

July 11, 1961

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2,991,847

LIFTING MECHANISM FOR LIFT TRUCK

Filed Nov. 30, 1953

3 Sheets-Sheet 1

Fig. 2.

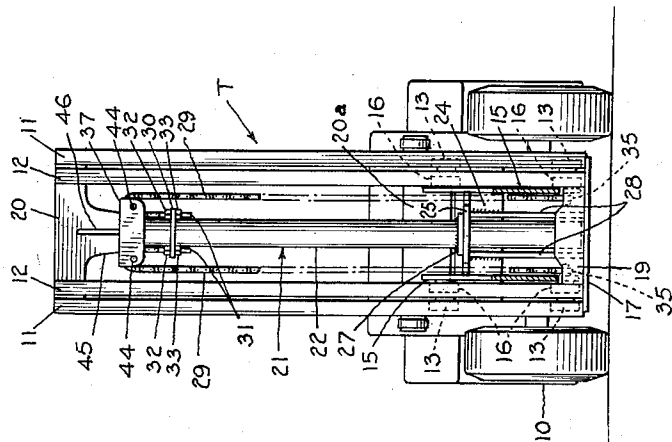
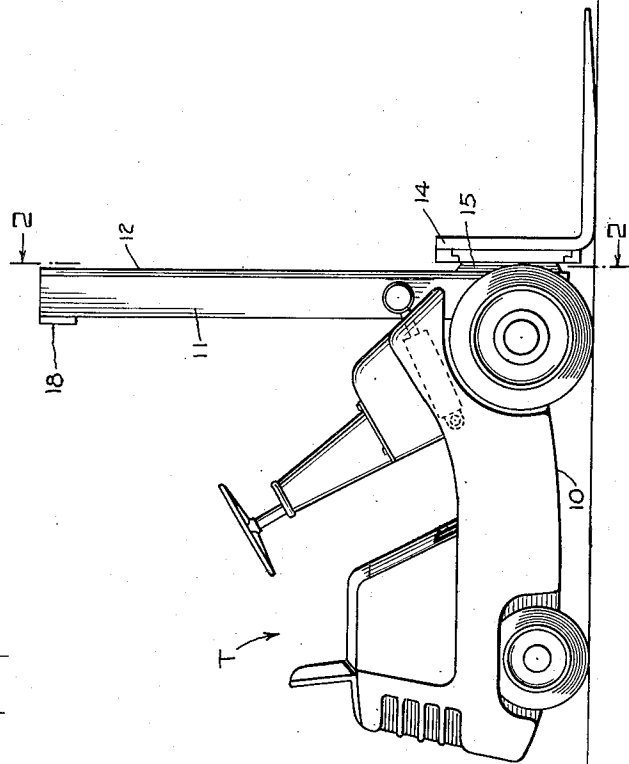


Fig. 1.



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3 Sheets-Sheet 2

Fig. 3.

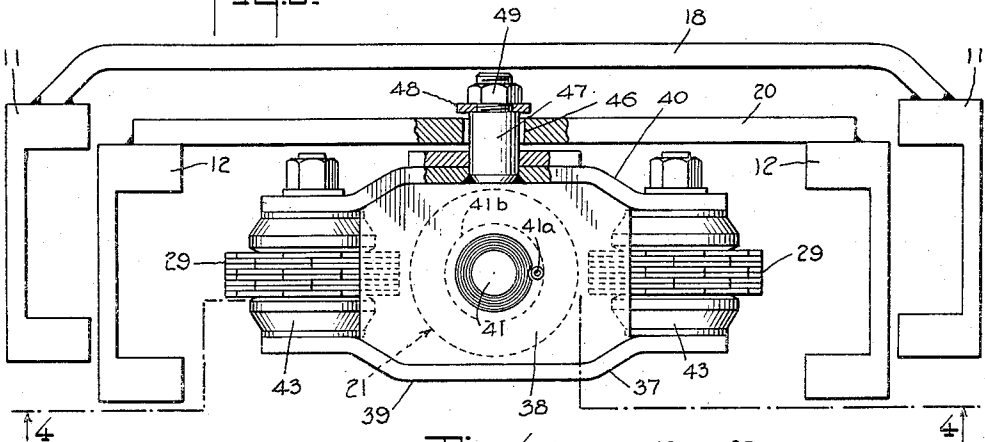
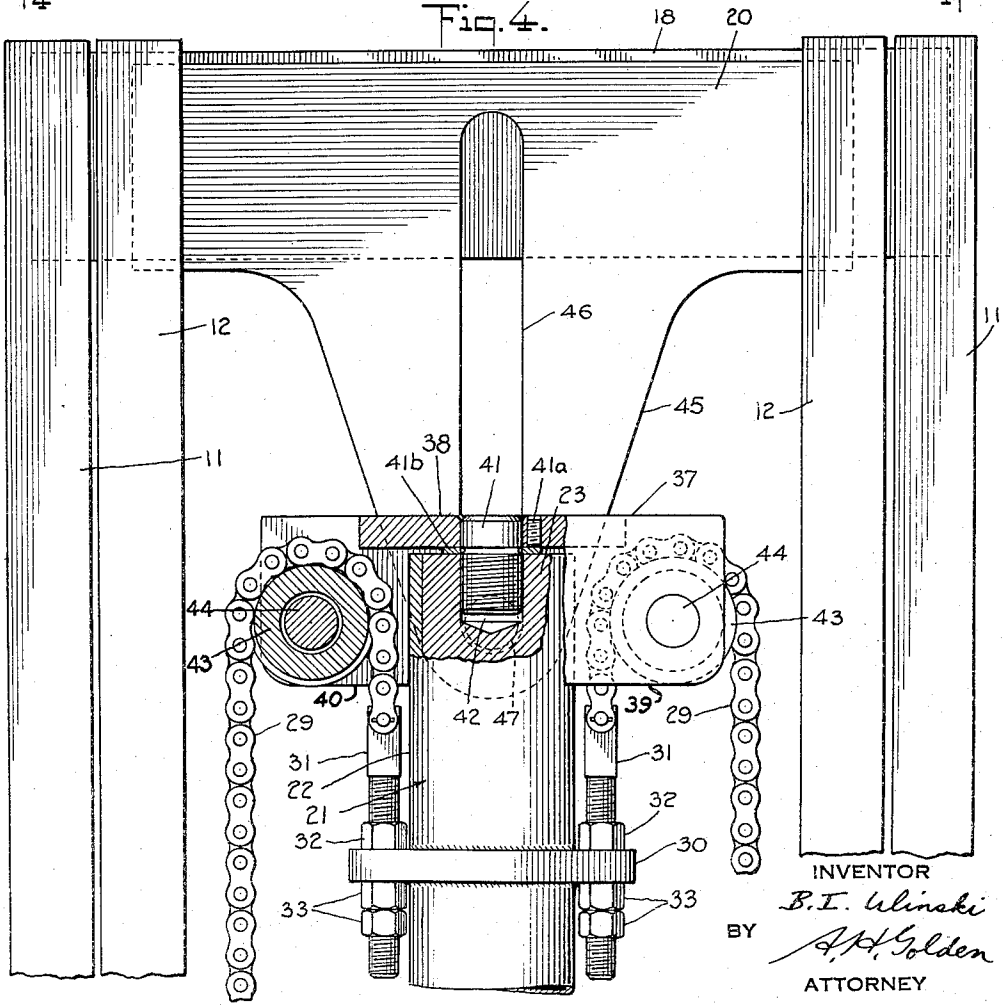


Fig. 4.



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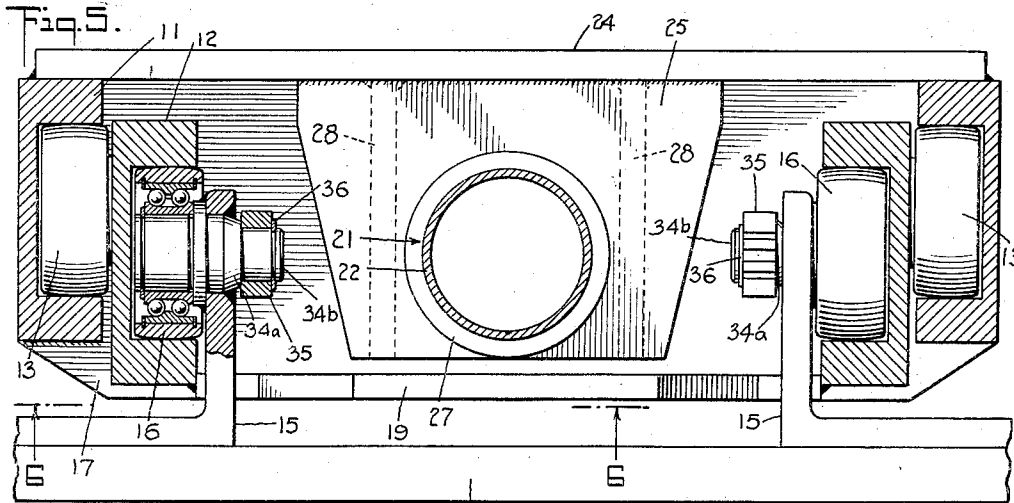
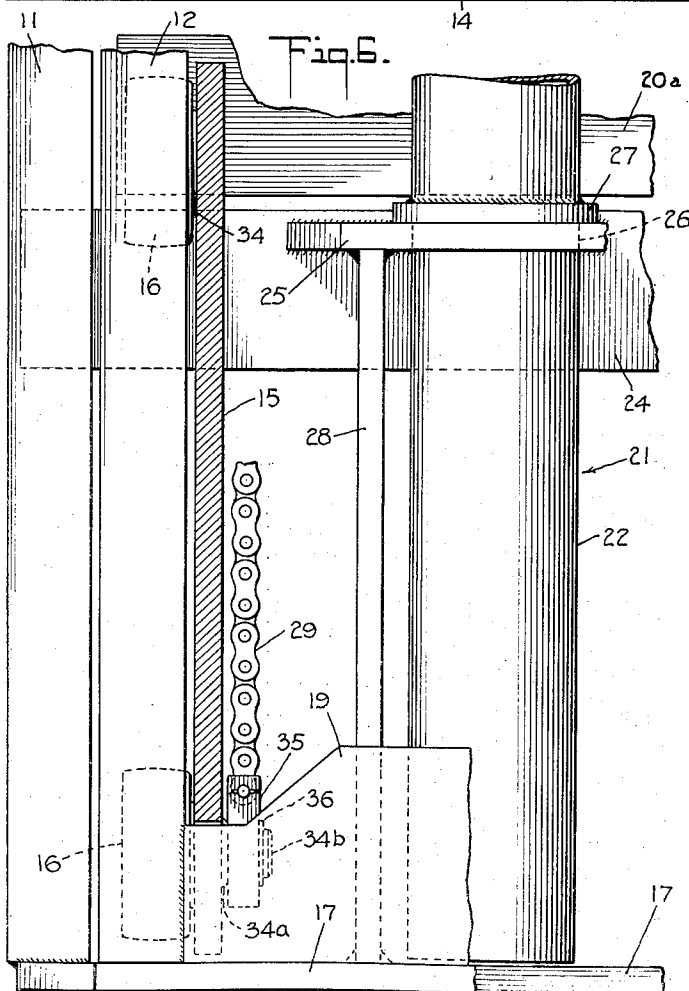
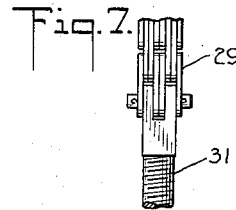
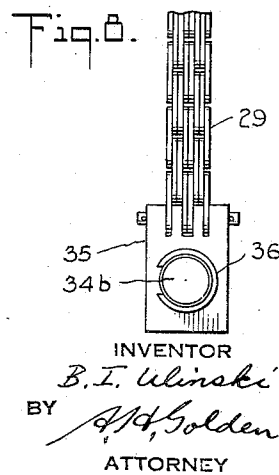
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LIFTING MECHANISM FOR LIFT TRUCK

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3 Sheets-Sheet 3



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1

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LIFTING MECHANISM FOR LIFT TRUCK

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Filed Nov. 30, 1953, Ser. No. 395,040

6 Claims. (Cl. 187—9)

This invention relates to an industrial truck, and more particularly, to the mechanism for lifting and lowering the elevating platform of an industrial truck.

Those skilled in the art fully understand that the mounting of the hydraulic lifting ram in a truck of the class described presents a rather considerable problem. Thus, the ram must be mounted so as to allow for a maximum lift of the elevating platform with the lowest possible initial overall height of the primary and secondary uprights of the truck. As a feature of my invention, I have conceived extremely novel means for mounting the ram, thereby eliminating any need for mounting means such as found on prior art trucks that are costly to manufacture and that make necessary the utilization of some space below the ram. My basic concept comprises the formation of a seat on the main frame or primary uprights of the truck, and the provision of means intermediate of the length of the ram adapted to rest on the seat. More in detail, I provide a collar welded to the ram, this collar resting on a seat that is carried by the primary uprights or main frame, the seat being merely a plate with an opening therein through which the ram extends below the collar. In this way, I produce an extremely simple and inexpensive mounting, easily fabricated, and allowing the simple insertion of the ram into position, and the simple removal of the ram out of position, all without tools or other special mechanisms.

In trucks of the particular class, it is customary to utilize a chain, or other flexible member such as a cable, that is secured at one end to the lifting carriage and at its other end to the main frame or primary uprights. Then by pressing against an intermediate part of the chain through the extension of the lifting ram, the elevating carriage is, of course, elevated relatively to the main frame or primary uprights, with the carriage moving on the secondary uprights where secondary uprights are utilized, all as those skilled in the art will fully appreciate.

A further problem of the prior art is the securing of the lifting chains or cables relatively to the main frame or primary uprights of the truck. I have conceived extremely simple means whereby to secure the ends of the chains, if chains are used, to the lifting ram itself. Since the lifting ram is supported on the primary uprights or main frame, it is obvious that if the ends of the lifting chains are secured thereto, they act as though secured actually to the main frame or primary uprights. As a particular feature of my invention, I secure the ends of the chains to means carried by the outer cylinder of the ram. In more detail, these means are in the form of a collar welded to the cylinder of the ram in the same way as is the supporting collar referred to above. In other words, by welding two collars to the ram cylinder, one collar can be utilized to support the ram, and the other to fix the chains thereto.

As a further feature of my invention, I secure to the carriage in a most novel manner, those ends of the chains opposite the ends secured to the lifting ram. For the particular purpose, I have conceived means that make possible the securing of the chain ends through the utilization of the roller support studs. Thus, those skilled in the art will fully understand that load lifting platforms or load carriages, of the class herein set forth, carry rollers that move relatively to the uprights, these uprights

2

being the secondary uprights if utilized. These rollers are mounted on studs or shafts, and I have conceived the extension of the studs or shafts so that they may support not only the rollers but also links that are in turn secured to the chain. This concept is of extreme importance in the particular art since chain securing means have heretofore presented many difficult problems.

As a still further feature of my invention, I provide novel means for moving upwardly the secondary uprights and for maintaining those secondary uprights in particular relation to the piston of the lifting ram. Thus, I have conceived the utilization of an extension on the secondary uprights formed with a slot in which operates a stud or similar member extending from the lifting ram piston. Through the utilization of this slot, the lifting ram piston has free movement relatively to the secondary uprights whereby to impart lifting movement to the load carriage or load platform through means of the chains, but without moving the secondary uprights and increasing the overall height of the truck. However, once the carriage has been moved a predetermined free amount, the secondary uprights are then moved through my novel means to allow for a high lift of the carriage. When the lifting ram is contracted through the lowering of the piston thereof, the secondary uprights are prevented from remaining in an upward raised position through the stud and slot connection. As a further part of this feature, I position the stud and slot connection at the side of the ram, whereby this connection does not utilize space between the ram and the upper end of the secondary uprights, all as will be fully apparent to those skilled in the art, who will appreciate further the very considerable contribution that has thus been made by my invention.

I have thus outlined rather broadly the more important features of my invention in order that the detailed description thereof that follows may be better understood, and in order that my contribution to the art may be better appreciated. There are, of course, additional features of my invention that will be described hereinafter and which will form the subject of the claims appended hereto. Those skilled in the art will appreciate that the conception on which my disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of my invention. It is important, therefore, that the claims be regarded as including such equivalent constructions as do not depart from the spirit and scope of my invention, in order to prevent the appropriation of my invention by those skilled in the art.

Referring now to the drawings:

FIG. 1 is a side view showing an industrial truck embodying my invention.

FIG. 2 is a view on the line 2—2 of FIG. 1.

FIG. 3 is a plan view showing the upper portion of the uprights and the lifting mechanism of my truck.

FIG. 4 is a view on the line 4—4 of FIG. 3.

FIG. 5 shows the lower portion of the uprights and lifting mechanism.

FIG. 6 is a view on the line 6—6 of FIG. 5.

FIGS. 7 and 8 show the attaching means at the opposed ends of a lifting chain.

As best seen in FIGS. 1 and 2, I utilize in my invention a truck T of the class having a main frame 10 and a pair of primary uprights 11 mounted on the main frame 10 at the front of the truck. A pair of secondary uprights 12 are positioned between the primary uprights 11 and, as is usual in trucks of this class, all of these uprights are formed as channel members, with rollers 13 on the secondary uprights 12 engaged in the channels of the primary uprights 11 to guide the secondary uprights for vertical movement. A load carriage 14 moves on the secondary uprights 12, this carriage having bracket

members 15 positioned between the secondary uprights 12 and equipped with rollers 16 engaged in the channels of the secondary uprights 12.

I show the primary uprights 11 connected at their lower ends through a cross member 17, and at their upper ends by a cross member 18, while the secondary uprights 12 are connected by lower and upper cross members 19 and 20. I utilize these cross members 17, 18, 19, 20 in a novel way, as I shall explain in due course. I show also an intermediate cross member 20a extending between the secondary uprights 12. For lifting the load carriage 14, I use a hydraulic ram that I indicate generally by the numeral 21, this ram having a cylinder 22 and a piston 23 adapted to be extended relatively to the cylinder, as is most clearly apparent in FIG. 4.

The ram cylinder 22 is mounted relatively to the main frame 10 of the truck by extremely novel means that will be best understood when considering FIGS. 2, 5, and 6. On the rear side of the primary uprights 11, I mount a cross member 24, FIGS. 5 and 6, with a support plate or seat 25 welded to this member 24 in a horizontal position between the pair of secondary uprights 12. The support 25 is positioned a considerable distance above the lower ends of the primary uprights 11, and for reinforcing this support 25 I use a pair of vertical plates 28 welded to the lower cross member 17 and to the support seat 25 at opposed sides thereof.

I form the support 25 with an opening 26 that is adapted to receive the outer ram cylinder 22, and I equip the cylinder 22 with means to limit the insertion of the cylinder into the opening 26, these means preferably being a collar 27 welded to the cylinder 22. The collar 27 is so positioned on the cylinder as to seat upon the support plate 25 when the lower end of the ram cylinder 22 is slightly spaced from the lower cross member 17 on the primary uprights 11, as shown in FIG. 6. The support 25 thereby carries the ram 21 and the entire load thereon, and supports the ram relatively to the main frame 10 of the truck. I am enabled by this novel construction to mount the ram 21 through means that utilizes no space between the lower end of the ram and the lower ends of the primary uprights. Also, I can very easily assemble the ram 21 relatively to the truck merely by inserting the ram cylinder 22 through the opening 26 in the support member 25, and I eliminate the need for additional mounting parts that require tools for their manipulation.

Referring again to FIG. 2, I show a pair of load chains 29 through which the ram piston 23 acts to lift the load carriage 14. It will be remembered that the flexible members or chains in trucks of the particular class are secured at one end relatively to the main frame of the truck. For securing the load chains 29 relatively to the main frame 10, I utilize extremely novel means well shown in FIG. 4. Thus, I secure to the outer ram cylinder 22, at a point considerably below its upper end, a flange 30, this flange preferably being a collar welded to the cylinder. Each chain 29 is equipped at one end with a threaded stud 31 positioned in an opening in the collar 30 and secured thereto by nuts 32, 33. Because the ram cylinder 22 is mounted relatively to the primary uprights 11, that are in turn mounted on the truck frame 10, it will be obvious that I secure the load chains 29 through the collar 30 relatively to the truck frame 10. As I have already described, I utilize a collar 27 to mount the ram cylinder 22, and therefore, I can mount the cylinder 22 and also secure the chains 29 relatively to the truck merely through two collars welded to the ram cylinder.

I contribute also an extremely novel arrangement to secure the chains 29 to the load carriage 14. Referring to FIGS. 5 and 6, it will be observed first that the carriage rollers 16 are mounted on the brackets 15 through stub shafts in a conventional way, the stub shafts for the upper rollers being indicated by the numeral 34, and those for

the lower rollers by the numeral 34a. I form one of the stub shafts at each side of the carriage 14, these stub shafts preferably being the lower stub shafts 34a, with an extension 34b projecting inwardly from the bracket member 15. I equip the corresponding end of each chain 29 with a link 35 in the form of a block, FIG. 8, having an opening in which the projecting extension 34b of a stub shaft 34a is positioned, with a ring 36 retaining the link 35 upon the stub shaft. Through the particular arrangement, I enable the load chains 29 to lift the carriage directly through the stub shafts of the rollers, and require no special securing means for this end of the chains.

I have already described the novel arrangement whereby by my ram mounting utilizes no space between the lower end of the ram cylinder 22 and the lower end of the primary uprights 11. It is, of course, desirable to make available as much space as possible for the ram in a longitudinal sense, and I enable the ram not only to extend to the bottom of the primary uprights, but also to utilize all of the space between the upper ends of the secondary uprights 12. Referring to FIGS. 2, 3 and 4, I equip the upper end of the ram piston 23 with a cross head 37, this cross head having a flat base portion 38 positioned upon the upper end of the piston 23, and front and rear flanges 39, 40 extending downwardly from the base portion 38. To attach the cross head 37 to the piston 23, I equip the base portion 38 with a stud 41 engaged in a threaded opening 42 in the piston. A set screw 41a in the base portion 38, FIG. 4, presses against the upper end of the piston 23 through a washer 41b on the stud 41. No part of the cross head 37, however, extends above the flat base portion 38. At opposed sides of the ram cylinder 22 I mount a pair of wheels 43 through shafts 44 secured between end portions of the cross head flanges 39, 40. The chains 29 extend upwardly from their means of attachment with the collar 30 on the ram, over the wheels 43, and then downwardly to their means of attachment with the load carriage 14, whereby the ram piston 23 when extended upwardly moves intermediate portions of the chains 29 to lift the carriage.

To provide a lost motion connection whereby the ram piston 23 lifts the secondary uprights 12, I form the upper cross member 20 on these uprights in a particular way to coact with the cross head 37. It will be observed at this point that the cross member 20 is positioned entirely to the rear of the ram 21 and the cross head 37, as clearly shown in FIG. 3. I form the cross member 20 with a downwardly extending portion 45, FIG. 4. This downwardly extending portion 45 has a vertical slot 46, and I equip the cross head 37 with a rearwardly extending stud 47, FIG. 3, positioned in the slot 46 and retained therein by a washer 48 secured to the stud by a nut 49. When the ram piston 23 is first extended upwardly from the position shown in FIG. 4, the load carriage 14 does, of course, lift it through the chains 29, but the piston 23 does not at that time have any lifting action relatively to the secondary uprights 12 because the stud 47 moves freely in the slot 46.

After predetermined upward movement of the load carriage 14, however, the stud 47 engages the upper end of the slot 46, and the piston 23 thereafter lifts the secondary uprights 12. When the ram piston 23 moves downwardly, the pin 47 is adapted to engage the lower end of the vertical slot 46, and thereby to pull the secondary uprights 12 downwardly should these uprights fail to descend of their own accord. Through the particular novel construction, I am able not only to provide a lost motion connection between the ram piston 23 and the secondary uprights 12, but to place the parts through which I obtain this connection entirely in such a position that they utilize no space between the upper end of the cross head 37 and the secondary uprights 12.

It should be noted, further, that the position of the

cross member 20 at the rear of the secondary uprights 12 leaves the space between the upper ends of these uprights entirely open, as may be seen in FIG. 3. This feature, together with the novel mounting of my ram cylinder 22, greatly facilitates the assembly of the ram relatively to the uprights. Furthermore, it is thereby possible to assemble the load carriage 14 to the secondary uprights 12 merely by moving it downwardly with its mounting rollers 16 inserted through the upper ends of these uprights, and it is not necessary to remove the rollers 16 from the carriage for this purpose.

I believe that those skilled in the art will now thoroughly understand the operation and advantages of my novel lifting mechanism. Through the extremely novel features of my construction, I have contributed a very simple lifting mechanism that has relatively few parts and can be very readily assembled and disassembled, but that nevertheless is extremely efficient in operation. I believe, therefore, that the very considerable value of my invention will be appreciated.

I now claim:

1. In a truck of the class described, a pair of primary uprights, a pair of secondary uprights slidable on said primary uprights, a load member slidable on said secondary uprights, a lift ram for lifting said load member comprising an outer cylinder and a piston in said cylinder, support means for said lift ram comprising a seat having an opening substantially the outline of said cylinder, said cylinder fitting freely in said opening through vertical insertion therein, limit means on said cylinder for limiting the depth of insertion of said cylinder into said opening and supporting said cylinder on said seat, a flexible member through which the ram piston when extended relatively to the cylinder lifts the load member on said secondary uprights, a cross member attached to the upper ends of the secondary uprights at the rear sides thereof, said cross member by its position leaving the upper ends of the secondary uprights open to allow assembly and disassembly of the load member and ram relatively to the truck, and a stud on the ram piston moving in a vertical slot in the cross member to limit movement of the piston relatively to the secondary uprights.

2. In a truck of the class described, a pair of uprights, a load member, shafts on said load member, rollers on said shafts engaged with the uprights to mount the load member for movement on the uprights, a lift ram comprising an outer cylinder and a piston, a pair of flexible load lifting members, means attaching each flexible load lifting member at one end to one of the roller shafts, holding means secured to said cylinder, fastening means for securing the other end of each flexible load lifting member to said holding means, and means through which said piston moves said flexible load lifting member whereby to lift the load member.

3. In a truck of the class described, a pair of channel uprights, a load carriage, opposed side portions on said load carriage juxtaposed to the channels in said uprights, stub shafts on the opposed carriage portions, rollers on said stub shafts positioned in the channels whereby to mount the load carriage for vertical movement on the uprights, a lift ram, a pair of flexible members actuated by the lift ram, and means attaching each flexible member to one of the stub shafts at one side of the carriage whereby the flexible members lift the carriage through the stub shafts.

4. In a truck of the class described, a pair of primary uprights, a pair of secondary uprights slidable on said primary uprights, a load carriage slidable on said secondary uprights, a flexible member secured at one end relatively to said carriage, a ram having a cylinder and

a piston moving in said cylinder, a flange fixed to said cylinder intermediate its ends, a support member secured between said primary uprights and having an opening therein of such size that said cylinder will enter said opening to bring said flange against the support member, holding means secured to said cylinder, fastening means for securing the other end of said flexible member to said holding means, means for moving said flexible member intermediate its length upon extension of said ram piston whereby to lift said carriage on said secondary uprights, said ram and said secondary uprights mounted in spaced relation to allow free movement of the ram piston as it is extended, a part projecting transversely from said ram piston, and a member on the pair of secondary uprights formed with a vertical slot in which the transversely projecting part is engaged whereby to limit the free movement of said ram piston relatively to said secondary uprights.

5. In a truck of the class described, a pair of primary uprights, a pair of secondary uprights slidable on said primary uprights, a load member slidable on said secondary uprights, a lift ram for lifting said load member comprising an outer cylinder and a piston in said cylinder, support means for said lift ram comprising a seat having an opening substantially the outline of said cylinder, said cylinder fitting freely in said opening through vertical insertion therein, limit means on said cylinder for limiting the depth of insertion of said cylinder into said opening and supporting said cylinder on said seat, a flexible member through which the ram piston when extended relatively to the cylinder lifts the load member on said secondary uprights, a cross member attached to the upper ends of the secondary uprights at the rear sides thereof, said cross member by its position leaving the upper ends of the secondary uprights open to allow assembly and disassembly of the load member and ram relatively to the truck, and means through which the ram piston and cross member coact to limit movement of the piston and the secondary uprights relatively to one another.

6. In a truck of the class described, a pair of primary uprights, a pair of secondary uprights slidable on said primary uprights, a load member slidable on said secondary uprights, a lift ram for lifting said load member comprising an outer cylinder and a piston in said cylinder, support means for said lift ram comprising a seat having an opening substantially the outline of said cylinder, said cylinder fitting freely in said opening through vertical insertion therein, limit means on said cylinder for limiting the depth of insertion of said cylinder into said opening and supporting said cylinder on said seat, a flexible member through which the ram piston when extended relatively to the cylinder lifts the load member on said secondary uprights, and means through which the ram piston and secondary uprights coact to limit movement of the piston and secondary uprights relatively to one another.

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