Nov. 6, 1951 C. F. EATON 2,574,092

APPARATUS FOR INDUCING RESPIRATION BY TILTING

Filed June 23, 1949 2 SHEETS—SHEET 1

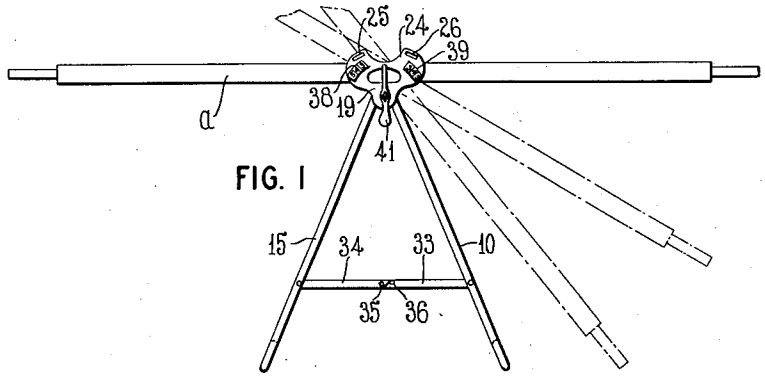

FIG. 1

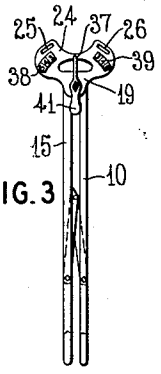

FIG. 3

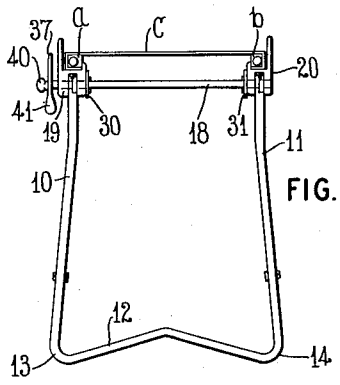

FIG. 2

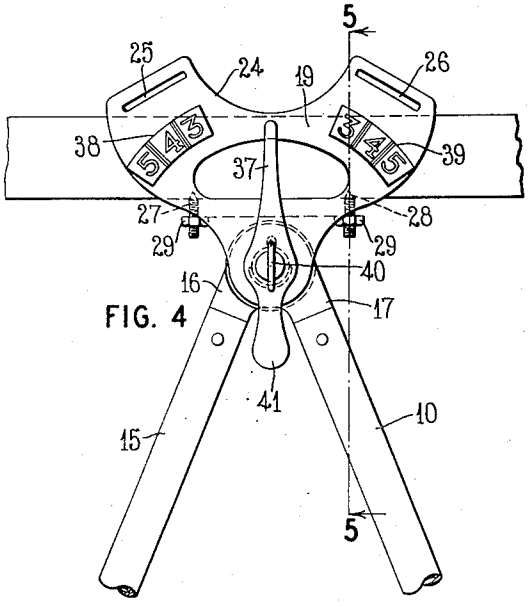

FIG. 4

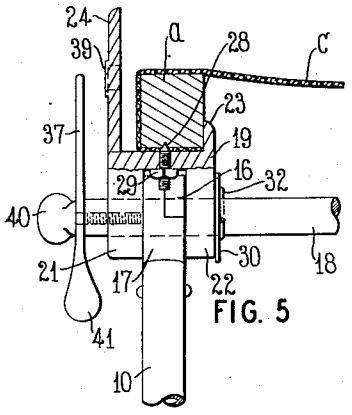

FIG. 5

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FIG. 7

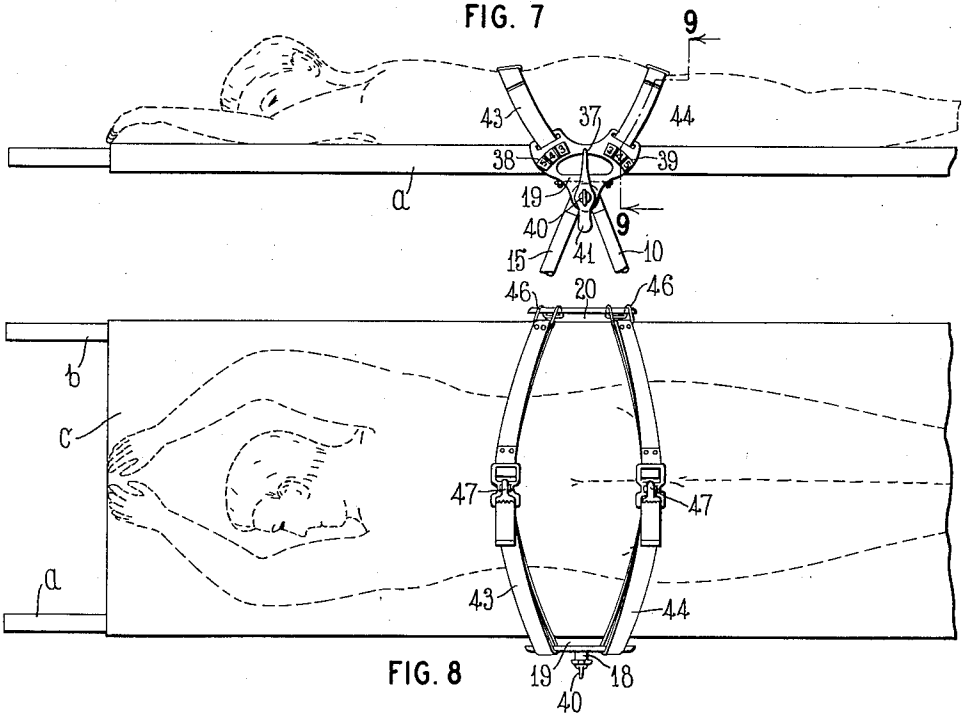

FIG. 8

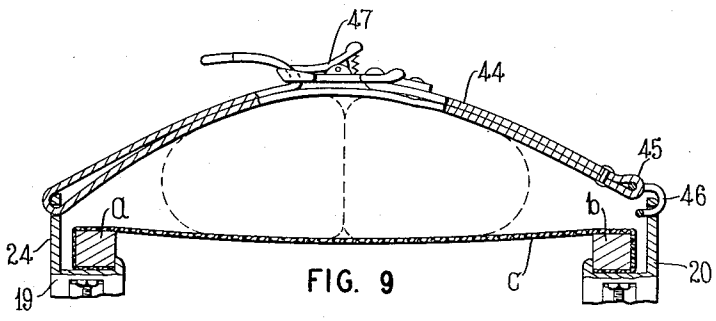

FIG. 9

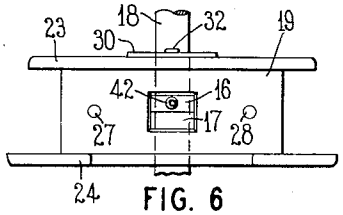

FIG. 6

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APPARATUS FOR INDUCING RESPIRATION BY TILTING

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Application June 23, 1949, Serial No. 100,783

7 Claims. (Cl. 128—28)

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The present invention relates to the procedure for resuscitating persons who are victims of asphyxia (by inhalation of water or gas or otherwise), or shock, according to which the affected person, supported in a prone position, is rocked about a transverse horizontal axis so as to tilt his body alternately head downward and feet downward. In this procedure, the abdominal organs are displaced by gravity toward and away from the chest, pulling and pushing the diaphragm back and forth, thereby expelling water or asphyxiating gases, and causing the lungs to inhale and exhale. At the same time gravity propels the blood in arteries and veins alternately in opposite directions. By rhythmic repetition of such alternate tilting movements at the correct rate (about ten times per minute in each direction), the victim, if living, is induced to breathe naturally and circulation of the blood is restored.

Apparatus heretofore used for this purpose have included stretchers and fulcrum supports. In one type of such apparatus, the fulcrum support is a framework having a wide base and a single cross bar at the top. Conventional collapsible stretchers are used with this support, the side bars of the stretcher extending over the cross bar of the support and being made fast thereto so that they will not slip when the stretcher is tilted at a steep angle. In using that apparatus, the unconscious victim must be lifted a height of three or four feet in order to be placed on the stretcher, which requires the cooperation of three or more people to hold the body straight while lifting it, and to steady the stretcher; and care must be taken to locate the body on the stretcher with its center of gravity as near as possible to the cross bar. When the body is placed on the stretcher the fabric sags under the weight of the body, but the cross bar prevents sagging of the mid length of the stretcher, making a ridge which presses into the abdomen of the person lying on the stretcher and impedes those movements of the organs which produce compression and expansion of the lungs.

Another type of equipment, which is used on boats, includes a basket stretcher to which, at mid length, a cross bar is permanently connected, and the ends of the cross bar are designed to be placed in sockets at the upper ends of two rigid supports which are secured permanently to the deck of the boat. In using it, the victim of drowning is lashed in the stretcher when pulled out of the water and the stretcher is then mounted on the uprights. In that procedure it happens more often than not that the body is placed with its center of gravity at some distance from the cross bar.

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The importance of centering the body as nearly as possible with the fulcrum axis is to insure proper movement of the organs to give maximum results when the body of the victim is tilted in opposite directions, and to avoid excessive fatigue to the operators who, stationed at opposite ends of the stretcher, raise and lower the ends alternately. If the combined weight of the body and stretcher is not evenly balanced, there is an ever present danger that the tilting rhythm will be varied.

One of the objects of this invention is to provide a supporting means with which a stretcher can be connected for tilting movement after the victim of asphyxia or shock has been placed on the stretcher, and with respect to which the stretcher bearing the victim can be readily adjusted so as to bring the center of gravity directly over the fulcrum axis, without disturbing his position on the stretcher. Another object is to furnish a demountable stretcher support which can be stowed away in a small space when not in use and can be erected for emergency use almost instantaneously. A further object is to produce such apparatus at a cost moderate enough to enable units to be procured by municipal police and fire departments, the proprietors and custodians of bathing resorts, camps and other resorts, hospitals, etc. in numbers adequate to meet probable emergencies. Apparatus embodying the invention comprises a portable supporting structure which, in its preferred form, can be collapsed into small compass and instantly expanded for use, and stretcher connectors pivotally connected to such support and having means for receiving the longitudinal side members of a stretcher at any one of a number of points along the length of such side members and securing the stretcher against longitudinal displacement. It further comprises means for rapidly fastening the body of a victim to the stretcher so that it cannot slip when the stretcher is tilted and in such a manner that the circulation is not restricted in any part of the body. It also includes a means for showing when the stretcher applied to the connectors is horizontal and measuring the angles of tilting movement in each direction from the horizontal position.

This application is a continuation in part of my prior now abandoned application filed December 5, 1946, Serial No. 714,350, entitled Demountable Stretcher Support, and my application filed

January 8, 1948, Serial No. 1226, entitled Resuscitation Apparatus.

In the accompanying drawings,

Fig. 1 is a side elevation of the preferred embodiment of the present invention showing the supporting structure and a stretcher in assembled relation;

Fig. 2 is an end view of the same as seen from the right hand side of Fig. 1;

Fig. 3 is a side view of the supporting structure collapsed in condition for stowage;

Fig. 4 is a side elevation of the central portion of the equipment shown in Fig. 1 and depicted on a larger scale;

Fig. 5 is a cross section taken on line 5—5 of Fig. 4;

Fig. 6 is a plan view of the stretcher connector shown in Figs. 4 and 5;

Figs. 7 and 8 are, respectively, a side elevation and a plan view of the combined apparatus showing the position in which a person is placed on the stretcher for resuscitation and means for holding his body thereon;

Fig. 9 is a cross section of the stretcher and body holding means taken on line 9—9 of Fig. 7.

Like reference characters designate the same parts wherever they occur in all the figures.

The supporting structure comprises four legs and an axle rod, on which are pivotally mounted two clips or stretcher connectors. The legs are connected in pairs, each pair being composed of a single length of tubing bent into a form appropriate for the purpose. The legs 10 and 11, shown in Fig. 2, are connected at their lower ends by a cross member 12. These legs and the cross member are formed of a single piece of tubing bent at locations equidistant from the mid length to provide foot portions 13 and 14, between which the cross member 12 extends, and the cross member is bent so that its mid portion is offset upwardly from the line connecting the foot portions. This formation causes the contact of the legs with the ground or a floor to be concentrated at the foot portions 13 and 14 and located at a definite distance apart. The cross member 12 connects the foot portions rigidly, preventing them from spreading apart or being brought nearer together. By reason of its upwardly offset bend it is removed from any such contact with an under surface as to permit sidewise rocking of the structure, but at the same time it is so near to the line of the foot portions that it affords a widening base on soft ground or sand into which the foot portions may sink. Above the bends which form the foot portions 13 and 14, the legs 10 and 11 are inclined slightly toward each other, and near their upper ends are bent so that their end portions are parallel.

The legs of the other pair, one of which is designated 15 in the drawings, and a connecting cross member, are identical with the legs and cross bar formation above described.

In the upper ends of all of the legs are mounted and secured shank portions of eye fittings, two of which are shown at 16 and 17 in Figs. 4 and 5. Such fittings on the corresponding legs of each pair are overlapped so that their eyes are in alinement, and an axle bar 18 is mounted in them.

Two stretcher connectors or clips 19 and 20 are mounted on the axle bar 18 at the opposite ends thereof and in interengaged association with the legs. The connector 19 is shown in detail in Figs. 4, 5 and 6. It is made with a base portion having a flat upper surface and two

depending lugs 21 and 22 separated sufficiently to receive between them the eye fittings on the legs 10 and 15, and perforated to receive the axle. These lugs closely embrace the fittings 16 and 17, but are sufficiently free thereon, and also on the axle, to permit rocking movement of the connector. A lip or inner flange 23 rises from the base of the connector at the inner side thereof and a web or outer flange 24 rises from the base at the outer side of the connector. Such lip and web are parallel to one another and are in planes perpendicular to the axle. They are spaced apart, providing a channel enough wider than the thickness of the side bars of all standard stretchers to receive any such side bar flatwise on the upper surface of the connector base. The web 24 contains slots 25 and 26 which are separated from one another by a distance prescribed by considerations later explained, are located at opposite sides of the median line of the connector (the line perpendicular to the connector base which passes through the pivotal center of the lugs 21 and 22), and are inclined upwardly from their outer ends toward such median line. Spurs 27 and 28 are mounted in the connector base near the opposite ends thereof, being provided by the pointed ends of screws which are threaded through the base so as to be adjustable and are secured by lock nuts 29.

The connector 20 is identical with the connector 19 as thus far described, and is disposed in symmetrically opposite position on the opposite end of the axle 18 with its lugs embracing the end fittings of the leg 11 and the leg corresponding thereto which is united with leg 15.

The parts thus described are assembled by overlapping the end fittings of the two pairs of legs with their eyes in register, placing the connectors 19 and 20 in embracing relation to the pairs of overlapped fittings, and passing the axle rod through the alined holes in the connector lugs and eye fittings. The axle is then secured against endwise displacement by washers 30 and 31 which are placed close against the inner faces of the lugs 22 of the two connectors, and cotter pins 32 passing through holes in the axle close to the respective washers.

Braces are provided to limit the distance to which the legs can spread apart and prevent collapsing of the structure when in use. Such braces are formed by bars 33 and 34 pivoted to the legs 10 and 15, respectively, and a similar pair of bars pivoted to the legs at the opposite side of the structure. The bars are connected together by a pivot 35 equally distant from both points of connection of the bars with the legs; and the bar 34 is formed with an extension which is arranged to bear on the upper side of a stop 36 on bar 33 when the bars are extended in line.

The structure can be collapsed by raising the joint between the bracing bars and bringing the pairs of legs together, as shown in Fig. 3, and can be stowed away in a small space when not in use. It can be erected for use instantaneously by grasping the legs of both pairs and moving them rapidly apart so that the brace bars are extended into their alined and blocked position. and placing the structure upright on the ground or other supporting surface.

Provision is made for defining the vertical with respect to the structure when set up for use and for measuring the angles of tilting movement of the connectors and of a stretcher mounted thereon. Such provision is here em-

bodied in a pointer 37 mounted in radial relation to the axle 18 adjacent to the outer side of the web 24 of the connector 19, and angle indicators 38 and 39 on the outer face of web 24.

The pointer is pivoted coaxially on one end of axle 18, which projects slightly beyond the lug 21 of connector 19, preferably on a clamp screw 40 which enters a tapped hole in the axle. It is provided with a weighted arm 41 at the opposite side of the axis from its indicating arm, which acts as a plumb-bob when the clamp screw is loosened and then locates the indicating arm of the pointer in vertical position. When tightened, the screw holds the pointer vertical, whereby it serves as an index, with respect to which tilting movement of the apparatus can be measured. In order to prevent rotation of the axle, and of the pointer with it, when the connectors are tilted, the axle is clamped to the eye fitting of one of the legs (it is immaterial which one). Fig. 6 shows means for so clamping the axle as a set screw 42 passing through the eye fitting 16 of leg 15. An opening is formed in the bottom of the connector 19 through which the screw is accessible.

The angle indicators are symmetrically disposed angularly at opposite sides of the median line of connector 19 around the pivotal axis thereof. In this illustration they have the form of three trapezoidal raised areas bearing the numbers 3, 4 and 5, respectively, at each side of the median line. The areas on which numeral 3 are applied subtend an angle from 20° to 30° from the vertical, the areas bearing the numeral 4 subtend an angle of 30° to 40°, and those bearing the numeral 5 an angle of 40° to 50°; these being the range of angles through which bodies are tilted in inducing artificial respiration. The butt ends of the screws 27 and 28 are disposed in position to engage the legs 15 and 16, respectively, when the connector has been tilted 50° in either direction, and the screws of the other connector are similarly disposed to engage the legs at the other side of the supporting structure. Thus the inclination in either direction is limited to 50°, which is the greatest allowable inclination when the subject's head is downward, since if tilted to a steeper angle, there is danger that the blood pressure will be increased to such an extent that the victim will remain or become unconscious. But it is desirable at the commencement of the procedure to rock the subject through approximately as large an angle as this for a prescribed period in order to start the compression and expansion of the lungs to the greatest safe degree. Thereafter the angle is reduced to 40°; and in the final stage the rocking angle is not more than 30°.

Each of the raised areas has distinct side edges which can be felt and distinguished by the fingers of an operator. Thus the device can be operated accurately in the dark, if necessary.

It will be understood from the foregoing description that, when the supporting structure has been set up as described, as it can be in a few seconds, a stretcher bearing a person whose breathing has ceased can be placed immediately on the connectors 19 and 20. It may be noted that the width of the structure and length of the axle rod are established with reference to conventional stretchers so that the width between the outer webs of the two connectors is enough greater than the extended width of the stretcher to receive the stretcher between them, and the lips 23 of the two connectors are spaced apart by a distance less than that between the inner faces of the side bars of the stretcher. This relationship is shown by Figs. 1 and 2 where *a* and *b* designate the side bars of a stretcher and *c* designates the fabric body support between them. Fig. 5 shows one of the side bars and a portion of the fabric support.

The stretcher is placed so that the mid length of a person's body is brought over the axle rod and is lowered upon the connectors. The combined weight of stretcher and body causes the spurs 28 of the connectors to penetrate the side members of the stretcher sufficiently to hold them against endwise movement when the stretcher is tilted. The stretcher is additionally forced against the holding spurs, and the superposed body confined so that it cannot shift when tilted, by straps which are engaged with the connectors and pass over the body across the small of the back and across the thighs close to the buttocks. Two straps 43 and 44 are provided for this purpose. Each strap is doubled at a point between mid length and one end to form a loop 45 (Fig. 9) by which a hook 46 is held. The other end of each strap is passed through one of the slots in one of the connectors (for instance, the strap 43 is passed through the slot 25, and the strap 44 through slot 26, of connector 19), in such manner that the mid length portion of the strap is underneath and the ends are above. A spring actuated gripper 47 is secured to the strap end which runs from the loop 45, and the opposite strap end is passed through the gripper in such manner that it can be pulled through to tighten the strap when the hook 26 is engaged with the opposite connector (for example, the connector 20). Both straps are connected semipermanently by means of the parts which pass through the slots 25 and 26 around the adjacent edges of the web 24 of one connector and into engagement with grippers 47; and they are normally detached from, but quickly engageable with, the other connector by means of the hooks 46. The spacing between the slots 25 and 26 of both connectors and their opposite inclinations cause the straps to diverge and then converge in passing across the stretcher. Thus the straps naturally fall into position above and below the buttocks of a person lying prone on the stretcher when, being in slackened condition, they are laid across the body and hooked into the connector at one side. When adequately tightened after being located in place, they securely hold the body against shifting and without applying collapsing pressure to the abdomen. By being applied against the bulge of the body which is formed by the buttocks, and lying in planes which are inclined to the length of the stretcher, the one that is lowered when the stretcher is tilted, is effective immediately to resist displacement of the body. The spacing apart of the strap slots in each connector is established so that the above described disposition of the straps will occur with persons of small stature; while the capacity for elongation of the straps enables them to be similarly engaged with the tallest persons.

While apparatus having the characteristics here described can be made of various dimensions, I may remark that the one here illustrated is designed to take stretchers six feet and a half long between the tips of their handles and one foot ten inches wide, and the height of the axis on which the connectors rock is 30 inches above the base plane of the extended legs. The connectors are

dimensioned to hold the top of the structure about three inches above that axis. This height is greater than possible sagging of the fabric of a stretcher and avoids possibility of the abdomen of the occupant being indented by the axle rod. With these characteristics, a stretcher of the length indicated, when placed exactly central over the axle, can be tilted in either direction to an angle of about 45° before the handle ends reach the ground.

What I claim is:

1. An apparatus for inducing respiration comprising a supporting structure and two stretcher connectors pivotally mounted on said structure coaxially and spaced apart from one another, each of said connectors having a channel extending transversely of the pivot axis adapted to receive separably a longitudinal element of a stretcher and having a pointed spur rising from the bottom of its channel arranged to indent such longitudinal element to prevent lengthwise slip thereof relative to the connector.

2. An apparatus for inducing respiration comprising a supporting structure and two stretcher connectors pivotally mounted on said structure coaxially and spaced apart from one another, each of said connectors having a channel extending transversely of the pivot axis adapted to receive separably a longitudinal element of a stretcher, and screws mounted in the connector at opposite sides of a line passing through its pivot axis perpendicular to the bottom of the channel therein, said screws having pointed ends protruding above the channel bottom for indenting engagement with a stretcher element and arranged to engage the supporting structure when the connector is rocked about its pivot axis whereby to limit the extent of rocking movement of the connector.

3. In apparatus of the character described, a supporting structure comprising two pairs of legs and cross bars connecting the lower ends of the legs of each pair, the upper ends of the legs having eyes and those of corresponding legs of each pair being overlapped, an axle extending through the eyes of the overlapped legs, and connectors pivotally mounted on said axle, each connector having lugs embracing the overlapped eyes of two of the legs and surrounding the axle, and having provisions for making supporting engagement with a longitudinal side element of a stretcher.

4. In apparatus of the character described, a supporting structure comprising two pairs of legs and cross bars connecting the lower ends of the legs of each pair, the upper ends of the legs having eyes and those of corresponding legs of each pair being overlapped, an axle extending through the eyes of the overlapped legs, connectors pivotally mounted on said axle, each connector having lugs embracing the overlapped eyes of two of the legs and surrounding the axle, and having provisions for making supporting engagement with a longitudinal side element of a stretcher, and a pointer mounted on one end of the axle adjacent to the outer side of one of the connectors, the adjacent connector having angle indicators for measuring rocking movements thereof.

5. In apparatus of the character described, a supporting structure comprising two pairs of legs and cross bars connecting the lower ends of the legs of each pair, the upper ends of the legs having eyes and those of corresponding legs of each pair being overlapped, an axle extending through the eyes of the overlapped legs, brace bars pivoted to corresponding legs of both pairs and pivotally connected to one another at a point equidistant from their connections with the respective legs, said brace bars having interengaging means to prevent displacement downward from their alined position, and stretcher connectors mounted on the axle to rock about the same, each connector having lugs embracing the overlapping ends of two of the legs and having provisions for engagement with a structural side member of a stretcher.

6. In apparatus of the class described, a supporting structure comprising two pairs of legs and cross-bars connecting the lower ends of the legs of each pair, each said cross-bar being shaped to be at a higher level than the lower ends of the legs, the upper ends of the legs having eyes and those of corresponding legs being overlapped, an axle extending through all said eyes, and connectors pivotally mounted on said axle, each said connector having a top channel to receive a side bar of a stretcher.

7. In apparatus of the class described, a supporting structure comprising two pairs of legs and cross-bars connecting the lower ends of the legs of each pair, the upper ends of the legs having eyes and those of corresponding legs being overlapped, an axle extending through all said eyes, connectors pivotally mounted on said axle, each said connector having a top channel to receive a side bar of a stretcher, and means on said axle adjacent to the inner surfaces of said connectors to prevent axial displacement of the axle.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,499,242	Fleming	Feb. 28, 1950

FOREIGN PATENTS

Number	Country	Date
405,065	Great Britain	Feb. 1, 1934