

May 24, 1960

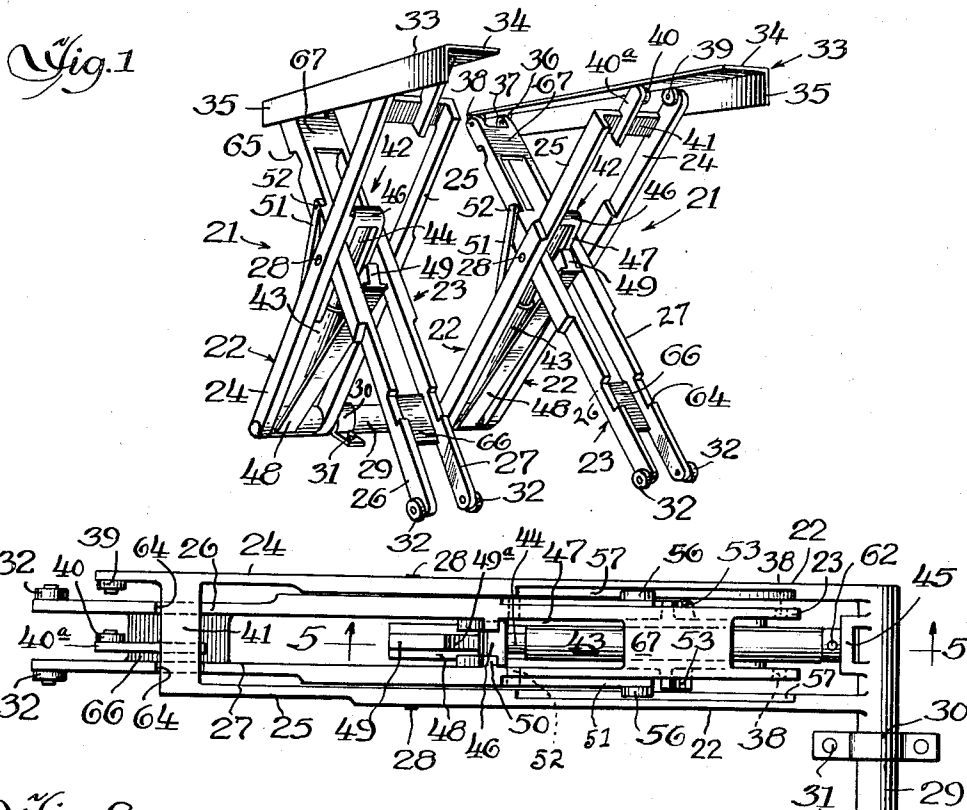
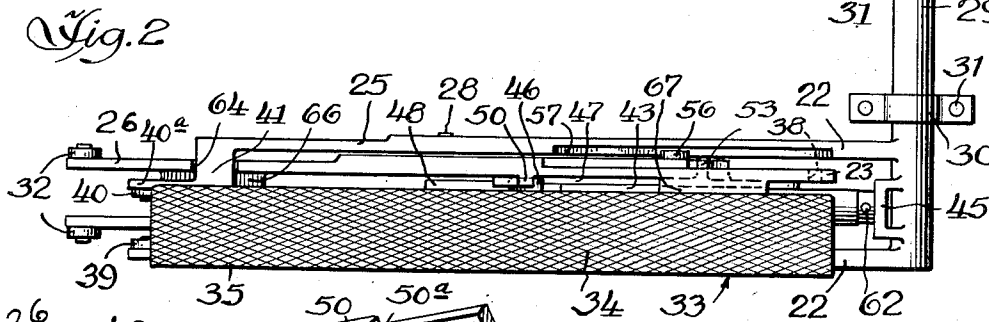
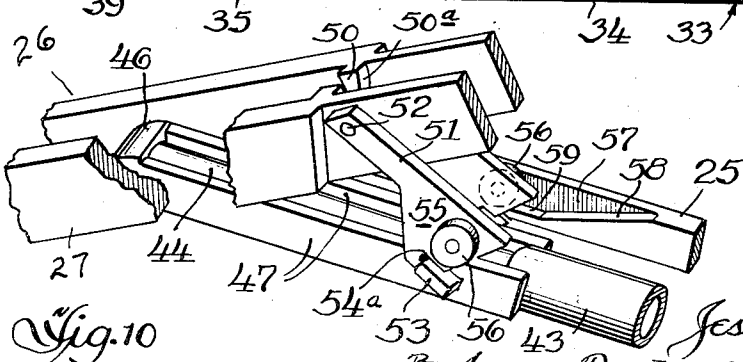
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2,937,852

LIFT DEVICE

Filed Oct. 29, 1956

5 Sheets-Sheet 1



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May 24, 1960

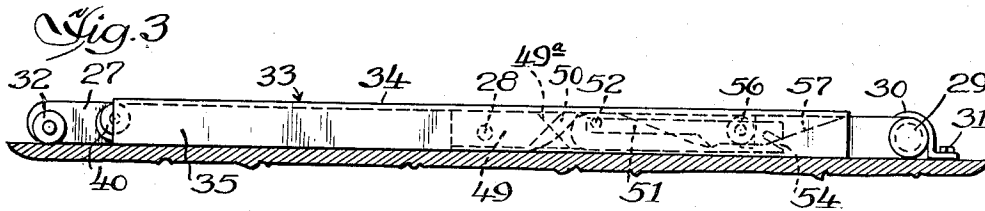
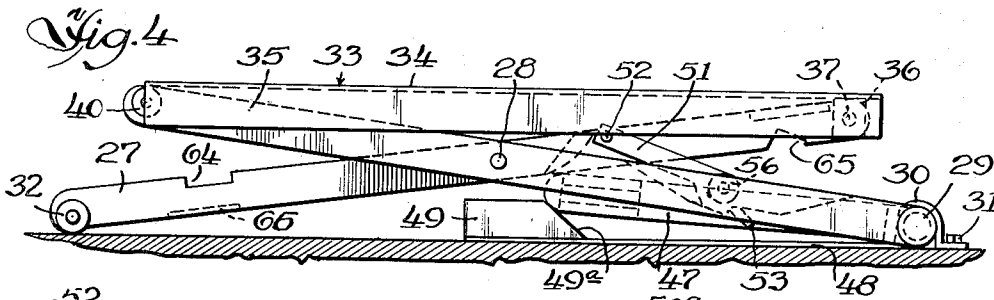
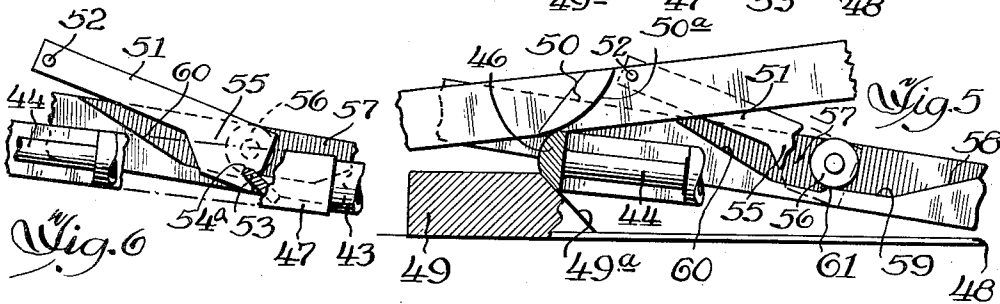
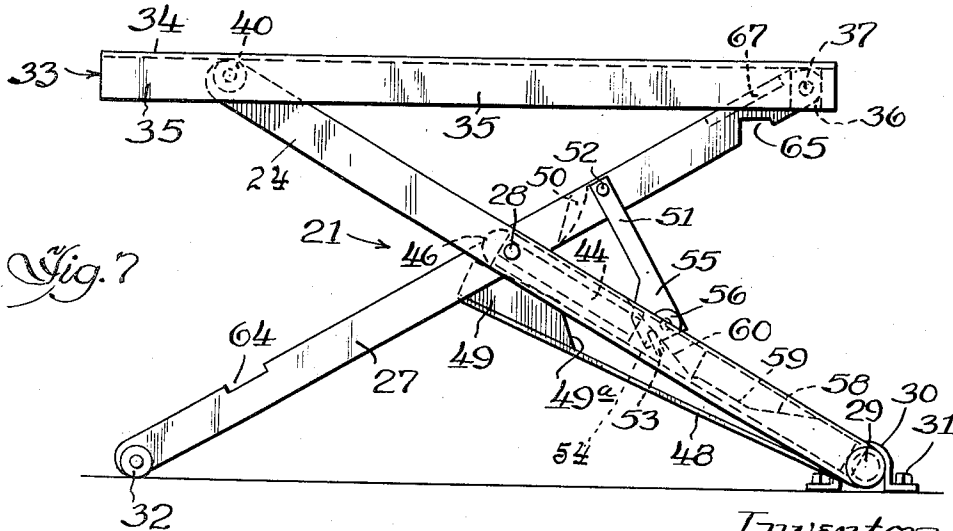
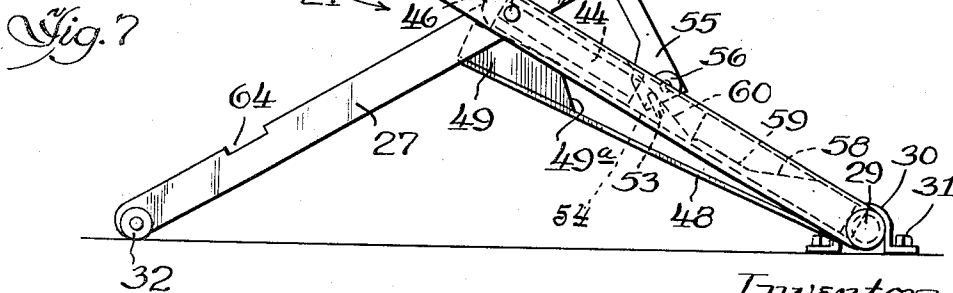
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LIFT DEVICE

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5 Sheets-Sheet 2



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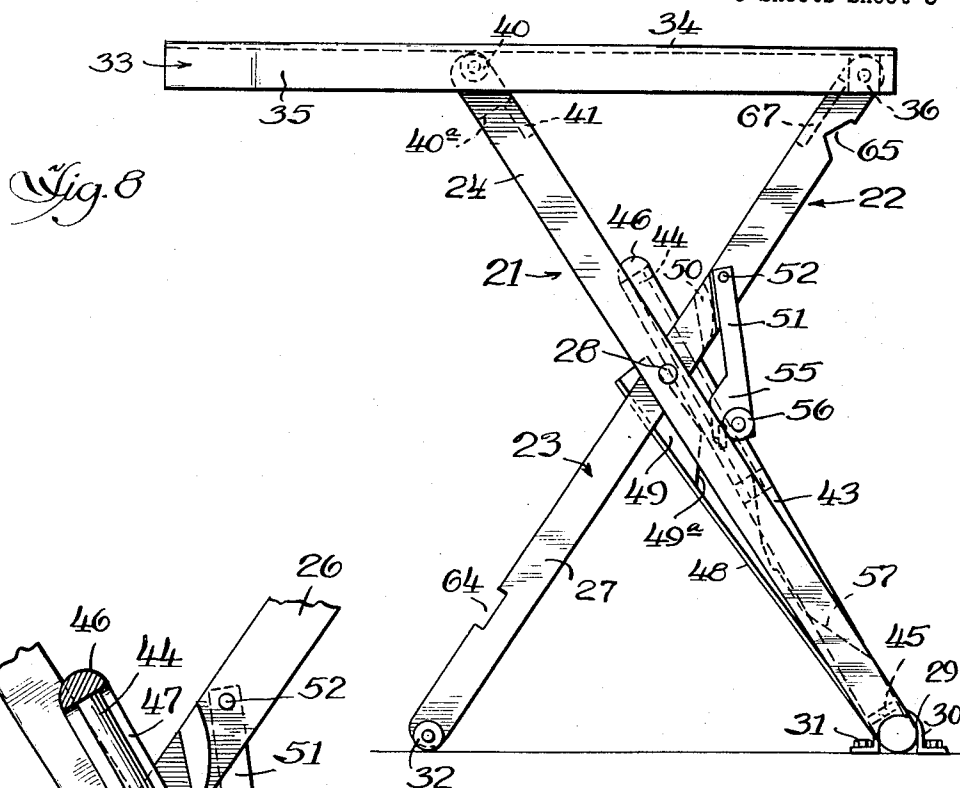
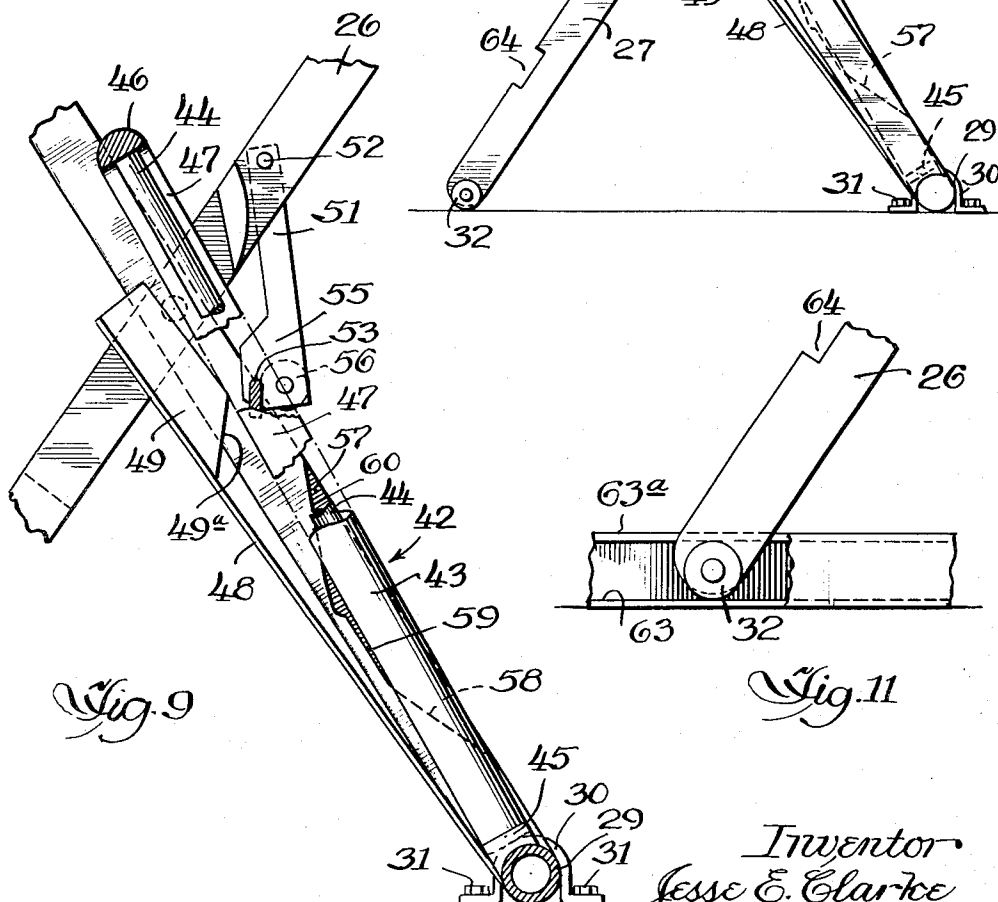
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LIFT DEVICE

2,937,852

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5 Sheets-Sheet 3




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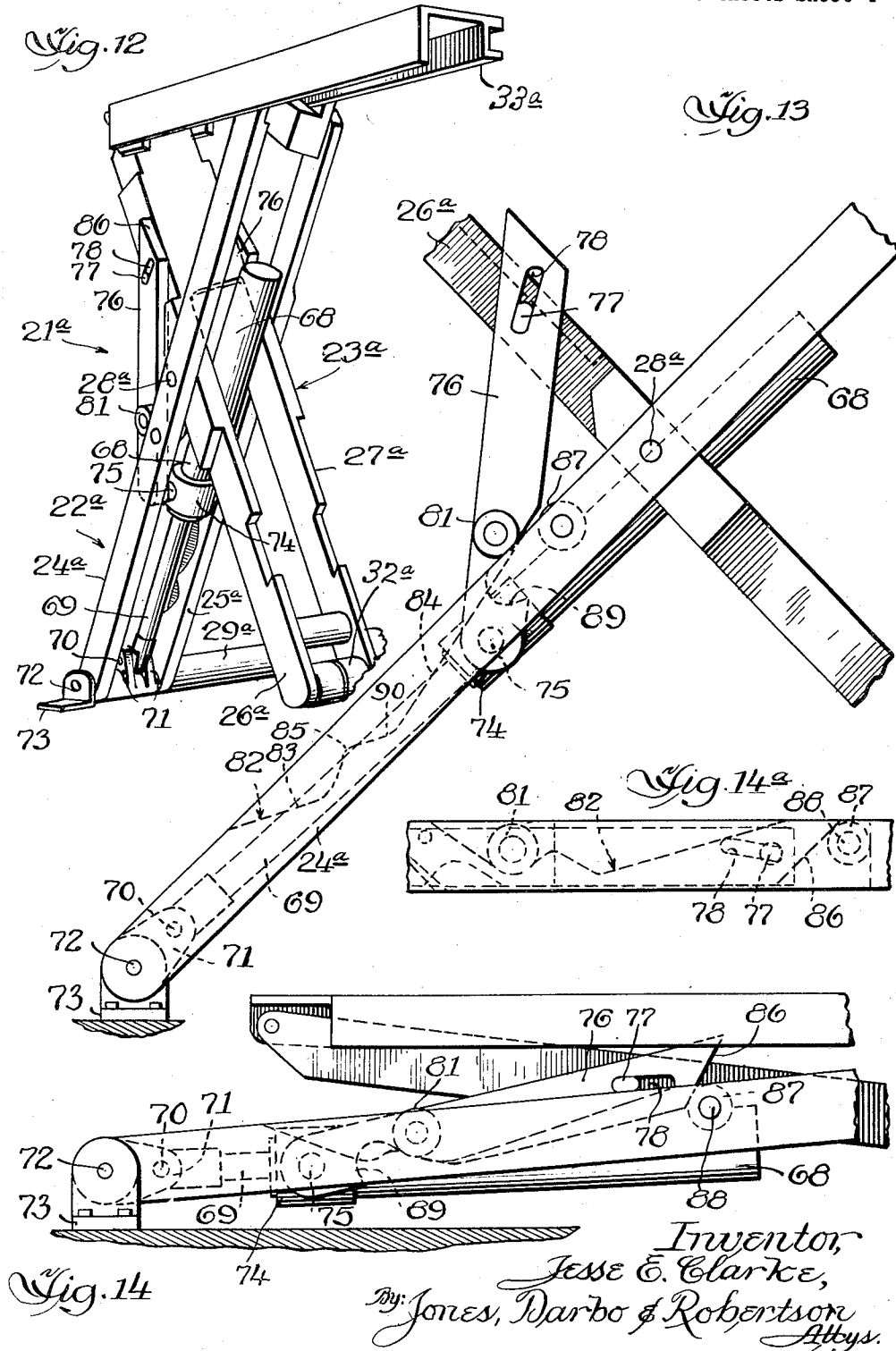
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LIFT DEVICE

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May 24, 1960

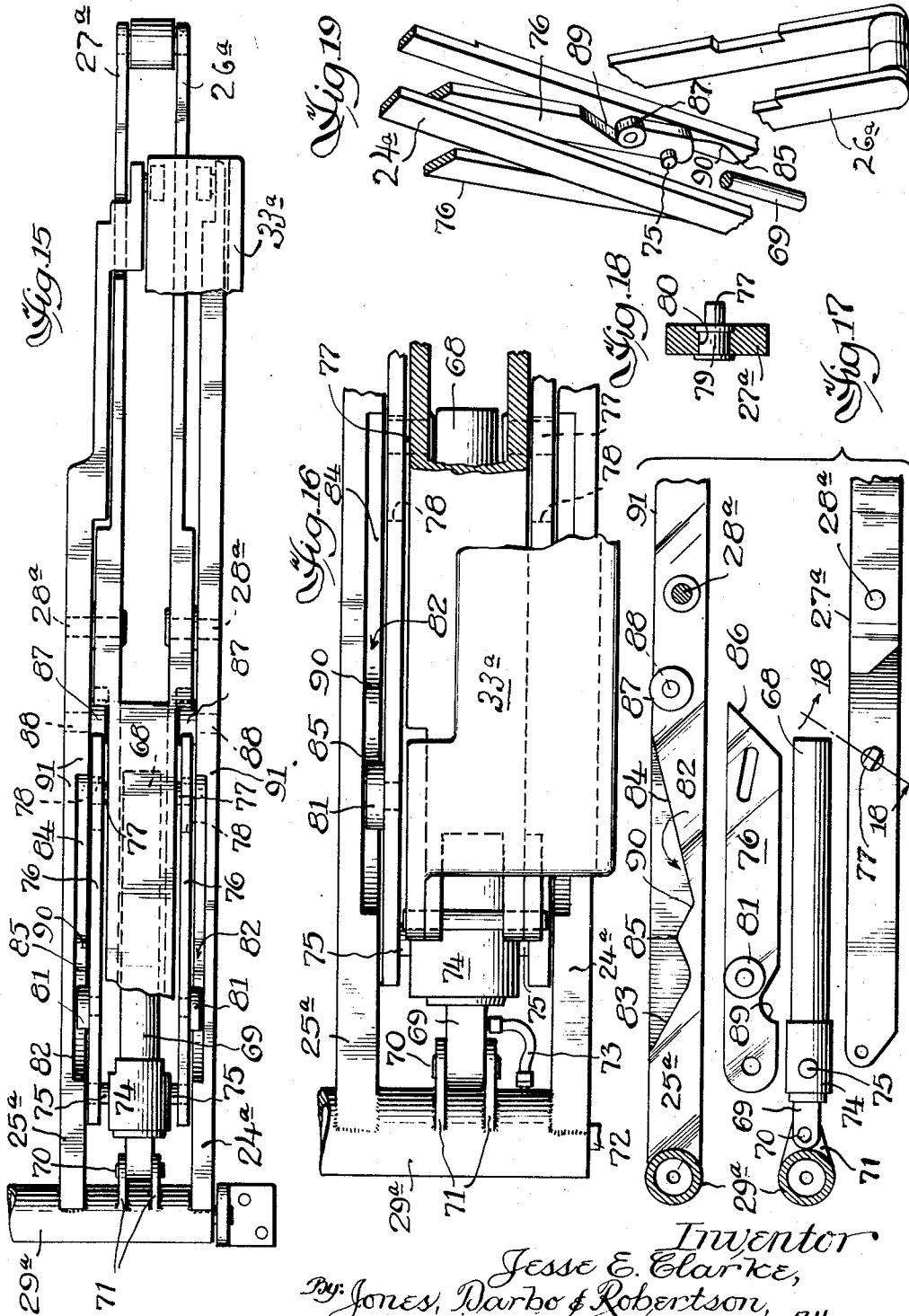
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LIFT DEVICE

Filed Oct. 29, 1956

5 Sheets-Sheet 5



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2,937,852

LIFT DEVICE

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14 Claims. (Cl. 254—122)

This invention relates to improvements in lift devices of the table or hoist type and more particularly such as employ hydraulic power or other fluid pressure means.

An important aspect of the present invention is the provision of an improved device of this class of enhanced capacity in proportion to its dimensions that may be used interchangeably either as an industrial lift in factories and warehouses or as an automobile hoist, for example, in filling stations, garages, and auto repair shops. The lift of the present invention embodies novel compound camming and leverage expedients while at the same time it is not only readily and interchangeably usable for a variety of applications but it is furthermore portable or at least semi-portable in the sense that it can be installed on the surface of a floor or pavement without the necessity of underground excavation, the device advantageously having practically no parts below the surface upon which it is located.

A further object of the invention is to provide a device of this class in which the lifting range is maximized while the collapsed or lowered dimensions are minimized, the present device having a collapsed height, above the surface on which it is mounted, of a relatively few inches, while the maximum height to which it can be extended may be in the neighborhood of say six feet, this height at the same time being a distance of the order of the largest dimension of the device in its collapsed or lowered position, thus conserving shop or ground space, affording economies of installation and operation, and avoiding undue obstructions to free visibility and maneuverability of the shop or station personnel.

The device advantageously may be substantially entirely prefabricated and assembled at its place of manufacture and shipped as a finished unit which may be readily located in position for use with substantially no installation labor or expense of assembly.

These and other objects and advantages will be apparent from the following description, taken together with the accompanying drawings, of an illustrative embodiment of the invention, and in which drawings—

Figure 1 is a perspective view of a device following the present invention in an elevated or vertically extended position;

Figure 2 is an enlarged plan view of the device, as it lies on a floor or the like in its lowered or collapsed position with one of the vehicle support beams omitted for purposes of description, and the direction of the legs being reversed;

Figure 3 is a side elevational view of the scale of Fig. 2 of the device in collapsed position;

Figure 4 is also a side elevational view but with the parts in an initially raised position;

Figure 5 is an enlarged partial section taken on the line 5—5 of Fig. 2;

Figure 6 is another fragmentary view of parts in the position shown in Figs. 4 and 5 but showing other details;

Figure 7 is another side elevational view similar to Figs. 3 and 4 but showing the device in a further elevated position;

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Figure 8 shows the device at say fully elevated position and being the position shown say in Figure 1;

Figure 9 is a fragmentary enlarged view of parts shown in Figure 8, in the same position, but with parts omitted or broken away for clearness of description;

Figure 10 is a perspective view illustrating the operation of the secondary camming or fulcruming action;

Figure 11 shows the adaptation of a guide track to the unanchored legs;

Figure 12 is a perspective view showing a modification, one set of the composite legs being illustrated;

Figure 13 is a fragmentary side view, somewhat enlarged, of parts shown in Fig. 12;

Figure 14 is a fragmentary view on the scale of Fig. 13 of parts shown in the latter figure, in a different position;

Figure 14a is a fragmentary side view of parts in fully collapsed position;

Figure 15 is a plan view of parts shown in Fig. 12 but in collapsed position with parts broken away;

Figure 16 is an enlarged fragmentary plan view of parts shown in Fig. 12 in the position of Fig. 15;

Figure 17 is a group view of certain parts shown in the previous figures on the scale of Fig. 15 and separated for purposes of description;

Figure 18 is a section taken on the line 18—18 of Fig. 17; and

Figure 19 is a fragmentary perspective view of certain parts with parts broken away for clarification.

Referring in detail to the illustrative construction shown in the drawings, and turning first to Figs. 1 to 11 inclusive, the device of the present invention includes a pair of sets of legs 21, each set of legs 21 being made up of a plurality of pairs of composite legs 22 and 23, the pair of composite legs 22 in turn each being made up of legs 24 and 25 respectively, and the pair of composite legs 23 each being made up of legs 26 and 27 respectively. The pair of legs 23 is received between the pair of legs 22 and the intercalated legs 24 and 26 and 25 and 27 are pivoted together respectively, intermediate of their lengths, each by a pivot pin 28, so that the pair of legs 23 can fold into the pair of legs 22, somewhat as in so-called jackknife fashion, from their extended or elevated position as shown in Fig. 1 to the flat collapsed position shown in Figs. 2 and 3, being of scissors or X-form.

The sets of legs 21 are held together for this purpose by having the legs 22 of each set rigidly secured to a cylindrical bolster shaft 29 that may be rotatably secured, permanently or semi-permanently, on a floor or pavement as by the straps 30 that are arched over the bolster 29 and may be secured to the floor by appropriate floor fasteners 31. Thus the legs 22 are held from travel along the floor. Legs 23 which have traveling movement along the floor desirably are provided with anti-friction means such as the rollers 32 at their ends which contact the floor. At their other ends, each of the legs 23 has hinged thereto vehicle or other object support means 33 that are here shown of angle beam formation each having an upper flat table-like surface 34 and a depending flange 35 along its outer edge. Each beam 33 has ears 36 depending from its flat portion 34 upon which are trunnions 37 that enter suitable holes 38 in the adjacent ends of the legs 23 respectively. The other ends of the beams 33 ride freely on the ends of the legs 22 opposite their ends which are secured to the bolster 29, these opposite leg ends carrying anti-friction means such as the rollers 39 and 40 upon which the beams slide. The roller 40 is shown mounted on a strut piece 40a which is secured to a cross piece extension 41 of the leg 25 that connects the latter with the leg 24 at this end of the leg 22.

Since the sets of legs 21 and their associated parts are

identical a description of one set 21 will suffice as next given.

For elevating the legs from their flat or collapsed position to or toward the position shown in Fig. 1, fluid pressure means such as a hydraulic ram or jack 42 is interposed between each of the pair of legs 26 and 27, the jack comprising a hydraulic cylinder 43 and an extensible and retractable plunger 44 constituting in this instance the movable part of the jack. As here shown, the cylinder 43 is abutted at its proximal end as at 45 against the bolster 29 parallel with the legs 24 and 25, and between these legs as well as between the legs 26 and 27, with the movable part of the jack, here represented by the plunger 44, extending between the legs 26 and 27 and being provided with a ram nose 46 that has integral therewith a pair of side bars 47 that are parallel with the plunger 44 at each side thereof and slidingly lap the cylinder 43 in movements of the plunger.

Secured also to bolster 29 to rotate therewith in a vertical arc between the legs 26 and 27 is the flexible arm 48 that at its outer end carries a cam block 49 that has a cam incline 49a on its proximal edge that cooperates, as presently described, with the rounded nose 46 of the plunger 44. Also for cooperation with the nose of the plunger are a pair of cam lugs 50 located on the inner faces of each of the legs 26 and 27, the cam lugs 50 being spaced apart to receive between them the cam block 49 while being sufficiently close together to be engaged by the ram nose 46. Each of the cam lugs 50 has an arcuate cam surface 50a which, in the collapsed position of the legs, faces the plunger nose 46 as does also the cam incline 49a on the cam block 49, the former above the ram nose and the latter below. In the collapsed position of the legs, the flexible arm 48 and its cam block 49 lie flat on the ground, the flexibility of the arm causing it to readily accommodate its position to that of the ram nose. When the legs rise, the arm with its block rises with them, but is held in lateral position aligned between the legs and in position to have the cam block received between the cam lugs on next lowering of the device.

Pivoted to each of the legs 26 and 27 of each composite leg 23 on their outer sides is a lifter link 51, the pivot 52 comprising a pin that goes through the link and through the adjacent leg 26 or 27, as the case may be, the legs 26 and 24 and 27 and 25 being spaced apart sufficiently to allow the link to lie along the outer side of each of the side bars 47 of the hydraulic plunger, these side bars in turn having each fixed thereon a pusher lug 53 that is adapted to engage a furcation 54 in enlarged outer end 55 of the link 51. Above the furcation 54, and on the enlargement 55, each link carries anti-friction means such as the roller 56. Each of the rollers 56 projects laterally outwardly beyond its adjacent pusher lug 53 and rides in a cam track or groove 57 cut into the adjacent inner face of each of the legs 24 and 25 respectively. These cam grooves, as best seen in Fig. 5, have a proximal declivity 58, a dwell surface 59, and a distal cam rise 60, there being a slight drop 61 between the dwell 59 and the cam rise 60. The pivot 52 is offset from the pivot 28, and the lug 53 and the hook or furcation 54 provide accommodation to the angle of the link 51.

Operation of the device is as follows: When the lift is in collapsed position with the parallel legs jackknifed as alluded to, and as shown in Figures 2 and 3, the plunger of each hydraulic jack is retracted by the weight of the upper part of the device acting on the ram plungers through the lifter links 51, the pusher lugs 53, and the cam surfaces 49a and 50, the nose of the jack being thus brought to the position seen in phantom in Fig. 3. When conversely oil under pressure from any suitable source of supply is admitted into the cylinders 43, as through ports 62 to which the usual hose connections

(not shown) may be made, the plunger of each jack is projected and the ram nose 46 of the plunger rides onto the cam incline 49a of the cam block 49 as well as at the same time under the curved cam surfaces 50a of the cam lugs 50. This effects the primary camming action to lift the legs off dead-center on their common pivot 28 and to start them moving upwardly. As soon as the legs have arrived at the position shown in Fig. 4, where the ram nose is ready to leave the primary cam expedients, the compound camming and leverage action of the lifter links 51 and cam rise 60 is initiated by the lugs 53 engaging the notches 54a of the furcations 54 and, while the ram nose rides off the cam rise 49a and the cam curves 50a, the pusher lugs 53 on the plunger side bars 47 begin to exert pressure on the free ends of the lifter links 51. The cam groove drop 61 assists in positioning the links advantageously for leverage action by placing the links in preferred position for initiating the ride of the follower rollers 56 of the links up the cam rise 60 of the cam grooves 57. It will be understood that the cam rise 60 contributes to the lifting movement exerted through the pusher lugs 53 by directing the force of the latter upwardly. By continuing outward movement of the plunger, the rollers 56 are caused to ride up the cam rise 60 and on to the upper edges of the legs 24 and 25 respectively and to the position shown in Figs. 8 and 9 where the line of force on the lifter links through the pusher lugs 53 is almost vertical as shown in Figs. 8 and 9. When the control valve for the oil is opened the device falls by its own weight. The speed of rise and fall may be regulated by the valving means, as is well known.

The device as specifically illustrated in Figure 1, by reason of the fact that the beams 33 are spaced apart the distance of the sets of legs 21, is useful as an automobile hoist. A car may be driven over the device when it is in the collapsed position of Fig. 3, with the car wheels on each side of the vertical flanges 35 of the beams 33. The lift may then be raised to the position shown in Fig. 1 with the car thereon brought to a height say of six feet from the ground, this being a distance almost as great as the length of the device along the ground in its largest dimension. The greaser or repair man may then work under the car, between the sets of legs 21, having free access to the under-part of the automobile. The device may also be used in a similar manner in industrial establishments where articles to be lifted are long enough to extend transversely from one of the beams 33 to the other, or, where they are not, the beams 33 can be replaced by a continuous table running across from one set of legs 21 to the other.

Where it is desired to insure against a possible tendency of the device to be tilted by the weight of the load thereon so as to lift the legs 23 from the ground, the latter may be arranged to ride in a guide track 63 as shown in Fig. 11, the rollers 32 riding under and in contact with the overhanging flange 63a on the track.

The legs 26 and 27 at one end may have aligned cut-outs 64 that receive the transverse extension 41 of the leg 25 when the device is collapsed and similarly the legs 26 and 27 at their other ends may have notches 65 in their lower edges that receive the pusher lugs 53 when the device is collapsed. To reinforce and integrate the legs 26 and 27 a strengthening web 66 may extend transversely across them at one end, and a similar web 67 serves each pair of legs 26 and 27 at their opposite ends.

So constructed and arranged the device is economical of manufacture and installation while having strength and stability and may be operated with a minimum of power and with a maximum of efficiency and ease, particularly from the standpoint of rate of rise of the device, this rate, due to the construction illustrated and the mechanical advantages obtained, being desirably uniform throughout, while at the same time the supports 34 are

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maintained horizontal, the device operating with a minimum of power for enhanced capacity.

It will be understood that in upward movement of the legs, the hydraulic jacks, by their extension, force the X-form pairs of parallel legs 21 upwardly by means of the compound camming and leverage expedients provided, while at the same time raising their own distal ends and extending themselves to follow the legs, the legs 22 rotating in the straps 30 for this purpose while the legs 23 at their ends which travel on the ground move in toward the straps 30. In the downward movement of the legs the action is reversed.

Referring now to the modification shown in Figs. 12 to 19 inclusive and the embodiment of the invention therein disclosed, reference need be made to only one of the sets of legs 21a shown for example in Fig. 12, it being understood that, in the modification, there can be two sets of legs 21a just as there are two sets of legs 21, a set of legs 21a being made up of a plurality of composite legs 22a and 23a, the composite leg 23a being in turn made up of legs 26a and 27a respectively. The composite leg 23a is received between the legs 24a and 25a of the composite leg 22a, and the intercalated legs 24a and 26a and 27a and 25a are pivoted together respectively, intermediate of their length, by pivot pins 28a so that the composite leg 23a folds into the composite leg 22a, somewhat as in so-called jack-knife fashion, from the extended or elevated position of the composite legs to their flat collapsed position similarly to the legs 22 and 23 previously described.

The modification of Figs. 12 to 19 inclusive relates to the power means for raising the legs from their collapsed to their elevated positions as an alternative for the means shown in Figs. 1 to 11 inclusive, this alternative means being next described and the following description being directed to the respect in which the hydraulic jack and its associated parts shown in Figs. 12 et seq. differs from the comparable parts shown in Figs. 1 to 11 inclusive.

As shown in Figs. 12 et seq. the hydraulic jack here illustrated includes a cylinder 68 and a piston rod 69 that is pivoted at 70 in brackets 71 between legs 24a and 25a that are rigid with hollow bolster 29a that is pivoted at 72 on anchor plate 73 secured to the floor or the like. Piston rod 69 is hollow and has connected therewith the hydraulic fluid pipe 73 (Fig. 16) that communicates with the hollow bolster 29a that acts as a manifold for a source of fluid under pressure, thus admitting fluid under pressure to the interior of the cylinder 68 that acts in this case somewhat as its own piston or plunger being reciprocable on the piston rod 69 under the influence of hydraulic fluid admitted to the cylinder 68 through the hollow piston rod 69.

The proximal end of the cylinder 68 carries a head 74 from which projects laterally a pair of trunnions 75 on opposite sides thereof, upon which are pivoted a pair of lifter arms 76. At their other ends, the lifter arms 76 have a lost motion connection with the legs 26a and 27a respectively. This connection is formed by pintles 77 carried by the legs that play in elongated slots 78 in the lifter arms 76, the pintles being elongated in the direction of the slot so that they may slide non-rotatively therein. Each pintle 77 projects from a cylindrical insert 79 (Fig. 18) that rotates in a circular opening 80 in the legs 26a or 27a as the case may be. Each lifter link 76 on its outer face carries a roller 81 that rides in a cam groove 82 in the adjacent leg 24a or 25a as the case may be. As best seen in Fig. 17 the cam groove 82 has a proximal declivity 83, a distal cam rise 84 and an intermediate cam rise 85. Each lifter link 76 also has a tapered outer end that provides on its under surface an inclined cam surface 86 that is adapted to ride on a roller 87 rotatably carried at 88 on the inner face of the leg 24a or 25a as the case may be. Between the roller 81 of the link 76 and its pivot 75 on the cylinder head, the links 76 are notched as at 89 on their under edges.

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The legs 21a carry the object supporting beams 33a similarly to the beams 33 on the legs 21. Legs 23a are provided with anti-friction means such as rollers 32a.

Operation of the device as shown in Fig. 12 et seq. is as follows:

Turning first to Fig. 14a, showing the parts in their lowered or collapsed position, when the cylinder 68 moves outwardly under the influence of hydraulic fluid, the lifter links 76, which initially are parallel with all the other parts, move outwardly with the cylinder by reason of the connection 75. Immediately, however, the cam surfaces 86 on the outer ends of the lifter links, which contact rollers 87 on the legs 24a and 25a, are caused to ride upwardly, thereby moving the parts out of parallelism to a position shown, say, in Fig. 14. Simultaneously, since the hydraulic jack is otherwise free to move on the pivot 70, the rollers 81 on the lifter links, fulcrumed in cam grooves 82, then take over in moving the parts further out of parallel by riding up the cam rise 84 of the cam groove 82 under the influence of movement of the cylinder and the connection 75. Simultaneously, the pintles 77 move from the end of the slot 78 which they occupy in the flat position of the parts, to the other ends of the slots as seen in Fig. 14, applying lifting leverage through the links 76 on legs 26a and 27a. Further outward movement of the cylinder 68 and with it the lifter links 76 exerts further pressure directly through the pintles 77 on the adjacent ends of the legs 26a and 27a causing these to move upwardly carrying with them the main pivot pins 28a and the legs 24a and 25a so as to elevate the entire structure. The pintles 77 are free to rotate with respect to legs 26a and 27a to accommodate the changes in angles of the latter. The lost motion connection through slot 78 and rotatable pintle 77 avoids jamming.

When the parts move from the position shown in Fig. 14, the rollers 81 on the lifter links 76 first move down the distal side of the intermediate cam rise 85 to the low point 90 in the cam groove 82 and from there the parts move to the position say shown in Fig. 13, the rollers 81 riding up the cam rises 84 and finally onto the upper edges 91 of the legs 24a and 25a respectively. During this movement the lifter links 76 are placed in the most advantageous position to cause the lifter links to exert an upward force on the legs 26a and 27a. It will be seen that the cylinder 68 being pivoted at 70 is free to adapt itself to the position of the fulcrums 81 of the lifter links and need not remain in parallel with the legs 24a and 25a thereby enhancing the leverage. At the same time the cam groove directs the application of force applied.

When the legs reach their uppermost position, as shown in Fig. 12, the rollers 87 are received in the notches 89, thus avoiding interference of the rollers 87 with final movements of the lifter links 76. When it is desired to lower the structure suitable valving means which need not be shown, is actuated to permit the hydraulic fluid to flow out of cylinder 68 whereupon the legs drop under the influence of gravity back to the position shown in Fig. 14a.

In the embodiment of Fig. 12 the leg 26a, for example may be considered as a first leg and the leg 24a as a second leg, the lifter link 76 being pivoted at one end as at 77 to the first leg 26a, offset from the pivot 28a. The cylinder 68 may be considered as a ram or plunger engaging the lifter link 76 at its end opposite its pivot 77, as at 75, the track or groove 82 constituting a cam surface on the second leg 24a cooperating with the engagement means 75, roller 81 for rotating the legs upwardly.

In both embodiments, as the legs go up, the inclination of the cam track is continuously and progressively changed toward the vertical and the lifter link at the lower end is pushed by the ram against the cam track throughout the change in inclination of the cam track and finally onto the upper edge of the leg itself. The compound or double acting camming and leverage action

thus provided causes the ram to apply uniform thrust force throughout its operation, effecting also a desirable uniformity of speed of rise of the legs.

In view of the fact that the device requires no special foundation, it is adaptable as a stage lift for theaters, opera-houses and the like, and in such installation it could be sunk into the floor just sufficiently to be flush therewith in its collapsed state.

It is to be understood that such changes may be made, including modifications or additions, as fall within the scope of the appended claims, without departing from the invention, it being desired to cover, singly or in combination, the novel features above set forth.

What is here claimed is:

1. In a lift device, a load support, a pair of intermediately pivoted crossed legs, comprising a first leg and a second leg, one end of each leg supporting the support, a ram device having a plunger lying alongside the second leg, a lifter link pivotally engaging the first leg at a first end of the link, a second end of the link engaging the plunger and movable therewith, a first cam surface on the second leg, a first roller on the link riding said first cam surface, a second cam surface on the first end of the link, a second roller on the second leg engageable with said second cam surface, and a notch in the link receiving said second roller at the limit of movement of the legs, said pivoted engagement including a rotatable member on the first leg, an elongated slot in the link, and a pintle on said rotatable member received in the slot, said pintle being elongated in the direction of the slot to have slidings non-rotative movement therein, said pintle being rotatable with respect to the first leg.

2. The device of claim 1 wherein there is an intermediate hump in said first cam surface engageable by the first roller when the second cam surface is engaged by the second roller.

3. In a lift device, a pair of intermediately pivoted crossed legs, comprising a first leg and a second leg, a ram device having a plunger lying alongside the second leg, a lifter link pivotally engaging the first leg at a first end of the link, a second end of the link engaging the plunger and movable therewith, a first cam surface on the second leg, a first roller on the link riding said first cam surface, a second cam surface on the first end of the link, a second roller on the second leg engageable with said second cam surface, and a notch in the link receiving said second roller at the limit of movement of the legs, said pivoted engagement of the link and the first leg including a rotatable member on the first leg, an elongated slot in the link, and a pintle on said rotatable member received in the slot, said pintle being elongated in the direction of the slot to have sliding non-rotative movement therein.

4. In a lift device, a pair of intermediately pivoted crossed legs, comprising a first leg and a second leg, a ram device having a plunger lying alongside the second leg, a lifter link pivotally engaging the first leg at a first end of the link, a second end of the link engaging the plunger and movable therewith, a first cam surface on the second leg, a first roller on the link riding said first cam surface, a second cam surface on the first end of the link, a second roller on the second leg engageable with said second cam surface, and a notch in the link receiving said second roller at the limit of movement of the legs.

5. In a lift device, a pair of intermediately pivoted crossed legs, comprising a first leg and a second leg, a ram device having a plunger lying alongside the second leg, a lifter link pivotally engaging the first leg at a first end of the link, a second end of the link engaging the plunger and movable therewith, a first cam surface on the second leg, a first roller on the link riding said first cam surface, a second cam surface on the first end of the link, and a second roller on the second leg engageable with said second cam surface.

6. In a lift device, a pair of intermediately pivoted crossed legs, comprising a first leg and a second leg, power means including a plunger, a lifter link engaging the first leg at a first end of the link, a second end of the link engaging the plunger and movable therewith, a cam surface on the first end of the link, and a roller on the second leg engageable with said cam surface whereby the legs may be moved by said power means from a collapsed parallel position to an elevated X-like position.

7. In a lift device or the like embodying a first leg and a second leg intermediately commonly pivoted in scissors fashion for relative movement in the plane of the legs, that improvement including a link pivoted at one end on the first leg and adjacent its other end carrying a roller engaging a surface carried by the second leg, and power means for propelling said other end of the link along said surface toward the common pivot of the legs, said surface providing a reaction element whereby to effect a camming action directly between the legs and said link to cause relative movement of the legs in said plane.

8. The device of claim 7 wherein there are a plurality of pairs of pivoted legs and one leg of each pair is rigid with a rotatable bolster member providing a torque element resisting distortion of the legs.

9. In a lift device, a load support member, a pair of intermediately pivoted crossed legs carrying the support member, said legs including a first leg and a second leg, a lifter link pivoted at one end to said first leg offset from the pivot of the legs, a ram transverse to said first leg having a movable element, means carried by the movable element and said link for interengaging the movable element and the end of said link opposite its said pivot, on the same side of the pivot of the legs in a horizontal direction as the pivot of the link to the first leg, and a cam surface on said second leg cooperating with the said link and said ram element for rotating the legs upwardly to lift the support member by pushing the ram element engaging end of the link in a direction along said second leg toward the pivot of the legs, whereby the pivot of the link to the first leg is above the pivot of the legs in the elevated position of the support member.

10. The structure of claim 9 wherein there is a roller on the lifter link riding on said cam surface, said cam surface being inclined upwardly to and merging into the upper edge of said second leg.

11. The structure of claim 9 wherein the link is pivoted to the first leg on a lost motion connection.

12. A lift device according to claim 9 wherein there are a plurality of sets of legs, each set comprising a plurality of pairs of legs, the legs of a first pair of each set being arranged to be straddled by a second pair of said set, aligned pivots for the legs, each pivot passing through one leg of a first pair and another leg of a second pair intermediately of the lengths of the legs, a bolster shaft rigidly joining the outer ends of said second pairs of legs of the sets, and there are two of said rams abutting said bolster shaft, one ram being disposed between the first pair of legs and between the second pair of legs of each set.

13. A lift device according to claim 12 comprising a retractable and extensible ram part on each ram, a rounded nose on said ram part, a flexible arm rigidly attached to said bolster shaft at one end and extending in the direction of said ram part, a cam block on said plate at its other end disposed beneath said ram nose and having a cam surface engageable by the nose when the ram is in horizontal position, and inwardly directed cam lugs on said first pair of legs receiving said cam block between them in the horizontal position of the jack, said lugs being also engageable by said ram nose on upward movement of the ram on said cam block to provide a primary camming action for causing upward movement of said legs.

14. In a lift device, a pair of intermediately pivoted crossed legs, comprising a first leg and a second leg,

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power means including an element movable with the legs, a lifter link pivotally engaging the first leg at a first end of the link, a second end of the link being pivoted to the element and movable therewith, said second end of the link engaging the element on the same side of the pivot of the legs in a horizontal direction as the pivot of the link to the first leg, interengaging primary cam elements on the link and second leg actuated by movement of the movable element for causing initial movement of the legs from a collapsed parallel position, and secondary cam elements on the link and second leg actuated by further movement of the element causing the legs to ele-

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vate to an X-like position, said secondary cam elements including a cam surface increasing its inclination as the legs are elevated, whereby the pivot of the link to the first leg is above the pivot of the legs in the elevated position of the legs.

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