Nov. 22, 1949 A. M. BARRETT 2,488,521

LIFT TRUCK

Filed April 18, 1945 4 Sheets-Sheet 1

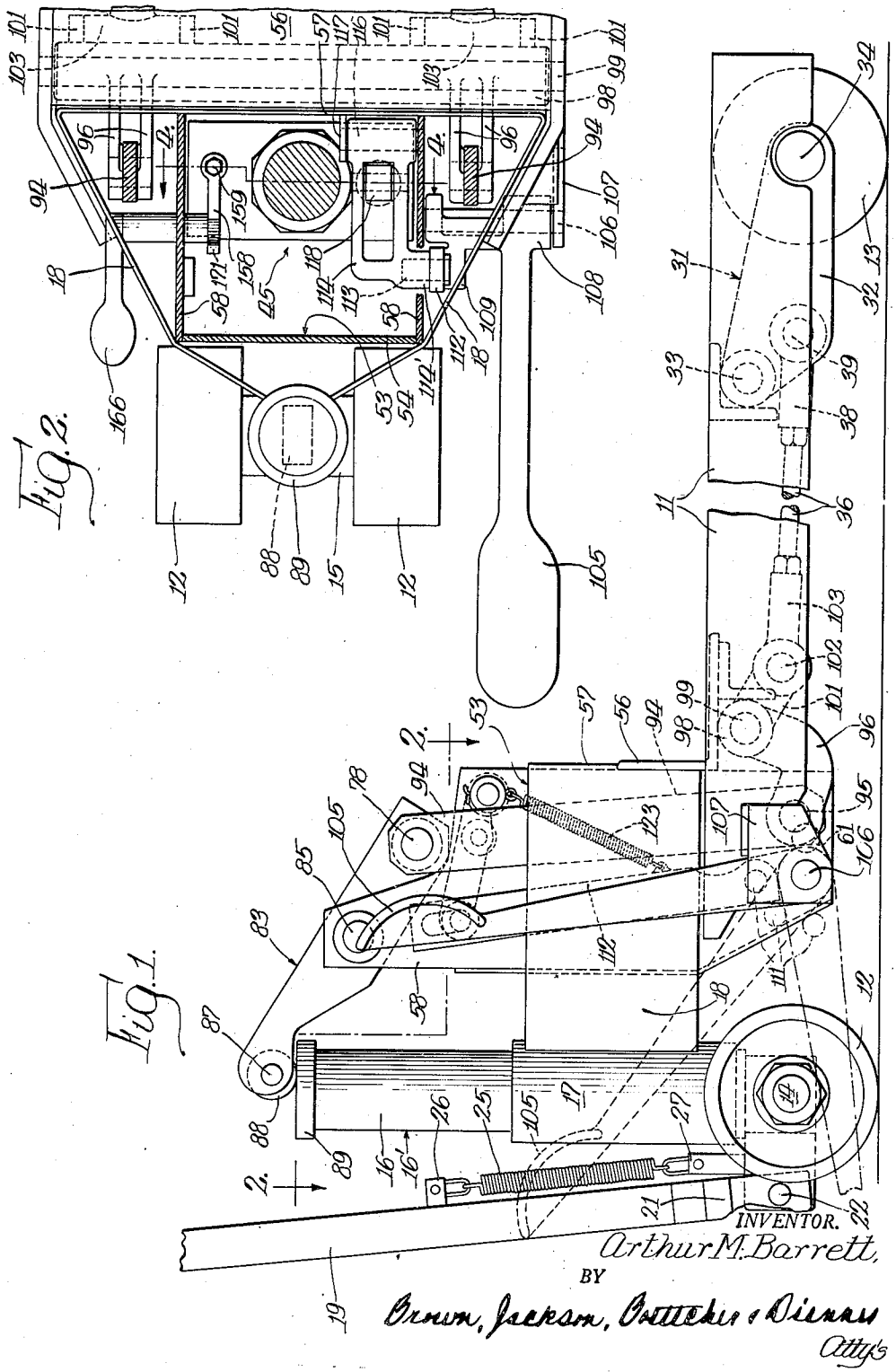


Fig. 2.

Fig. 1.

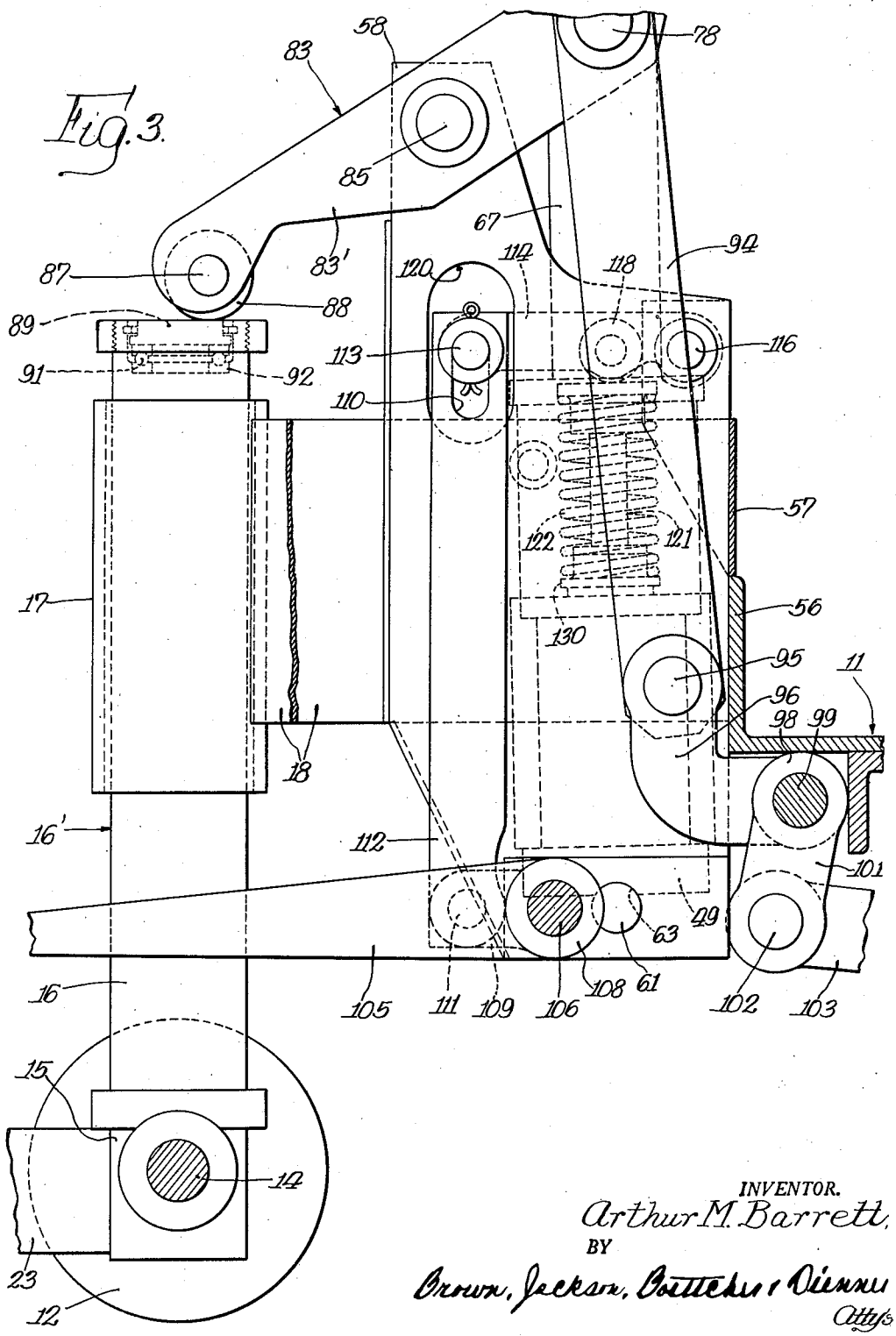
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Fig. 3.



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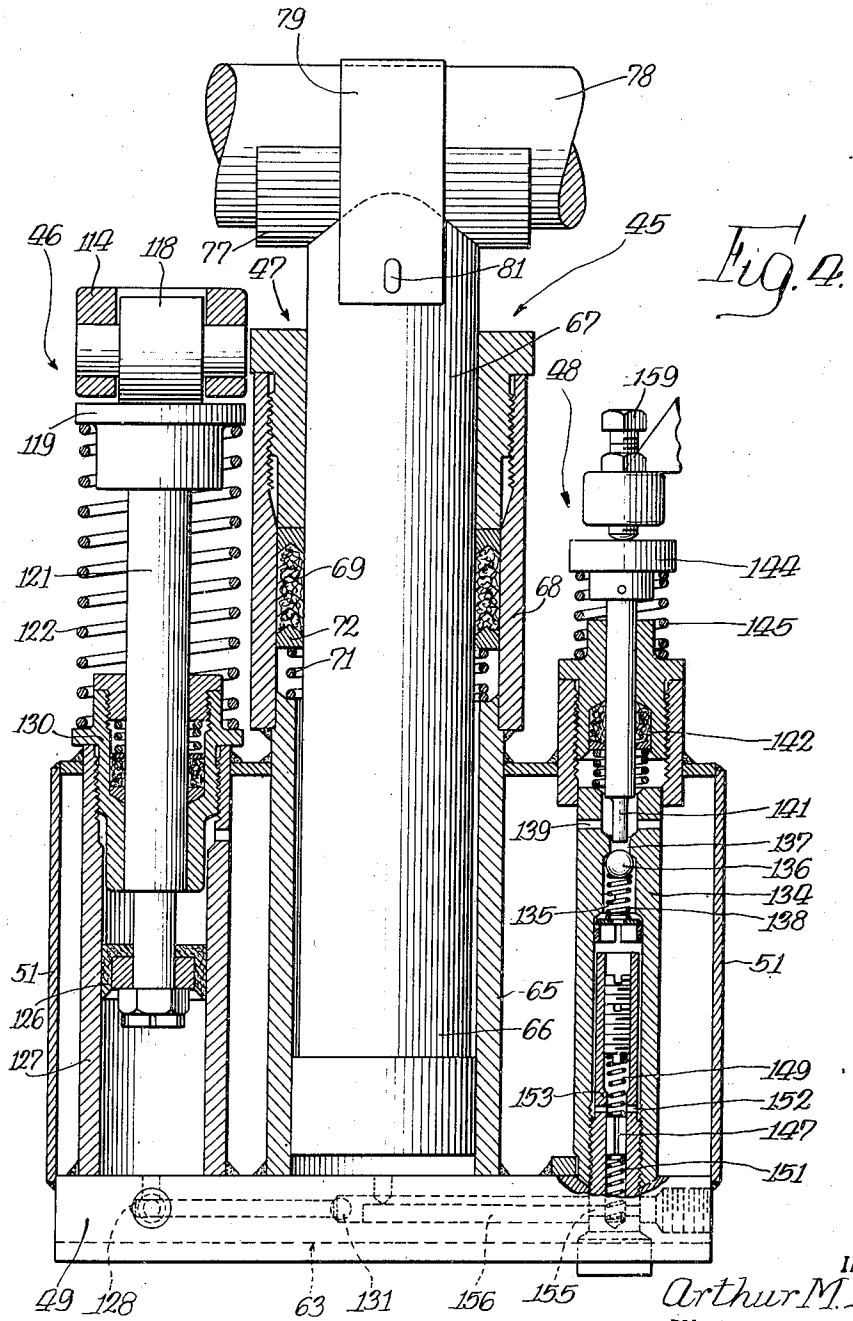


Fig. 4.

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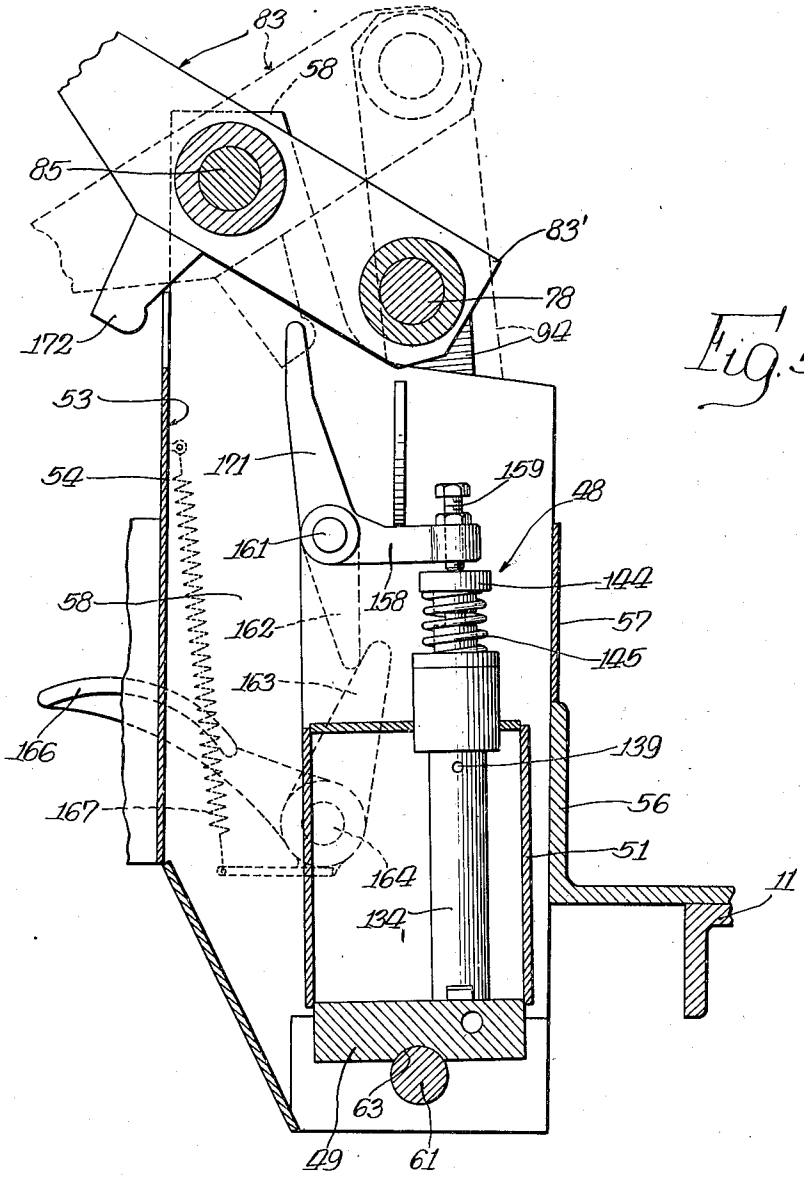


Fig. 5.

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UNITED STATES PATENT OFFICE

2,488,521

LIFT TRUCK

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Application April 18, 1945, Serial No. 588,925

20 Claims. (Cl. 280—44)

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The present invention relates to lift trucks, and more particularly to those of the hydraulic type in which the load is lifted through the action of a hydraulic jack or ram.

One of the principal features of the invention resides in an improved operating relation between the hydraulic unit and the frame which lifts the load. The hydraulic unit is mounted on the lifting frame to move up and down bodily therewith. The lifting force of the hydraulic ram is applied in an upward direction to the inner end of a rocker member which has pivotal support intermediate its ends on the lifting frame. The outer end of this rocker member is arranged to exert downward reaction on the front wheels of the truck or other ground engaging support.

Another feature of the invention resides in an improved motion transmitting arrangement wherein the above motion of the rocker member is also made effective to raise the rear portion of the frame relative to the rear wheels.

Another feature of the invention is to provide a low level truck of the single frame or pallet type embodying the aforementioned improved hydraulic mechanism and improved motion transmitting arrangement.

Another feature of the invention resides in an improved mounting of the lifting frame on the front truck whereby the lifting frame has guided sliding movement up and down along the vertical king pin of the front truck.

Another feature of the invention resides in constructing the hydraulic pump, the ram, the release valve, the governing valve and the hydraulic reservoir all as one complete unit, which can be readily removed as a unit from the lift truck for the purposes of repair, adjustment, or replacement of the hydraulic mechanism. It is only necessary to release two mounting or operating connections, whereupon the entire hydraulic unit can be removed in its entirety from the bottom of the truck. By having all of the hydraulic parts constructed or assembled in unit form, there is avoided all necessity of flexible hose connections, moving joints, etc., in the hydraulic conduits, and hence leakage problems are minimized.

Another feature of the invention resides in an improved automatic cut-off of the hydraulic lift mechanism which prevents further liquid being forced into the hydraulic ram after the lifting frame has been raised to a predetermined maximum height.

Another feature of the invention resides in an improved pedal type of actuating arrangement for the hydraulic pump. When the pedal is not

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in use it occupies a substantially vertical position where it is out of the way. When the pedal is to be put into use it is swung into a lower position where it is very convenient for foot actuation. Such pedal can be actuated in cramped quarters where there would not be room to impart load lifting movement to the conventional draft and steering handle. However, the invention is not limited to pedal actuation of the hydraulic pump, but also includes modified arrangements wherein the steering and draft handle is used to actuate the hydraulic pump, where that is desired.

Other features, objects and advantages of the invention will appear from the following detail description of one preferred embodiment of the invention. In the accompanying drawings illustrating such embodiment:

Figure 1 is a fragmentary side elevational view of my improved truck showing the frame in its lowered position;

Figure 2 is a fragmentary horizontal section of the front end of the truck, taken approximately on the plane of the line 2—2 of Figure 1;

Figure 3 is a fragmentary side view of the front portion of the truck on a larger scale, showing the truck in its raised position;

Figure 4 is a transverse sectional view through the hydraulic unit, corresponding to a section taken on the plane of the line 4—4 of Figure 2; and

Figure 5 is a fragmentary sectional view showing the release mechanism, both manual and automatic, for releasing the hydraulic lifting mechanism.

In its preferred embodiment, my invention is constructed in the form of a single frame or pallet type of lifting truck comprising a single frame 11 which serves to connect the front wheels 12 with the rear wheels 13 and which also serves as a lifting element. This pallet type of lift truck is particularly adapted for use with the relatively low pallet type of load carrying platforms. While this is the preferred embodiment of my invention, nevertheless I wish it to be understood that the invention, or certain features thereof, can be embodied in other types of lift trucks as well. There are two front wheels 12 mounted on the outer ends of an axle pin or axle studs 14 carried by the main frame member or casting of a front truck 15. Rising substantially vertically on this main casting 15, between the front wheels 12, is a king bolt 16 formed with a long cylindrical guide surface 16'. Sliding up and down along this cylindrical guide surface is a cylindrical sleeve 17 which is rigidly secured to the forward portion

of the frame 11. The frame is attached to the guide sleeve by welding or otherwise securing two relatively heavy plates 18 to the forward portion of the frame 11, one on each side thereof, and extending these plates 18 forwardly and securing them by a welded joint or in any other suitable manner to the guide sleeve 17. The truck is adapted to be pulled and steered through a front handle 19 which has its lower end fastened between a pair of laterally diverging yoke bars 21 which are pivotally mounted on pivot pins 22 projecting outwardly from a front portion 23 of the truck casting 15. The handle 19 is biased toward its upright position by a tension spring 25 which has its upper end secured to a lug 26 projecting from the upper or back edge of the handle and which has its lower end hooked to a clevis 27 extending upwardly from the front portion of the front wheel truck. It will be evident that the front end of the frame 11 can be raised or lowered by merely causing the guide sleeve 17 to slide up and down along the cylindrical guide surface of the king bolt 16, and it will also be seen that in any one of the raised or lowered positions of the frame the front wheel truck is free to be swiveled to right or left in pulling, steering and maneuvering the truck.

The two rear wheels 13 are mounted on a swinging crank assembly 31 for fore and aft swinging motion under the rear portion of the frame 11. When this crank assembly 31 together with the rear wheels 13 is swung in a forward direction relatively to the frame the frame is lifted bodily at its rear end, and when the crank assembly and wheels are swung rearwardly the rear portion of the frame is lowered. The swinging crank assembly comprises two pairs of laterally spaced crank arms 32 which have their upper or forward ends pivotally connected with the frame 11 on a transverse pivot shaft or shafts 33 carried between the side bars of the frame 11. The wheels 13 are journaled upon a transverse axle or axles 34 extending through the rear portions of the crank arms 32. The swinging crank assembly and rear wheels are swung forwardly and rearwardly in the lifting and lowering of the frame through the instrumentality of two tie or pull rods 36 which extend from the front portion of the truck back to the rear portion, near each side bar of the frame. The rear ends of these tie rods have adjustable threaded fastening in T-shaped bearing members 38 which are disposed between each pair of crank arms 32, where they are journaled on pivot pins 39 extending between these pairs of crank arms. The pivot pins 39 are so spaced from the pivotal axis 33 of the crank arms that when forward pulling force is exerted through the pull rods 36 the wheels 13 are swung forwardly to raise the rear end of the truck substantially to the position illustrated in Figure 3, and when the rods are moved rearwardly, or allowed to move rearwardly, the wheels 13 swing back to their rearward position and thereby allow the frame 11 to move down to its lower position as illustrated in Figure 1. The operative connection of the rods 36 with the hydraulic lifting mechanism at the front end of the truck will be described after the details of the hydraulic lifting unit have been described.

Referring to Figure 4, the hydraulic unit is indicated in its entirety at 45 and comprises a hydraulic pump 46 for generating the hydraulic pressure, a hydraulic ram 47 for raising the truck in response to this pressure, and a release valve 48 for releasing the hydraulic pressure from the

ram 47 for lowering the truck. These three parts 46, 47 and 48 all have their base portions welded or otherwise rigidly secured to a base plate 49 so that the pump, ram and release valve are all rigidly joined together as a single hydraulic unit 45. Surrounding the lower portions of the pump, ram and release valve is an oil reservoir 51 which stores the necessary amount of oil for the operation of the hydraulic unit. This hydraulic unit assembly is removably mounted within a box-like compartment 53 (Figure 2) which is formed between the forward frame plates 18 directly back of the king bolt guide sleeve 17. The front wall of this compartment 53 is defined by a transversely extending vertical plate 54 which has its ends welded to the inner side surfaces of the forwardly converging frame plates 18. The rear wall of the compartment is defined by the upstanding flange of a heavy angle bar 56 and extension plate 57 which extend transversely of the frame and have their ends welded to the frame side bars 11. The load carrying area of the frame extends forwardly up to this angle bar 56. The side walls of the compartment 53 are defined by two spaced side plates 58 which have their front edges welded to the transverse front plate 54 and which have their rear edges welded to the transverse rear plate 57. The hydraulic unit assembly is mounted for slight fore and aft tilting movement within this box-like compartment 53, this tilting motion occurring around a transverse mounting shaft 61 which is removably mounted in the lower portion of the compartment 53. The ends of this mounting shaft 61 are slidably seated in holes formed in the lower portions of the spaced side plates 58, being releasably held in these holes by a set screw or other suitable fastening means. Upon the release of this fastening means, the shaft can be slid endwise out of its supporting position in the plates 58. As shown in Figure 5, the base plate 49 of the hydraulic unit is formed with an arcuate groove 63 extending transversely across its bottom surface, and this arcuate groove sets down over the upper surface of the mounting shaft 61, affording a rockable bearing support which enables the hydraulic unit to tilt fore and aft around the axis of the mounting shaft 61. Upon the aforementioned removal of the mounting shaft 61, the entire hydraulic unit can be dropped straight down through the open bottom of the compartment 53, whereby the unit can be readily removed for repairs, adjustments, or for the substitution of another hydraulic unit.

Referring now to the manner in which the hydraulic unit transmits lifting force to the lifting frame, it will be seen from Figure 4 that the hydraulic ram 47 comprises a cylinder 65 in which a piston 66 is adapted to be forced upwardly by the admission of oil under pressure into the lower end of the cylinder 65. The piston comprises a slightly reduced shank portion 67 which has a tight pressure fit within an upper gland packing 68 carried in the head end of the cylinder 65. This gland packing comprises a plurality of packing rings 69 which are maintained under pressure by a compression spring 71 and pressure ring 72, the rings 69 preferably being composed of neoprene or other like material capable of effecting a tight seal. The upper end of the piston shank 67 is formed or provided with a yoke or saddle 77 which bears against the underside of a horizontally extending thrust pin 78. If desired, the yoke 77 may be held up against the underside of the thrust pin 78 by a

removable retainer strap 79 fastened to the piston shank by a releasable cotter pin 81. However, this removable retainer strap 79 is not essential and may be omitted because the yoke 77 and pin 78 are normally held pressed together by the weight of the truck and the weight of the load on the truck. The yoke 77 thus has a one-way pushing connection against the thrust pin 78, which pushing connection may be readily separated when the hydraulic unit 45 is to be removed by dropping down through the bottom of compartment 53.

The thrust pin 78 is mounted transversely in the rear end of a rocker arm 83 which is made up of two spaced side plates 83', the pin 78 having its ends mounted in holes in these side plates. Said rocker arm has intermediate fulcrum mounting on a heavy transverse bearing pin 85 which extends through the two rocker plates 83' and which has its ends mounted in holes formed in upward extensions of the side plates 58 of box-like compartment 53. Thus, this intermediate mounting pivot 85 of the rocker arm 83 always remains in fixed relation to the lifting frame for exerting lifting force on the frame. The front end of the rocker member 83 extends forwardly out over the top of the king bolt 16 where it is provided with a transverse pin 87 on which a pressure roller 88 is journaled between the side plates 83' of the rocker member. This pressure roller is adapted to exert downward reaction force against the upper end of the king bolt 16. The upper end of the king bolt carries an antifriction disc 89 against which the roller 88 is adapted to exert its pressure, the king bolt 16 being freely rotatable relatively to the disc 89 so that steering rotation of the king bolt is not materially resisted by the downward pressure which the roller 88 exerts against the disc 89. As shown in Figure 3, the disc 89 has an anti-friction turntable mounting in the upper end of the king bolt 16 through the medium of an antifriction bearing 91 which is seated in a counterbored recess 92 in the upper end of the king bolt.

It will be seen from the foregoing that when oil under pressure is forced into the lifting ram 47 the upward motion of the piston 66 will thrust upwardly on the rear pin 78 of the rocker member 83. The action of this upward thrusting force against the rear end of the rocking member is to cause the member to swing around the intermediate pivot 85, whereby to cause the rocker member to assume different angular positions around this intermediate pivot relatively to the frame plates 58. In assuming these different angular positions around the axis of the intermediate pivot 85, the outer roller end 87, 88 of the rocker member is prevented from moving downwardly by virtue of the fact that it is reacting downwardly against a stationary point or reaction which bears directly on the floor through the king bolt 16 and front wheels 12. Hence, while the rocker member 83 is changing its angular position relatively to the frame plates 58, with the outer end 87, 88 held against downward movement, it necessarily follows that the intermediate pivot 85 must rise. Thus, the front end of the lifting frame 11 is carried upwardly, notwithstanding the fact that the hydraulic ram 47 is carried by this same lifting frame and is exerting a downward reaction force against the frame through the oil pressure acting against the lower end of the cylinder 65. With continued introduction of oil into the cylinder 65, the rocker member 83 will continue to swing around the axis of the intermediate pivot 85 until the frame is in its fully raised position, as illustrated in Figure 3.

Referring now to the motion transmitting mechanism which transmits this lifting motion to the rear wheels 13 for causing the rear end of the truck to lift relatively to the rear wheels, this mechanism comprises a pair of vertically extending pull links 94 which have their upper ends pivotally mounted over the projecting ends of the pin 78 extending through the rear end of the rocker member 83. The lower end of each pulling link or lifting link 94 has pivotal mounting on a pivot pin 95 extending between a pair of closely spaced arms 96, 96 which extend forwardly from a rocker sleeve 98. This rocker sleeve is pivotally mounted to turn about a transverse pivot shaft 99 which has its ends mounted in the side rails 11 of the lifting frame. This rocker sleeve 98 extends across substantially the full width of the frame to carry pairs of forwardly extending arms 96 for effecting pivotal attachment to the lifting links 94 at each side of the hydraulic unit. The links 94 extend downwardly on the outer sides of the side plates 58 which define the compartment for housing the hydraulic unit. Projecting rearwardly from the rocker sleeve 98 adjacent its ends are pairs of arms 101 which carry pivot pins 102. Pivotally mounted on the pins 102 between the pairs of arms 101 are T-shaped coupling members 103 into which are threaded the forward ends of the previously described pull rods 36 which extend back to the swinging crank assembly 31 on which are mounted the rear wheels 13. It will be seen from the foregoing that when the hydraulic unit is actuated to transmit lifting motion to the front rocker member 83, the upward motion of the rear pin 78 relatively to the frame of the truck transmits an upward pull through links 94 which causes the rocker sleeve 98 to rotate in a clockwise direction around its mounting shaft 99 for transmitting a forward pull through the pull rods 36. This forward pull on the pull rods causes the crank arms 32 of the swinging crank assembly 31 to swing in a forward direction relatively to the frame for causing the rear wheels 13 to be moved in a forward and downward direction relatively to the frame. Such relative forward and downward movement of the wheels causes the rear end of the frame to swing upwardly, this occurring concurrently with the upward motion of the front end of the frame. The parts are so proportioned that the rear end of the frame rises at substantially the same rate as the front end of the frame so that the load is lifted and lowered substantially uniformly fore and aft.

Referring now to the manually actuated mechanism for operating the hydraulic pump 46 in the lifting operation, I have shown a pedal type of actuating mechanism in the exemplary embodiment of truck herein shown, but it will be understood that the pump can be actuated in other ways if desired. In some instances, truck operators prefer pedal actuation and in other instances they prefer handle actuation. In the pedal embodiment shown, the pumping pedal is indicated at 105, being pivoted at its rear end on a pivot pin 106 which extends through the frame plates 18 and 58 and which has its outer end supported in a reinforcing strap 107. The pedal is formed with a relatively wide hub 108 from the inner portion of which projects a forwardly extending arm 109

carrying a pivot pin 111. A link 112 extends upwardly from the pivot pin 111, on the outer side of the adjacent side plate 58 of compartment 53, and the upper end of this link has a long vertical slot 110 therein which engages over a pivot pin 113 which actuates pumping lever 114. The front end of this lever is formed with a laterally projecting portion 114' (Figure 2) for carrying the pin 113, and this laterally projecting portion extends outwardly through a slot 120 in the adjacent side plate 58 (Figure 3). The rear end of the pumping lever 114 has bearing mounting on a transverse pivot pin 116 which is supported at one end in the adjacent frame plate 58 and at the other end in a bracket 117 projecting forwardly from plate 57 (Figure 2). Pivotally mounted in a yoke portion of the pumping lever 114 is a roller 118 which is adapted to transmit downward strokes to the flat upper surface of a plunger head 119 secured to the upper end of the pump plunger 121. The plunger is thrust in an upward direction by a compression spring 122 which is confined between the plunger head 119 and a gland body 130 closing the upper end of the pump cylinder. By reason of the fact that the pumping lever 114 merely has a one-way pushing connection with the pump plunger through the medium of the roller 118, it is not necessary to disconnect any of the pump operating linkage when the hydraulic unit is removed down through the bottom of compartment 53, the plunger head 119 merely separating from the roller 118. While the truck is being maneuvered into position for picking up a load, or while it is transporting a load from one point to another, the foot treadle 105 is held in a substantially vertical position where it is entirely out of the way, this position being illustrated in full lines in Figure 1. The treadle is held in this upright position by a tension spring 123 which is pivotally connected at its lower end to the treadle in any suitable manner, such as by attachment to the link 112, and which has its upper end connected to the adjacent frame plate 58. This spring is of just sufficient tension to overcome the weight of the treadle. The provision of the lost motion slot 110 in link 112 permits the treadle to swing to this upright position, while the pumping lever 114 still remains in its substantial horizontal position. When the treadle is to be actuated for raising the truck, it is first swung down to the upper diagonal position indicated in dotted lines in Figure 1, from whence it is stroked upwardly and downwardly by the operator's foot, and the action of the spring 123, one of the lower positions being fragmentarily indicated by the dash and dot lines in Figure 1. As the truck frame moves upwardly in the lifting operation, the treadle is permitted to have a greater range of oscillatory movement, before striking the ground.

Referring again to the hydraulic pump 46, it will be seen from Figure 4 that as the pump piston 126 is moved upwardly in the pump cylinder 127, oil will be conducted from the reservoir 51 into the pump cylinder 127 through a suitable inlet valve 128 and associated passages, the details of which arrangement will be well understood by those skilled in the art. On the downstroke of the piston 126, oil will be forced from the cylinder 127 through suitable passageways and past the check valve 131 leading into the ram cylinder 65. The successive actuations of the hydraulic pump force the ram piston 66 upwardly to effect the lifting operation previously described.

Referring now to the release valve mechanism 48, it will be seen from Figure 4 that this mechanism comprises a stationary valve housing 134 having an axial bore 135 in which a ball type of release valve 136 is mounted. This valve is normally pressed upwardly into closing position against a tapered valve seat 137 by the action of a compression spring 138. The axial bore 135 has communication with the lower end of the ram cylinder area, and the valve port 137 has communication with radial ports 139 leading back into the reservoir 51. When the release valve 136 is forced downwardly off its seat 137, oil is free to flow from the lower end of the ram cylinder back into the reservoir through ports 139, whereby the piston of the ram is permitted to descend. The valve 136 is adapted to be forced downwardly off its seat 137 through downward thrusting motion imparted thereto by release plunger 141. This release plunger extends out through a gland packing 142 extending upwardly from the valve housing 134, and the upper end of the plunger carries a head 144 which is adapted to be forced downwardly by a release lever which I shall presently describe. A compression spring 145 normally holds the release plunger 141 in its raised position. When the release valve 136 is opened the rate of return flow from the ram to the reservoir is automatically governed by a velocity responsive control valve 147. These automatic regulating valves are well known to those skilled in the art and hence a detailed description is not necessary. It will suffice to say that the valve element 147 is balanced between two springs 149 and 151 in such manner that if the rate of release flow exceeds a predetermined velocity the valve shifts in an upward direction so as to exert a throttling action on laterally directed governing ports 152 formed in the stem 153. The oil issuing from the ports 152 flows upwardly to release valve 136 and its port 137. The lower end of the stem 153 connects with ports 155 which communicate with a passageway 156 extending from the lower end of the ram cylinder 65.

Two mechanisms are operative to open the release valve 136 for venting oil back into the reservoir, one mechanism being manually actuated for the purpose of lowering the lifting truck when it is desired to deposit the load, and the other mechanism being automatic and being brought into action when the lifting frame has reached a predetermined maximum height so as to prevent the possibility of the hydraulic mechanism being further actuated and causing damage to the parts after the lifting frame has been raised to its maximum position. Referring to Figure 5, the release plunger 141 is adapted to be forced downwardly by the rocking action of a release lever 158 carrying an adjustable screw 159 at its outer end adapted to bear on the plunger head 144. The lever 158 is secured to a rock shaft 161 which is journaled between the adjacent side plate 58 and frame plate 18. An arm 162 extends downwardly from the shaft 161 in position to be engaged by the front edge of a rocker arm 163 extending upwardly from a lower pedal shaft 164. The pedal shaft is journaled in the frame plate 18 and carries a release pedal 166 which is normally held in a substantially upright position by a tension spring 167. When the lift truck is to be lowered by manipulation of the pedal 165, the latter is swung forwardly and downwardly from its raised position so as to bring the arm 163 into engagement with the arm 162, whereupon further downward movement of the pedal is operative to rock the release lever 158 for opening the release valve 136. The auto-

matic actuation of the release valve is effected through an upwardly extending arm 171 which is also secured to the rock shaft 161. The upper end of the arm 171 is disposed in the path of a release lug or arm 172 which projects downwardly from the rocker member 83 or from the rocker shaft 85 in such position that the lug 172 engages the forward edge of the arm 171 and starts swinging the latter arm when the lifting frame has been raised approximately to its predetermined maximum position. This operates through the release lever 158 to open the release valve 136, thereby holding the lifting frame at this predetermined maximum position and preventing further upward movement of the frame.

While I have illustrated and described what I regard to be the preferred embodiment of my invention nevertheless it will be understood that such is merely temporary and that numerous modifications and rearrangements may be made therein without departing from the essence of the invention.

I claim:

1. In a lift truck for lifting pallets or skids, the combination of a frame, dirigible front wheel means supporting the front end of said frame, a swiveling king pin connecting said front wheel means with said frame, rear wheels for supporting the rear end of said frame, a handle arranged for pulling the truck and steering said front wheels, a rocker member pivotally mounted at a point intermediate its ends on the front end of said frame to extend substantially fore and aft thereof, hydraulic mechanism mounted on said frame and operatively connected to transmit upward thrusting motion against the rear end of said rocker member, means for transmitting downward thrusting force from the front end of said rocker member to said swiveling king pin whereby to lift the front portion of said frame, and means responsive to pivotal motion of said rocker member for causing lifting movement of the rear portion of said frame relatively to said rear wheels.

2. In a lift truck for lifting pallets or skids, the combination of a frame, dirigible front wheels supporting the front end of said frame, rear wheels for supporting the rear end of said frame, a handle for manually pulling the truck and steering said front wheels, a king bolt rising from said front wheels, a guide sleeve secured to said frame and movable vertically along said king bolt, a rocker member pivotally mounted on the front end of said frame to extend substantially longitudinally thereof and arranged to have its forward end exert downward thrust reaction on said king bolt, and a substantially vertical hydraulic lifting ram connected with the rear portion of said rocker member for causing rocking movement of said rocker member whereby to lift said frame.

3. In a lift truck for lifting pallets, skids or the like, the combination of a frame, dirigible front wheels supporting the front end of said frame, rear wheels for supporting the rear end of said frame, a handle connected for manually pulling the truck and steering said front wheels a king bolt rising from said front wheels, a guide sleeve secured to said frame and movable vertically along said king bolt, a rocker member pivotally mounted on the front end of said frame to extend substantially fore and aft of the frame and arranged to have its front end exert downward thrust reaction on said king bolt, a substantially vertical hydraulic ram connected between said

frame and the rear end of said rocker member for causing rocking movement of said rocker member to lift the front end of said frame relatively to said front wheels, and motion transmitting mechanism pivotally connected to the rear end of said rocker member for lifting the rear end of said frame relatively to said rear wheels.

4. In a lift truck, the combination of a frame, dirigible front wheels for supporting the front end of said frame, rear wheels supporting the rear end of said frame, a king bolt rising from said front wheels, a guide sleeve secured to said frame and movable vertically along said king bolt, a rocker member pivotally mounted on said frame to extend substantially fore and aft thereof and having its front end arranged to exert downward thrust reaction on said king bolt, and hydraulic lifting mechanism comprising a hydraulic ram pivotally mounted between said frame and the rear end of said rocker member for transmitting motion to said frame.

5. In a lift truck, the combination of a frame, dirigible front wheels for supporting the front end of said frame, rear wheels supporting the rear end of said frame, a king bolt rising from said front wheels, a guide sleeve secured to said frame and movable vertically along said king bolt, a rocker member pivotally supported intermediate its ends on said frame to extend substantially fore and aft of said truck and having its front end arranged to exert downward thrust reaction on said king bolt, a hydraulic ram having its lower end pivotally supported on said frame and having its upper end pivotally connected with the rear end of said rocker member for rocking said member relatively to said frame whereby to lift the front end of said frame relatively to said front wheels, and motion transmitting mechanism pivotally connected with the rear end of said rocker member for lifting the rear end of said frame relatively to said rear wheels.

6. In a lift truck, the combination of a frame, front supporting wheels for said frame, lifting mechanism for raising said frame relatively to said front wheels comprising a rocker member adapted to transmit downward reaction pressure to said front wheels, hydraulic mechanism for actuating said rocker member, said hydraulic mechanism comprising a ram and a pump, and a readily releasable mounting shaft for mounting said hydraulic mechanism on said truck whereby said ram and said pump can be removed as a unit from the truck by the release of said mounting shaft.

7. In a lift truck, the combination of a frame, supporting wheels for said frame, lifting mechanism for raising said frame relatively to said wheels, hydraulic mechanism for actuating said lifting mechanism, said hydraulic mechanism comprising a ram, a pump and a release valve, and readily releasable mounting means for mounting said hydraulic mechanism on said truck, said mounting means comprising a shaft on which said ram, pump, and release valve have tiltable support, and arranged whereby upon the release of said shaft said ram, pump and release valve can be removed as a unit from the truck without disassembling either said ram, pump or release valve.

8. In a lift truck, the combination of a frame, supporting wheels for said frame, lifting mechanism for raising said frame relatively to said wheels, hydraulic mechanism for actuating said lifting mechanism, said hydraulic mechanism comprising a ram, and a pump, releasable pivot

means pivotally connecting one end of said ram with said lifting mechanism, and releasable pivot means pivotally supporting the other end of said ram on said frame, said ram and said pump pivoting as a unit between said two pivot means, both of said releasable pivot means being adapted to be released for permitting said ram and said pump to be removed as a unit from the truck.

9. In a lift truck, the combination of a frame, front and rear wheels supporting said frame, a rocker member pivotally mounted on said frame, means responsive to rocking movement of said rocker member relatively to said frame for transmitting downward reaction force to said front wheels and thereby raising said frame relatively to said wheels, hydraulic mechanism for actuating said rocker member, said hydraulic mechanism comprising a ram, pump and release valve, upper pivot means pivotally connecting said ram with said rocker member, lower pivot means pivotally supporting said ram, pump and release valve on said frame, and means permitting ready removal of said lower pivot means whereby said ram, pump and release valve can be readily removed as a unit from the truck.

10. In a lift truck, the combination of a frame, supporting wheels for said frame, a rocker member pivotally mounted on said frame, a lifting mechanism responsive to rocking motion of said rocker member for raising said frame relatively to said wheels, hydraulic mechanism for actuating said rocker member, said hydraulic mechanism comprising a ram and a pump, manual actuating means for actuating said pump, a one-way pushing connection between said ram and said rocker member, a one-way pushing connection between said manual actuating means and said pump, and readily releasable mounting means for said hydraulic mechanism enabling said ram and said pump to be removed as a unit from the truck, said one-way pushing connections facilitating the separation of said ram and pump from said rocker member and said manual actuating means in the removal of the hydraulic mechanism from the truck.

11. In a lift truck, the combination of a frame, supporting wheels for said frame, a rocker member pivotally mounted on said frame, lifting mechanism responsive to rocking movement of said rocker member for lifting said frame relatively to said wheels, hydraulic mechanism for actuating said rocker member, said hydraulic mechanism comprising a ram, a pump and a release valve, readily releasable mounting means for said hydraulic mechanism enabling said ram, pump and release valve to be removed from the truck as a unit, manual pumping means for actuating said pump, manual release means for actuating said release valve, a one-way pushing connection between said ram and said rocker member, a one-way pushing connection between said manual pumping means and said pump, and a one-way pushing connection between said manual release means and said release valve, said one-way pushing connections facilitating the ready removal of said hydraulic mechanism from the truck.

12. In a lift truck, the combination of a frame, supporting wheels for said frame, hydraulic lifting mechanism for causing lifting motion of said frame relatively to said wheels, said hydraulic lifting mechanism comprising a pump, a treadle for actuating said pump, spring means normally tending to hold said treadle in an upwardly extending non-operating position, and motion transmitting means including a lost motion connection which is operative to transmit motion from said treadle to said pump only after said treadle has been swung down to a lower operating position below said non-operating position.

13. In a lift truck, the combination of a frame, supporting wheels for said frame, a rocker member rockably mounted on said frame, hydraulic mechanism mounted on said frame for rocking said rocker member, means actuated by said rocker member for transmitting downward reaction forces against said supporting wheels for lifting said frame, said hydraulic mechanism comprising a pump, a treadle for actuating said pump, spring means normally tending to hold said treadle in an upwardly extending non-operating position, and motion transmitting means including a lost motion connection which is only operative to transmit motion from said treadle to said pump after said treadle has been swung down to a lower operating position below said non-operating position.

14. In a lift truck, the combination of a frame, supporting wheels for said frame, a rocker member rockably mounted on said frame, hydraulic mechanism mounted on said frame and operatively connected to rock said rocker member, means actuated by said rocker member for transmitting downward reaction forces against said supporting wheels for lifting said frame, said hydraulic mechanism comprising a release valve, manually actuated means operative to open said release valve for lowering the frame, and automatically actuated means operative to open said release valve in response to rocking movement of said rocker member for preventing continued operation of said hydraulic lifting mechanism after said frame has been raised to a predetermined maximum height.

15. In a lift truck, the combination of a frame, supporting wheels for said frame, a rocker member rockably mounted on said frame, hydraulic mechanism mounted on said frame and operatively connected to rock said rocker member, means actuated by said rocker member for transmitting downward reaction forces against said supporting wheels for lifting said frame, said hydraulic mechanism comprising a release valve, a release pedal operative to open said release valve for lowering the frame, spring means normally holding said release pedal in an upwardly extending, nonoperating position, and automatically actuated means operative to open said release valve in response to rocking movement of said rocker member, whereby said hydraulic mechanism is prevented from exerting continued lifting force after said frame has been raised to a predetermined maximum position.

16. In a lift truck for lifting pallets, skids and the like, the combination of a frame, dirigible front wheels for supporting the front end of said frame, rear wheels supporting the rear end of said frame, a swiveling king bolt rising from said front wheels, means supporting the front end of said frame on said king bolt for vertical movement thereon, a hydraulic ram mounted on said frame in rear of said king bolt, a supporting structure extending upwardly from said frame between said king bolt and said hydraulic ram, a walking-beam type of rocker having pivotal support intermediate its ends on said supporting structure, and having its front end extending forwardly across the top of said king bolt and having its rear end extending rearwardly across the top of said hydraulic ram, means for trans-

mitting upward thrusting force from said hydraulic ram to the rear end of said rocker beam, and means for transmitting downward thrusting force from the front end of said rocker beam to said king bolt.

17. In a lift truck for lifting pallets, skids and the like, the combination of a frame, dirigible front wheels for supporting the front end of said frame, rear wheels supporting the rear end of said frame, a swiveling king bolt rising from said front wheels, means supporting the front end of said frame on said king bolt for vertical movement thereon, a hydraulic ram mounted on said frame in rear of said king bolt, a supporting structure extending upwardly from said frame between said king bolt and said hydraulic ram, a walking-beam type of rocker having pivotal support intermediate its ends on said supporting structure, and having its front end extending forwardly across the top of said king bolt and having its rear end extending rearwardly across the top of said hydraulic ram, means connecting said hydraulic ram to the rear end of said rocker beam, anti-friction pressure transmitting means effective between the front end of said rocker beam and the top end of said king bolt for transmitting downward pressure to said king bolt, bell crank lever means pivotally mounted on said frame, link means pivotally connected between the rear end of said rocker beam and one arm of said bell crank lever means for transmitting oscillatory movement to said lever means when said rocker beam is rocked to raise the frame, and motion transmitting link means extending from the other arm of said bell crank means to said rear wheels for lifting the rear end of said frame relatively to said rear wheels.

18. In a lift truck for lifting pallets or skids, the combination of a frame, front and rear wheels for said frame, a handle arranged for pulling the truck and steering said front wheels, a rocker member pivotally mounted at a point intermediate its ends on the front end of said frame to extend substantially fore and aft thereof, hydraulic mechanism mounted on said frame and operatively connected to transmit upward thrusting motion against the rear end of said rocker member, means for transmitting downward thrusting force from the front end of said rocker member to said front wheels whereby to lift the front portion of said frame, and means

responsive to pivotal motion of said rocker member for causing lifting movement of the rear portion of said frame relatively to said rear wheels.

19. In a lift truck for lifting pallets, skids or the like, the combination of a frame, front and rear wheels for said frame, a handle connected for pulling the truck and steering said front wheels, a rocker member pivotally mounted on said frame to extend substantially longitudinally thereof and having its front end arranged to exert downward thrust reaction on said front wheels, hydraulic mechanism for causing pivotal motion of said rocker member, and means connected with the rear end of said rocker member for causing lifting movement of the rear portion of said frame relatively to said rear wheels.

20. In a lift truck for lifting pallets, skids or the like, the combination of a frame, front and rear wheels for said frame, a handle connected for pulling the truck and steering said front wheels, a rocker member pivotally mounted at a point intermediate its ends on the front portion of said frame and extending substantially fore and aft of said frame, lifting mechanism mounted on said frame and operatively conected to transmit upward thrusting motion against the rear end of said rocker member, means for transmitting downward thrusting force from the front end of said rocker member to said front wheels whereby to lift the front portion of said frame, and means responsive to upward pivotal motion of the rear end of said rocker member for causing lifting movement of the rear portion of said frame relatively to said rear wheels.

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