being removed in an upward direction from either the top 88 of the stretcher 27 or from the apron 31. The said channels 82 and 83 are provided with a vertical wall 90 and the brackets 84 carry the said rollers 87, and said rollers 87 engage the said vertical walls 90 to prevent displacement of the crawler 33 in a longitudinal direction and to cause the same to run truly even though the crawler 33 is not directed accurately in a horizontal direction, such as where the strain is all toward one end thereof. Thus the rollers 85, 86, and 87 support the crawler 33 at the respective ends of the crawler 33 as it travels sideways over the stretcher 27 and over the apron 31. Also to enclose the rollers 85, 86 and 87, an angle bracket 91 (see Figs. 7 and 8) is carried by the crawler 33 and has a portion extending downwardly into the channels 82 and 83, depending upon the relative position of the crawler 33 on the stretcher 27, the apron 31, or both thereof.

Intermediate their end portions, the sections of the crawler 33 are each supported by rollers 92 (the bed side or outer of such rollers are given the number 42, as previously explained). The rollers 42 and the rollers 92 may be identical except the rollers 42 enter into depressions 41 as previously explained. When the outer or bed side rollers 42 drop downwardly because of the depressions 41 in the apron 31, the deck of the apron 31 is provided with downwardly inclined track portions 93 (see Figs. 5 and 12) so that rollers 85 and 86 at the bed side can move downwardly and so that the upper edge of the crawler 33 is substantially flush with the top of the surface onto which the patient is to be moved, as bed 28.

In order to provide a smooth surface over the joint between the top 88 of the stretcher 27 and the top 89 of the apron, the said tops 88 and 89 carry staggered portions 94 and 95 respectively and thus fill in spaces between the various hinged portions of the hinge 32. When the top 89 of the apron is substantially parallel with the top 88 of the stretcher, the staggered portions 94 and 95 will provide for a continuous even surface on which the rollers 85 and 92 are supported.

When the stretcher 27 is moved from place to place, preferably the apron 31 is in the position shown in Fig. 6 of the drawings. In such position the apron 31 extends downwardly in a

substantially vertical plane about hinge 32. As will be recalled, the apron 31 has its outer portion bowed or concaved as best indicated in Fig. 12 of the drawings. In order to hold said apron 31 flat against the stretcher 27 and to remove such bow, openings 96, which are preferably of a key hole shape, are provided. These openings 96 (Fig. 1) provide means by which the outer end portions of the apron 31 may be engaged by means carried by the stretcher 27. A typical illustration of such means comprises rods 97 (Fig. 6) mounted for reciprocating movement in guides 98, which guides 98 are carried by the main frame structure 29 of the stretcher 27. As a means to engage the rods 97 with the openings 96 in the apron 31, I have shown button-like members 99 pivotally secured to the rods 97 (see Figs. 6 and 11). The button-like members 99 can be pivoted to cause them to enter the larger opening of the key hole slots 96 and then pivotally or angularly moved to engage the smaller portions of said key hole slots 96. At each end of the stretcher and as a means to urge the rods 97 toward the right, as viewed in Fig. 6 of the drawings, the rods 97 carry racks 100. Each rack 100 meshes with a pinion 101 and pinions 101 are carried by shaft 102 which extends lengthwise of the stretcher 27. In order to angularly move shaft 102 and in turn move rack 100 to the right as viewed in Fig. 6 of the drawings and at the same time to readily provide sufficient pressure so that bow is removed from the apron 31, a crank 103 is provided rigid on shaft 102. In order to limit angular movement of shaft 102 and pinion 101, a pawl 104 is provided.

When it is desired to permit the racks 100 to move toward the left as viewed in Fig. 6 of the drawings, pawl 104 may be raised out of engagement with the pinion 101 and then the racks 100 can be manually moved toward the left as viewed in Fig. 6 of the drawings. The apron 31 will tend to move toward the left and away from the position shown in Fig. 6 of the drawings when the pawl 104 is released because the said apron 31 is bowed as indicated in Fig. 12 of the drawings and the bow is flattened out or removed when the apron is held vertical by the rods 97. When the apron 31 is released from the pressure of the rods 97, the button-like members 99 can be angularly moved relative to the key hole slots 96 and by registration of the head portion of said button member 99 with the larger opening of the key hole slots 96, the apron 31 may be released from the button-like members 99. When the apron 31 is in such relatively free position, it can be angularly moved and in a clockwise direction as viewed from Fig. 6 of the drawings by manipulating one of the levers 34.

In order to angularly move the apron 31, hand levers 34 are provided, one of which is readily available at either end of the device. When a hand lever 34 is in the position shown in Fig. 4 of the drawings the apron 31 will be substantially horizontal and can be permitted to rest upon a bed 28. However, the hand lever 34 should be moved from the full line position shown in Fig. 4 to the dot-and-dash line position shown in said figure if the apron 31 and parts associated therewith are to be moved to their upward horizontal position, which latter position is indicated by dot-and-dash lines in Fig. 4 of the drawings. With the apron 31 in such position, the stretcher 27 can be moved alongside of a bed 28 and the apron 31 permitted to move downwardly to sub-

stantially a horizontal position and rest on the bed 28. Also when the stretcher 27 is to be moved away from a bed, first the apron 31 will be moved by the hand lever 34 to its said upper vertical position shown by dot-and-dash lines in Fig. 4.

In order to facilitate abutting the stretcher 27 alongside of the bed 28, the stretcher posts 105 are recessed inwardly from the ends of the stretcher 27 as is best indicated in Fig. 14 of the drawings. Thus overhanging structure comprising frame members 106 is provided at each end of the stretcher 27. The guide member 98 for the rack 100 is carried by frame members 106 and held thereto by any suitable means, such as a clamp 107.

Assuming that a patient is resting on a bed 28 and it is desired to move the patient from said bed 28 onto the stretcher 27, the stretcher 27 is first rolled alongside a bed 28 and secured to the bed. The means for securing the stretcher 27 to the bed 28 comprises bumpers 108 (see Figs. 1 and 2) which are carried by the frame member 106 and abut against the bedpost frame structure 110 of the bed 28. Also clamps numbered generally 109 (see Figs. 2, 6 and 10) secure the frame members 106 and thereby the stretcher 27 to the bedpost frame structure 110 of the bed 28. Such clamps 109 may be in many forms and as an illustration thereof I have shown a C clamp 109 which is pivotally mounted on a frame member 106 and disposed between two collars 111 (Fig. 6). The clamp 109 is provided with a gate member 112 (Fig. 10) which is angularly movable in a vertical plane to permit the C clamp 109 to engage or be released from a frame member 106 carried by stretcher 27. The C bracket portion 113 can be angularly moved to engage about a bedpost 110 and thereafter the gate member 112 can be moved to locked position (as shown in Fig. 10) and thus the stretcher 27 may be engaged to a bed 28 adjacent the end portions thereof and more particularly to bedposts 110 of the bed 28.

On the side of the bed 28 away from the stretcher 27 there is provided means to engage with a belt or sheet 114, shown detached in Fig. 19 and also shown in Figs. 21 to 26, inclusive. Such means may comprise a horizontally extending tube 115 (see Figs. 1, 2, 17 and 18) detachably connected to two bedposts 110 on the side of the bed opposite the stretcher 27 (i. e. to the left of Fig. 2) and positioned at an elevation above the level of the mattress on bed 28. Each end of the tube 115 (see Fig. 17) carries a U-shaped bracket 116 of a size to receive in the opening of the U a bedpost 110. Preferably the inside of the U-shaped bracket 116 is lined with suitably padding material to prevent marring of bedposts 110. A lever 117 is pivoted intermediate its end portions to a lug 118 carried by bracket 116. One end portion of the lever 117 pivotally mounts a bell crank shaped lever 119. One end portion of the lever 119 carries a roller 120. The other end portion of the lever 117 carries an adjustable pin 121 which is mounted for sliding movement through an opening in the U-shaped bracket 116. When the lever 119 is in the position shown in Fig. 17 of the drawings, the handle portion of said lever 119 has passed center in moving in a clockwise direction and hence the parts will remain in said position until moved. In moving the outer end portion of the lever 119 in a counter-clockwise direction, the roller 120 will pass along the U-shaped bracket 116 and

permit lever 117 to turn in a counter-clockwise direction and thus pull pin 121 and release the U-shaped bracket 116 from bedpost 110. Movements in the reverse directions from those described will cause the U-shaped bracket 116 to become secured to a bedpost 110 after the parts have first been properly juxtaposed.

The tube 115 rotatably supports therein a tubular member 122 as by means of roller bearings 123 (Fig. 17). The tubular members 115 and 122 extend substantially the full length of the bed 28. Periodically a lever 124 (Fig. 18) is secured to the tubular member 122 and a pin 125 is pivotally connected to each lever 124. The pins 125 project out through openings in the tube 115 and thus we have a plurality of outwardly projecting pins 125 as are so shown in the lower portion of Fig. 1 of the drawings. Each of the pins 125 is engageable with an opening 126 in belt or sheet 114. Fig. 19 is a fragmentary view of one side edge portion of the belt 114 and there are a series of aligned holes 126 for engagement with pins 125. Thus the belt 114 may be secured at a plurality of locations relative to its width to the tubular member 115 through pins 125. When the pins are in the full line position shown in Fig. 18 of the drawings, they will be secured to a belt or sheet 114 passing in a counter-clockwise direction upwardly and to the left as viewed in Fig. 18 of the drawings. At one end of the tube 115 is provided locking means 127 (see also lower left corner portion of Fig. 1). This locking means 127 is shown in detail in Fig. 18 of the drawings. The locking means 127 is mounted on a sleeve 128, which sleeve 128 is rotatably mounted on tubular member 115. The locking means 127 is provided with a spring loaded pin mechanism 129. The tubular member 115 is provided with spaced apart openings 130 and 131 (see Fig. 18) and when the pin of a spring loaded pin mechanism 129 registers in the opening 130, the pins 125 will maintain engagement with the openings 126 in the canvas belt 114. When the pins of the spring loaded pin mechanism 129 is released from opening 130 and caused to enter an opening 131 after the locking mechanism 127 has moved from the full line position to the dot-and-dash line position shown in Fig. 18, the pins 125 will be angularly positioned in the position shown by dot-and-dash lines in Fig. 18 of the drawings and the belt 114 pulled from the left in Fig. 18 of the drawings will be released.

In order to connect the tubular member 122 with the locking means 127, the tube 115 is provided with a circumferentially disposed slot 132. The locking means 127 is rigid with the sleeve 128 and the sleeve 128 is connected by a pin 133 with the tubular member 122. The slot 132 in the tube 115 permits movement of the pin 133 relative to said tube 115.

Assuming that a patient is lying on a bed 28 and that the stretcher 27 has been moved alongside of the bed 28 and locked to said bed 28 in the manner described, the belt 114 is worked under the patient with the end portion carrying the openings 126 toward the right as viewed in Fig. 21 of the drawings. In Figs. 21 to 26, inclusive, the belts 114 and 44 are shown diagrammatically. The canvas belt 114 is tucked under the patient so that the patient is substantially intermediate the end portions of the belt 114 and there will be substantial amounts of end portions of the canvas 114 on either side of the patient. The patient in Figs. 21 to 26, inclusive, is illustrated diagrammatically by the oval 134.

In this position the patient will be lying on his back and with the viewer looking toward the feet of the patient. Then the patient is turned on the patient's right side and the end portion of belt 114 carrying openings 126 is wrapped counter-clockwise around the patient and so that openings 126 engage the pin means 125. The patient in such position will be supported by the canvas belt 114 against turning movement in a clockwise direction. If the patient is not turned too far in a counter-clockwise direction, the patient will tend to turn by gravity in a clockwise direction, which will be resisted and counteracted by the canvas belt 114.

With the patient in the position shown in Fig. 21, a single operator can then roll the apron 31 onto the bed 28 and secure strap means 43, carried by said apron 31, to the bed 28. Then the sheet 44 may be arranged so the same is substantially in the position shown in Fig. 21 and with a desired amount of the end portion 135 of sheet 44 piled adjacent the patient, as indicated in said Fig. 21. The movement of the crawler 33 to the left and to the position shown in Fig. 21 may be accomplished by transmitting power from electric motor 45 via belt 46, sheave 47, sheave 50, belt 51, shaft 58, drums 60, and tape 61. Then the pins 125 may be released from the openings 126 in belt 114 and the patient permitted to turn in a clockwise direction from the position shown in Fig. 21 to the position shown in Fig. 22. Obviously the purpose of the structure involving pins 125 to connect with openings 126 in canvas belt 114 is to permit one operator to handle both the patient and the apparatus. If it is possible to have one operator to maintain the patient in the position indicated in Fig. 21 of the drawings, then openings 126 in the belt 114 need not be secured to the pins 125. However, it is more satisfactory to use the said canvas belt 114 and the catch means including pins 125, for the purposes indicated rather than to manually manipulate and hold the patient in the position indicated in Fig. 21 of the drawings.

After a patient is turned to the position indicated in Fig. 22 of the drawings (the patient will be lying on his back and with the feet toward the viewer), the end portion 135 of the sheet 44 is worked under the patient and the patient will be resting on sheets 114 and 44. Also the end portion 136 of the belt 114 is now folded adjacent the patient and toward the right of the patient. Upon applying power to the belt 44 from motor 45 (through belt 46, sheave 47, sheave 50, belt 53, sheave 54 and shaft 59), the canvas sheet 44 is wound on shaft 59 and the sheet 44 moves toward the right as viewed in Fig. 22 of the drawings. At the same time if the brakes 67 are applied to shaft 58 (see Fig. 15) then the crawler 33 will be held and both the sheets 44 and 114 and the patient (illustrated by 134) will be drawn up onto the crawler 33. Thus the patient 134 can be moved relatively to the right with sheet 44 so that the patient will be moved onto the crawler 33 and from the position indicated in Fig. 22 of the drawings to position indicated in Fig. 23 of the drawings as respects the crawler 33. Thereafter the brake 67 is released and power may be applied to the crawler 33 moving the crawler 33 and the patient 134 thereon, from the position shown in Fig. 22 to the position shown in Fig. 23 of the drawings. Thereafter the brake 67 may be applied to hold the crawler in such position shown in Fig. 23 of the drawings and power applied on shaft 59 to wind excess

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canvas on the shaft 59. Instead of moving the crawler 33 and canvas 44 separately as just indicated, canvas 44 can be wound on shaft 59, with the crawler 33 free, and the crawler 33, canvas 44 and the patient will be moved together in the case of heavier weighing patients providing sufficient friction between canvas 44 and crawler 33 so as to move crawler 33 along with canvas 44 and the patient. Then the end portion 135 of canvas belt 44 can be folded alongside of the patient 134, as piled on portion 137 of canvas belt 114. Then the stretcher 27 may be unfastened from the bed 28 by releasing strap means 43 and clamps 109. Next the apron 31 is turned upwardly to the dot-and-dash line position shown in Fig. 4 and the stretcher 27 may be removed from the bed 28. Then the apron 31 can be moved downwardly to the position shown in Fig. 6 of the drawings, and if desired, held in said position by engaging button-like members 99 with the openings 96 in the apron 31.

When a patient is to be returned from the stretcher 27 to a bed 28, hook means 138 carried by end portion 137 of canvas belt 114 are engaging with openings 139 in canvas belt 44. There are a plurality of sets of openings 139 crosswise in the canvas belt 44, one of each set of said openings being shown in Fig. 20. Also there is a set of hooks 138 crosswise of the canvas belt 114. The patient is turned clockwise and on the patient's left side, and such position is held by reason of the canvas belt 114, hooks 138 in said belt 114, openings 139 in belt 44, shaft 59 on which canvas belt 44 is rolled, and brake means 68 holding shaft 59 and parts connected therewith. Also belt 44 has on its end portion 135 a plurality of openings 140. These openings 140 are then engaged with hook means 141 carried by the apron 31 (see also Figs. 4 and 5, as well as Figs. 21 to 26). In such position as shown in Fig. 24 of the drawings the patient is supported by canvas belts 44 and 114 and hence the crawler 33 may be moved by power and moved to the right as respects the showing in Fig. 24 to that shown in Fig. 25. Power is applied to the crawler 33 from the motor 45 in the manner previously indicated. Thus the parts and the patient may have the relative changes in position indicated by the showings between Figs. 24 and 25. Then the brake 68 may be released from shaft 59 so that the canvas belts 44 and 114 can move to the left and move from the positions indicated in Fig. 25 to the positions indicated in Fig. 26. This is accompanied by moving the crawler 33 toward the left and from the position shown in Fig. 25 to the position shown in Fig. 26. Then the canvas belt 44 is unhooked from hook means 141 on apron 31 and the end portion 135 of canvas belt 44 is piled along the left side of the patient 134. Then the hooks 138 of the canvas belt 114 are released from the canvas belt 44 and the end portion 137 of the canvas belt 114 is piled alongside of the left side of the patient, as on the end portion 135 of the canvas belt 44. Next the patient is rolled in a counter-clockwise direction on his back and onto the end portions 135 and 137 of the canvas belts 44 and 114, respectively. Then the canvas belts 44 and 114 are worked out from under the patient after the patient has been rolled approximately 90° and to the position shown in Fig. 22 of the drawings. If desired, the canvas belt 114 may be used in the same manner as indicated in Fig. 21 of the

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drawings to hold the patient on the patient's right side as the stretcher 27 is released from the bed 28 in the reverse manner to which it was applied, and secured to the bed. Thereafter the canvas 114 may be worked out from under the patient so that the patient will rest on the bed 28.

From the foregoing it is obvious that a stretcher of my invention embodies a horizontal deck portion 88 of the stretcher 27. Preferably this horizontal deck portion is part of a wheeled mobile stretcher and of the character described. To such horizontal deck portion an apron 31 is hinged by a hinge, such as a piano type hinge 32. The hinge is preferably of a construction so as to provide a continuous track over which the crawler 33 may travel even though the apron 31 and the deck portion of the stretcher 27 are at an angle to each other. The outer or free edge portion of the apron 31 is adapted to rest upon and preferably be supported by a patient supporting means, as a bed 28, positioned alongside the deck portion of the stretcher 27. A mobile patient supporting member or crawler 33 is provided to support a patient substantially in a horizontal position and said patient supporting member 33 is mounted for traveling movement over the deck portion of the stretcher 27 and over the apron 31. A prime mover 45, as a reversible electric motor, is provided and is connected with the deck portion of the stretcher 27. Control means, as lever 56, is provided to connect the prime mover 45 with the mobile patient supporting means 33 and thus control traveling movement of the mobile patient supporting member 33 over the deck portion of the stretcher 27 and over the apron 31.

Preferably the mobile patient supporting member 33 comprises a plurality of hinged together sections 33(a), 33(b), 33(c) and 33(d) so that the mobile patient supporting means can travel over non-uniform surfaces and at the same time be supported by all of the rollers 92 and 85. Also the apron 31 is preferably provided with depressions 41 so that the outer end of the mobile patient supporting member 33 will depress or be lowered as it reaches the outer edge portion of the apron 31 and thus the difference in elevation between the outer end portions of apron 31 and mobile patient supporting member 33, when they are adjacent each other, is reduced to a minimum.

Preferably brake means 67 are connected with shaft 58 and thus in turn with mobile patient supporting member 33 so that said patient supporting member 33 is held at a desired position. Preferably the means to interconnect the mobile patient supporting member 33 and a prime mover, as electric motor 45, comprises a driven shaft 58 which is connected with said prime mover by suitable means, and cable means which may be in the nature of steel tapes 61 and 65 which are reeved in opposite directions around drums carried by shaft 58. The said steel tapes 61 and 65 are connected with opposite edge portions of the mobile patient supporting member 33 as by laterally spaced brackets 63.

Preferably anti-friction means are disposed between the patient supporting member 33 and the surface of apron 31, as well as between said mobile patient supporting member and the deck portion of a stretcher 27. These anti-friction bearing means are illustrated by rollers 92, 85, 86 and 87, rollers 87 being disposed on vertical axes and thus limiting relative endwise movement of the mobile supporting member 33.

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My invention also utilizes a traveling patient supporting belt, as canvas sheet 44, which is wound about shaft 59 and said shaft 59, in turn, is selectively connectible with the prime mover 45. Preferably brake means 68 are provided to secure shaft 58 in any desired angular position which, in turn, secures canvas sheet 44 against traveling movement in one direction.

Preferably the prime mover 45 will provide selective angular movements in opposite directions which may be accomplished by providing a reversible electric motor 45. Thus the mobile patient supporting member 33 may be driven in either direction while the patient supporting belt 44 need only be driven in one direction. While the shaft 59 carrying the patient supporting belt 44 may be driven in either direction as desired, a drive in one desired direction has been found satisfactory.

Preferably the outer and free end portion of the apron 31 is of concavo-convex shape in longitudinal section as this provides for a more uniform fit between the apron 31 and a bed having a mattress and springs thereon, such as bed 28. When the outer edge of the apron 31 is of such concavo-convex shape (best illustrated in Fig. 12 of the drawings), preferably means are provided to detachably connect such outer end portion of the apron with the stretcher when the apron is hanging in substantially vertical position, as is best shown in Fig. 6 of the drawings. This means comprises button-like members 99 which interfit with keyhole slots or openings 96 in the apron 31.

My invention also preferably contemplates a patient supporting belt 114 so that a patient may be held in the various positions illustrated in Figs. 21 to 26 of the drawings and so that a patient may be manipulated in the manner described in connection with said Figs. 21 to 26, by reason of belts 44, 114, and mobile patient supporting member 33. Preferably locking means, as bumpers 108 and clamps 109, are employed so that the stretcher 27 and bed 28 may be secured together when a patient is being manipulated or transferred to or from the stretcher 27.

Obviously changes may be made in the forms, dimensions and arrangements of the parts of my invention without departing from the principle thereof, the above setting forth only preferred forms of embodiment of my invention.

I claim:

1. A stretcher comprising a substantially horizontal deck portion; an apron hinged at one edge portion to said deck portion and adapted to have its other and free edge portion rest upon a patient supporting means alongside said deck portion; a mobile patient supporting member for supporting a patient in a horizontal position and mounted for traveling movement over said deck portion and said apron, said mobile patient supporting member comprising a plurality of longitudinally extending hinged together sections, whereby said mobile patient supporting member will follow the contour of the surfaces of said deck portion and of said apron when they are substantially in the same plane; a prime mover and power transmitting means connecting said prime mover with said mobile patient supporting means, thereby to provide driven traveling movement of said mobile patient supporting member over said deck portion and said apron.

2. A stretcher comprising a substantially horizontal deck portion functioning as track means

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for rollers; an apron hinged at one edge portion to said deck portion and adapted to have its outer and free edge portion rest upon a patient supporting means alongside said deck portion, said apron functioning as track means for rollers and having depressed roller track means at its outer edge portion; a mobile patient supporting member for supporting a patient in a horizontal position and having rollers mounted for traveling movement over said deck portion, said apron, and the depressed roller track means in the apron, whereby the mobile patient supporting means has its outer edge portion relatively lowered as it is supported by said depressed track means in the outer edge portion of the apron; a prime mover and power transmitting means connecting said prime mover with said mobile patient supporting means, thereby to provide driven traveling movement of said mobile patient supporting member over said deck portion and said apron.

3. A stretcher comprising a substantially horizontal deck portion; an apron hinged at one edge portion to said deck portion and adapted to have its other and free edge portion rest upon a patient supporting means alongside said deck portion; a mobile patient supporting member for supporting a patient in a horizontal position and mounted for traveling movement over said deck portion and said apron; a prime mover; a driven shaft connected with said prime mover; sheave means connected with said driven shaft; and two cable means connected with said sheave means and reeved in opposite directions thereabout and with the free ends thereof connected with said mobile patient supporting member in laterally spaced locations.

4. A stretcher comprising a substantially horizontal deck portion; an apron hinged at one edge portion to said deck portion and adapted to have its other and free edge portion rest upon a patient supporting means alongside said deck portion; a mobile patient supporting member for supporting a patient in a horizontal position; anti-friction bearing means mounting said mobile patient supporting member for traveling movement over said deck portion and said apron; other anti-friction bearing means disposed between said mobile supporting member and said deck portion and said apron limiting relative endwise movement of said mobile supporting member as respects said deck portion and said apron; a prime mover and power transmitting means connecting said prime mover with said mobile patient supporting means, thereby to provide driven traveling movement of said mobile patient supporting member over said deck portion and said apron.

5. A stretcher comprising a substantially horizontal deck portion; an apron hinged at one edge portion to said deck portion and adapted to have its other and free edge portion rest upon a patient supporting means alongside said deck portion; a mobile patient supporting member for supporting a patient in a horizontal position and mounted for traveling movement over said deck portion and said apron; a prime mover power transmitting means connecting said prime mover and said mobile patient supporting means, thereby to provide driven traveling movement of said mobile patient supporting member over said deck portion and said apron; a belt supporting shaft mounted for rotary movement and connected with and disposed alongside said deck portion at the edge portion opposite to the one edge portion to which said apron is hinged; power transmitting means connecting said belt supporting shaft with

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said prime mover; and a patient supporting belt having one end portion reeved over and connected with said belt supporting shaft and having the other end portion positionable over said mobile patient supporting member.

6. The combination of claim 5 which includes separately operable brake means for said mobile patient supporting member and for said belt supporting shaft.

7. A stretcher comprising a substantially horizontal deck portion; a framework supporting said deck portion; an apron hinged at one edge portion to said deck portion and adapted to have its other and free edge portion rest upon a patient supporting means along side said deck portion and having its said other edge portion of concavo-convex shape in longitudinal section and with the concave surface uppermost; and detachable, securing and bending means connected with said other edge portion of said apron and with said framework so said other edge portion may be bent to lie substantially in a common plane.

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