March 21, 1950 D. A. NEELY 2,501,001

LINKAGE MECHANISM WITH TWO LIFTING PHASES

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Fig. 1.

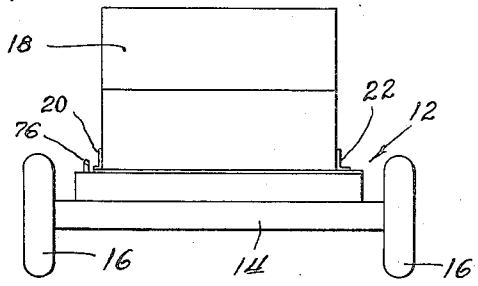


Fig. 2.

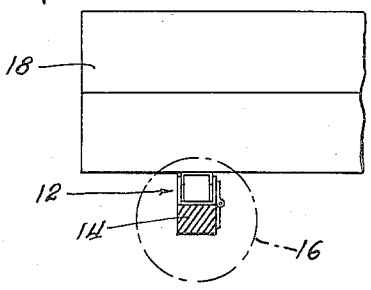


Fig. 6.

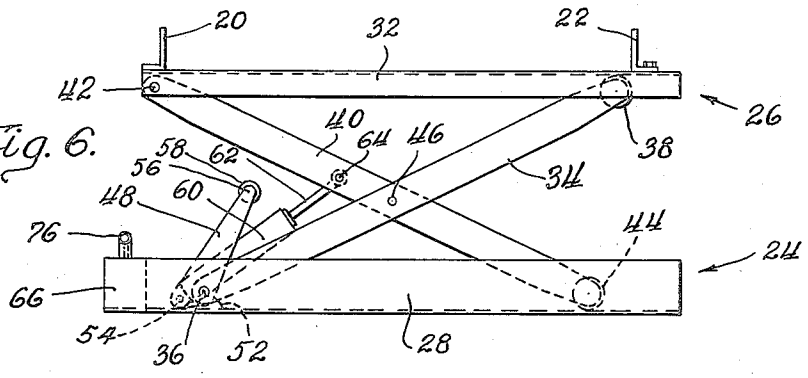


Fig. 5.

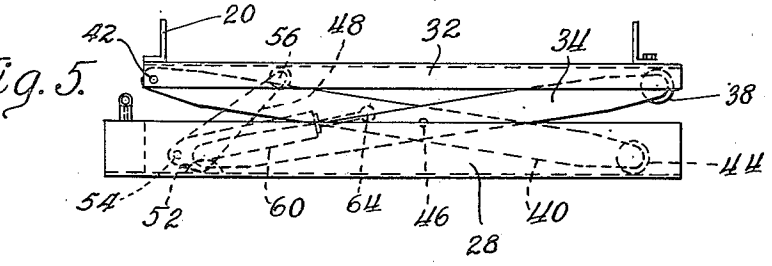
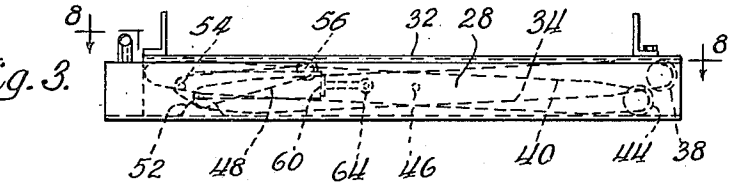


Fig. 3.



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Fig. 8.

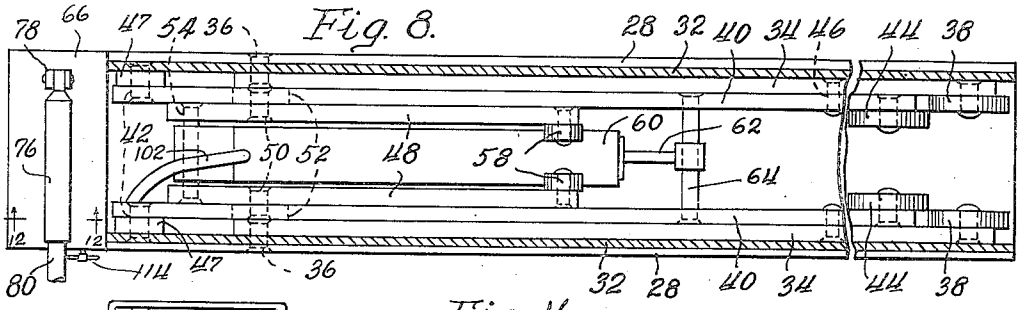


Fig. 4.

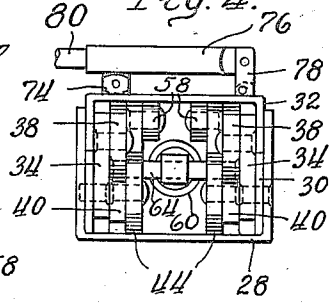


Fig. 7.

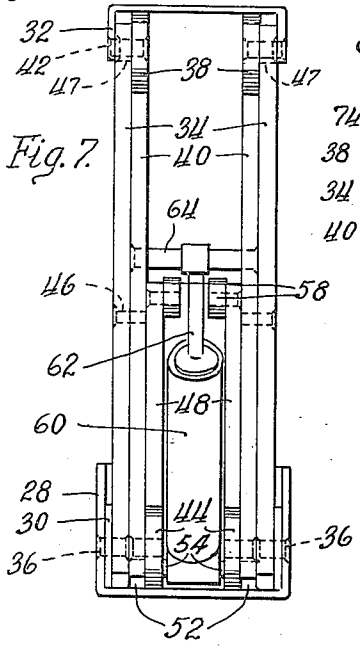


Fig. 9.

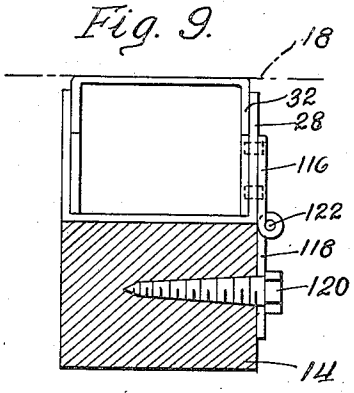


Fig. 10.

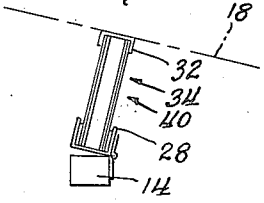


Fig. 11.

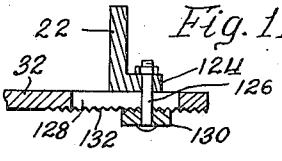


Fig. 12.

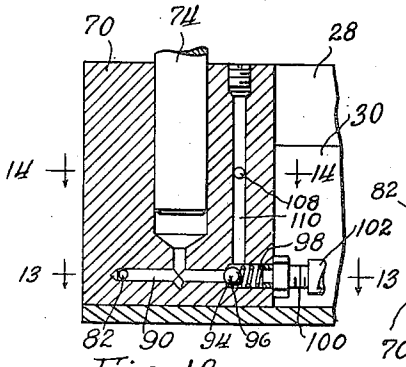


Fig. 13.

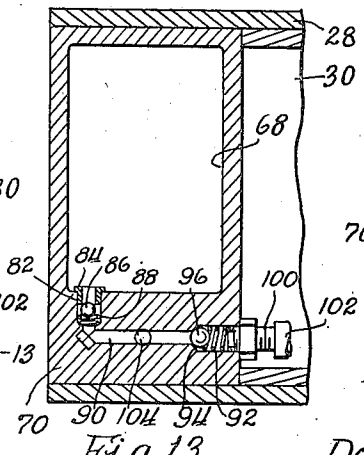
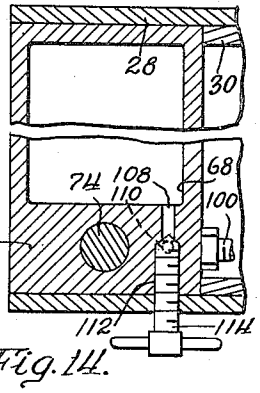


Fig. 14.



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LINKAGE MECHANISM WITH TWO LIFTING PHASES

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Application February 10, 1947, Serial No. 727,701

10 Claims. (Cl. 254—122)

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This invention relates to jacks or hoists for elevating the load carrying box of a wagon or truck.

The device of the present invention can be applied to an existing vehicle, or built in the original construction of the vehicle.

The device replaces the usual bolster, resting directly on the axle of the vehicle and supporting the load carrying box.

An object of the present invention is the provision of such a device which has a wide range of extension.

Another object of the invention is the provision of such a device which is small and compact when collapsed.

A further object is the provision of such a device which is made up of simple and rugged parts, and which when finished is simple in assembly and in operation.

A further object is the provision of a jack as described above which is made up of two channel shaped pieces having their open sides facing each other, and extendible links interconnecting the beams. When collapsed one of the beams fits almost entirely in the other, and the extendible links are in the confines of the two channel shaped beams.

An additional object is the provision of a hydraulic ram for operating the extendible links.

A still further object is the provision of a hydraulic pump and reservoir built in one of the channel shaped beams for operating the hydraulic ram. Such pump and reservoir is small and compact and contained within the confines of one of the channel shaped beams.

A still further object of the invention is the provision of a simple jack in which, when collapsed, the parts of the jack rest solidly within one another and form a solid support for the load carrying box of the vehicle.

When the device is collapsed the extendible links or levers within the channel shaped beams are of course disposed toward the horizontal in the device. In such a position it is difficult to provide an arrangement for initiating the spreading movement of the beams due to the horizontal disposition of the parts. To overcome this difficulty I provide a pair of levers having a point of reaction offset with respect to the pivot point of the levers through which the hydraulic ram acts. The initial operation of the rams turns such levers about their pivots, swinging the levers to engage one of the beams, to initiate the spreading action.

With these and other objects in view, my invention consists in the construction, arrangement

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and combination of the various parts of my device whereby the objects contemplated are attained as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawings wherein:

Figure 1 is an end view of a wagon employing the jack of the present invention;

Figure 2 is a side view of Figure 1;

Figure 3 is a side view of the jack shown in collapsed position;

Figure 4 is an enlarged view taken from the right of Figure 3;

Figure 5 is a side view of the device when partially extended, showing the operation of the spreading links;

Figure 6 is a side view of the device showing it in a further extended position;

Figure 7 is a view on an enlarged scale taken from the right of Figure 6;

Figure 8 is a plan view of the device with a portion of the upper beam removed, taken substantially on line 8—8 of Figure 3;

Figure 9 is an enlarged end view of the jack and vehicle axle showing the means of securing the jack to the axle;

Figure 10 is a semi-diagrammatic view showing the position of the jack when the wagon box is elevated;

Figure 11 is a detailed sectional view of a portion of the upper beam of the jack showing the means of adjusting one of the stop means for retaining the wagon box in position laterally;

Figure 12 is a sectional view taken approximately on the line 12—12 of Figure 8;

Figure 13 is a sectional view taken on line 13—13 of Figure 12; and

Figure 14 is a sectional view taken on the line 14—14 of Figure 12.

Referring now in detail to the drawings, Figures 1 and 2 show the jack of the present invention applied to a wagon. The jack is shown as a whole at 12, supported on the front axle 14 of the wagon, the wheels of which are indicated at 16. The jack is shown affixed to the axle and supports the wagon box 18 thereon. Stop means 20 and 22 are secured to the upper surface of the jack as viewed in Figure 1, for positioning the wagon box in position laterally. Such stop means will be referred to in detail later.

The jack proper includes a lower beam 24 and an upper beam 26. Both the beams 24 and 26 are channel shaped in cross-section, having their open sides facing each other. The channel formation of the lower beam 24 may be seen in Figures 4 and 7 where the numeral 28 indicates

a channel shaped member having spacers 30 positioned at the bottom of the inner surfaces, on each side thereof. Such spacers 30 extend a little above the center of the legs of the channel 28; and extend throughout the full length of the channel 28. The channel of the upper beam 26 is indicated at 32, which by reference to Figures 4 and 7, it will be noted is of a lesser depth than the channel 28. The channel 32 is also of lesser width and is adapted to fit within the channel 28 and rest on the spacers 30 as indicated in Figure 4. The web or upper surface of the channel 32 extends slightly above the upper edge of the channel 26 when the jack is in collapsed position.

The means for spreading the beams 24 and 26 includes a pair of links 34 pivoted at 36 in the lower channel 24, toward the left end thereof as viewed in Figures 3, 5, and 6, one on either side of the channel. Pivots for the links 34 may extend through the spacers 30 and the legs of the channel 28. The opposite ends of the links 34 are provided with rollers 38. The rollers are placed on the inner side of the links 34 so that the swinging ends of the links 34 are disposed adjacent the legs of the channel 32 of the upper beam.

A second pair of links 40 are pivoted at 42 in the legs of the channel 32 toward the left end thereof as viewed in Figures 3, 5, and 6. The opposite ends of the lever 40 are provided with rollers 44. These rollers 44 are also on the inner sides of the links 40, and are disposed to engage the web of the lower channel 28. The links 40 are disposed on the inner side of the links 34, and the two pairs of links 34 and 40 are pivoted at 46. Spacers 47 are interposed between the links 40 and the legs of the channel 32 at the pivot points of the links, to accommodate the thickness of the outer pair of levers 34.

A pair of spreading lever arms 48 are pivoted in brackets 52 secured in the lower channel 28. The spreading levers 48 are provided with a connecting point 54 offset with respect to the pivot point 50. Rollers 58 are secured to the extended ends 56 of the lever arms. The spreading levers 48 therefore are in effect bell cranks.

The brackets 52 may be welded in the bottom of the channel 28 at any convenient point toward the left end of the device, as viewed in Figure 6.

A hydraulic ram 60 is secured at one end in the levers 48 at the points 54. The plunger 62 is operably connected to a cross pin 64 secured in the inner links 40.

It will be noted that the lower beam 24 is longer than the upper beam 26, the lower beam having an extension 66 at the left. Formed in the extension 66 is a hydraulic pump and reservoir for actuating the hydraulic ram 60. The hydraulic mechanism just referred to is preferably a small and compact arrangement fitted in the channel 28 and contained within the confines thereof. Such mechanism includes an integral block as shown in Figures 12, 13 and 14, secured within the channel 28 of the lower beam 24. The block contains a cell 68 serving as a hydraulic reservoir, and a thickened wall 70 at one end thereof. Formed in the wall 70 is a vertical bore 72 and a plunger or piston 74 operable in the bore. The plunger 74 extends upwardly out of the block and is operable by a tubular handle 76 pivoted on a swinging link 78. A longer extension handle 80 may be inserted in the tubular member 76 for gaining greater leverage. A bore 82 is formed in the wall 70 and is provided with a screw plug

84 having a central opening therein. Disposed inwardly of the screw plug 84 is a ball valve 86 biased outwardly by a spring 88. A passage 90 leads from the bore 82 and connects with a second enlarged bore 92 which forms a valve seat 94 with the passage 90. A ball valve 96 is positioned in the bore 92 and is pressed inwardly by a spring 98. The spring 98 is held in place by a nipple 100 threaded in the bore 92 and extending out of the block. A hose or other flexible connection 102 leads from the nipple 100 to the hydraulic ram 60. A bore 104 leads from the bore 92 into the piston cylinder 72. By actuation of the piston or plunger 74 oil is pumped from the reservoir 68 into the hydraulic ram 60.

A relief valve is supplied for permitting the hydraulic ram to collapse. Extending upwardly from the bore 92 is a bore 110 at the upper end of which is a horizontal bore 108 leading to the reservoir 68. A horizontal screw threaded opening 112 is formed in the wall 70 coaxially with the bore 108 and provided with a screw plug 114. By turning the screw plug 114 outwardly oil is permitted to return to the reservoir 68 and permit the hydraulic ram to collapse under the pressure of the load on the hydraulic ram.

The means for securing the jack to the axle of the wagon is shown in Figures 9 and 10. A hinge element 116 is secured to the channel 28 by welding or other suitable means, and a second hinge element 118 is secured to the axle of the wagon by means of screws 120. The two hinge parts are pivoted at 122. The level of the wagon box 16 is shown in Figures 9 and 10 diagrammatically. When the wagon box is in lowered position it is of course horizontal, and the jack rests solidly on the axle 14 as indicated in Figure 9. As the front end of the wagon box is raised, it assumes an angle with respect to the axle as indicated in Figure 10, and therefore means must be provided to accommodate this angularity. By means of the hinge elements 116 and 118 the jack as a whole is permitted to tip backwardly to accommodate the angular disposition of the wagon box. The hinge means is of course of heavy construction to support the load.

The wagon box is secured in place laterally by means of the stop means 20 and 22. The stop means 22 is made adjustable to accommodate slightly different sizes in wagon boxes. The stop means 22 includes a lower horizontal leg 124 (see Figure 11) adapted to rest on the upper surface of the channel 32. A bolt 126 is inserted through the leg 124 and through a slot 128 in the channel 32. A block 130 is also fitted on the inner surface of the web of the channel 32, and the block 130 and the under surface of the web of the channel are provided with cooperating teeth 132 extending transversely of the channel. The block 130 secures the stop means 122 in position when the bolt 126 is tightened.

When the device is collapsed, as shown in Figure 3, the operating parts for extending the jack are disposed in a position toward the horizontal. It will be noted however that the pivot point 64 is disposed above the pivot point 46. In initially elevating the jack, as the hydraulic ram 60 is extended the thrust of the ram operates through the pivot points 54 on the arms 48, rocking the arms 48 about their pivots 50 and swinging the opposite ends 56 upwardly. This upward movement of the swinging ends of the arms 48 starts the spreading operation of the beams 24 and 26 of the device. Figure 5 shows

the beams partially spread and still being activated by the spreading arms 48. When the upper beam 26 reaches the point at which the arms 48 no longer engage it, the plunger 60 of the hydraulic ram acts directly on the links, and continues the spreading operation. At this point the spreading arms 48 are rotated to such a point that the offset pivots 54 engage the bottom surface of the channel 28 and furnish a solid point of reaction for the action of the hydraulic arm.

The pivot point 64 is disposed quite close to the hydraulic ram 60 so that when the ram 60 is extended the links 34 and 40 can be extended to a great height, resulting in an unusual range of lift of the jack.

When the jack is collapsed there is no need for any of the operating parts to sustain the weight of the load, since the legs of the channel 32 rest solidly on the spacers 30. All of the operating parts are contained within the confines of the two channel members 28 and 32 and form a compact device. The hydraulic pump and reservoir are also contained within the confines of the channel 28. It will therefore be seen that the whole device is simple and plain and all arranged within a compact space.

While I have herein shown and described a preferred embodiment of my invention, manifestly it is susceptible of modification and rearrangement of the parts without departing from the spirit and scope thereof. I do not, therefore, wish to be understood as limiting my invention to the precise form herein disclosed, except as I may be so limited by the appended claims.

I claim as my invention:

1. In a device of the class described, the combination comprising, a pair of parallel beams, a pair of scissors links pivoted together intermediate their ends and each having one end pivoted to one of said beams, the opposite ends of said links having bearing engagement with the opposite beams, a lever arm pivoted on one of said beams and engageable with the other beam, said lever arm having a connection point offset with respect to its pivot point, extending means interconnecting one of said links and said connection point of said lever arm, said extending means, when extended, swinging said lever arm in a direction to spread said beams, and means for actuating said extending means.

2. In a device of the class described, the combination comprising, a pair of parallel beams, a pair of scissors links pivoted together intermediate their ends and each having one end pivoted to one of said beams, the opposite ends of said links having bearing engagement with the opposite beams, a lever arm pivoted on one of said beams and engageable with the other beam, extending means interconnected between said lever arm and one of said links, said extending means, in its initial extending movement, actuating said lever arm for initially spreading said beams, said extending means on continued extension thereof reacting directly between its connected link and the beam to which said lever arm is pivoted for continued spreading of said beams, and means for actuating said extending means.

3. In a device of the class described, the combination comprising, a pair of parallel beams, a pair of scissors links pivoted together intermediate their ends and each having one end pivoted to one of said beams, the opposite ends of said links having bearing engagement with the opposite beam, a lever arm pivoted on one of said beams and engageable with the other beam, said lever arm having a connection point offset with respect to its pivot point, extending means interconnecting one of said links and said connection point of said lever arm, said extending means, when extended, swinging said lever arm in a direction to spread said beams, means limiting the extent of swinging of said lever arm, and means for actuating said extending means.

4. In a device of the class described, the combination comprising, a pair of parallel beams, a pair of scissors links pivoted together intermediate their ends and each having one end pivoted to one of said beams, the opposite ends of said links having bearing engagement with the opposite beam, a generally triangularly shaped lever arm pivoted to one of said beams, said lever arm having a connection point offset with relation to the pivot point of the lever arm and a roller in the extended end of the lever arm, said roller adapted to engage the opposite beam, extending means interconnecting one of said links and said connection point of said lever arm, said extending means, when extended, swinging said lever arm about its pivot point in a direction so that said roller engages the opposite beam and thereby spreads the beams, and means for actuating said extending means.

5. In a device of the class described, the combination comprising, a pair of parallel beams, a pair of scissors links pivoted together intermediate their ends and each having one end pivoted to one of said beams, the opposite ends of said links having bearing engagement with the opposite beam, a bell crank connected to one of said beams and having one arm thereof engageable with the other beam, extending means interconnecting said links and the other arm of said bell crank, said extending means, upon initial extension thereof, operating said bell crank for initial spreading said beams, and upon further extension thereof reacting directly through said links and the beam supporting said bell crank for extension of said links and further spreading said beams, and means for actuating said extending means.

6. In a device of the class described, the combination comprising, a pair of horizontal superposed beams, said beams being channel-shaped with their open sides facing each other, a pair of scissors links pivoted together intermediate their ends and each having one end pivoted to one of said beams within the confines thereof, the opposite ends of said links having rollers mounted therein, said rollers adapted to engage and travel in the inner surface of respective beams opposite their pivot points, said links in collapsed position resting substantially horizontally in the lower one of said beams, a lever arm pivoted in the lower one of said beams and having its free end engageable with the opposite beam, said lever arm having a connection point offset relative to the pivot point thereof, and operating means interconnecting said links and said connection point of said lever arm, said operating means being adapted to swing said lever arm and raise the upper one of said beams, said lever arm and operating means being within the vertical limits of said links when the latter are in collapsed position.

7. In a device of the class described, the combination comprising, a pair of horizontal superposed beams, said beams being channel-shaped with their open sides facing each other, a pair

of scissors links pivoted together intermediate their ends and each having one end pivoted to one of said beams within the confines thereof, the opposite ends of said links having rollers mounted therein, said rollers adapted to engage and travel in the inner surface of respective beams opposite their pivot points, said links in collapsed position resting substantially horizontally in the lower one of said beams, a lever arm pivoted in the lower one of said beams and having its free end engageable with the opposite beam, said lever arm having a connection point offset relative to the pivot point thereof, a hydraulic ram interconnecting said links and the connection point of said lever arm, said ram on actuation thereof being adapted to swing said lever arm and raise the upper one of said beams, said lever arm and hydraulic ram being within the vertical limits of said links when the latter are in collapsed position, the lower one of said beams having a portion extending longitudinally beyond the upper beam, and a hydraulic pump and reservoir formed in said extending portion for actuation of said ram.

8. In a device of the class described, the combination comprising a pair of parallel beams, a pair of scissors links pivoted together intermediate their ends and each having one end pivoted to one of said beams, the opposite end of each link having bearing engagement with the beam opposite that to which the link is pivoted, said links and beams adapted to move from collapsed to extended positions, a bell crank pivoted in one of said beams, extending means pivotally connected to one of the extended ends of said bell crank and to said links, the other extended end of said bell crank being adapted to engage the beam opposite that to which the bell crank is pivoted, said extending means and said links lying substantially horizontally when said links are collapsed, said extending means being adapted to exert thrust substantially in a horizontal direction when in said horizontal position.

9. In a device of the class described, the combination comprising a pair of horizontal superposed beams, said beams being channel-shaped with their open sides facing each other, a pair of scissors links pivoted together intermediate their ends and each having one end pivoted to one of said beams, the opposite ends of said links having bearing engagement with the opposite beam, said links and beams adapted to be moved from collapsed to extended positions, said beams being substantially telescoped and collapsed, a bell crank pivoted in one of said beams, said bell crank having a relatively long and a short arm, the long arm of said bell crank being substantially longer than the vertical height of said beams when the latter are collapsed, and extending means pivotally connected to the short arm of said bell crank and to said links, said links, extending means and the long arm of said bell crank all lying substantially horizontally when said beams are collapsed and lying within the confines of said telescoped beams.

10. In a device of the class described, the combination comprising a pair of parallel beams, a pair of scissors links pivoted together intermediate their ends and each having one end pivoted to one of said beams, the opposite end of each link having bearing engagement with the beam opposite that to which the link is pivoted, said links and beams being adapted to move from collapsed to extended positions, extending means, movable thrust converting means mounted on one of said beams, said extending means being interconnected between said thrust converting means and said links and operable to extend said links and thereby said beams, said extending means and said links lying substantially horizontally when said links are collapsed and being inclined from horizontal position when extended, said extending means being adapted to exert thrust substantially horizontally when in said horizontal position, said thrust converting means being adapted to receive thrust substantially horizontally from said extending means in the initial movement of the latter from horizontal position and transmit said thrust vertically between the beams.

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