

Oct. 27, 1959

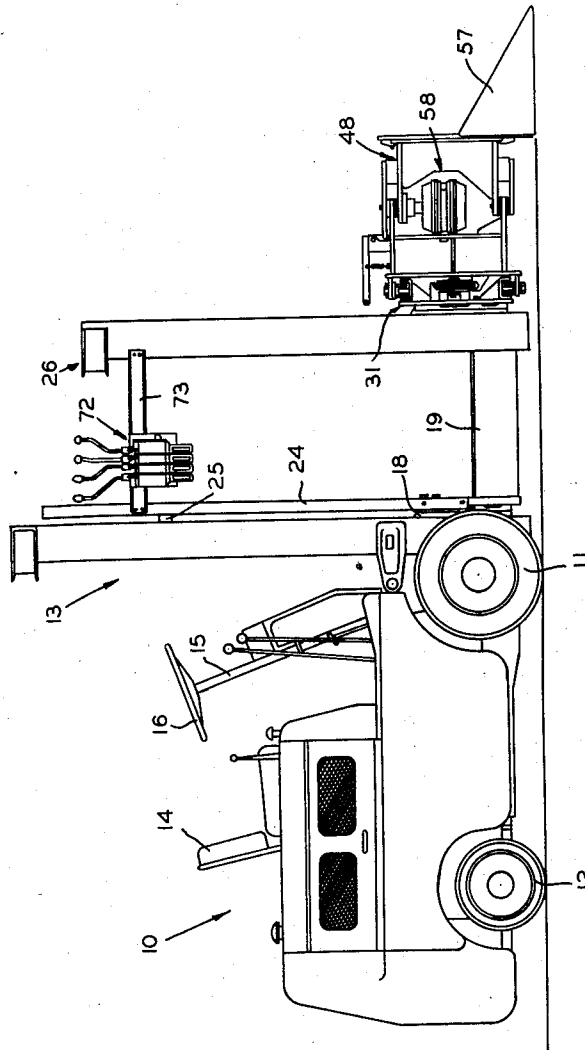
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INDUSTRIAL LIFT TRUCK

2,910,204

Filed July 5, 1957

5 Sheets-Sheet 1

FIG. 1



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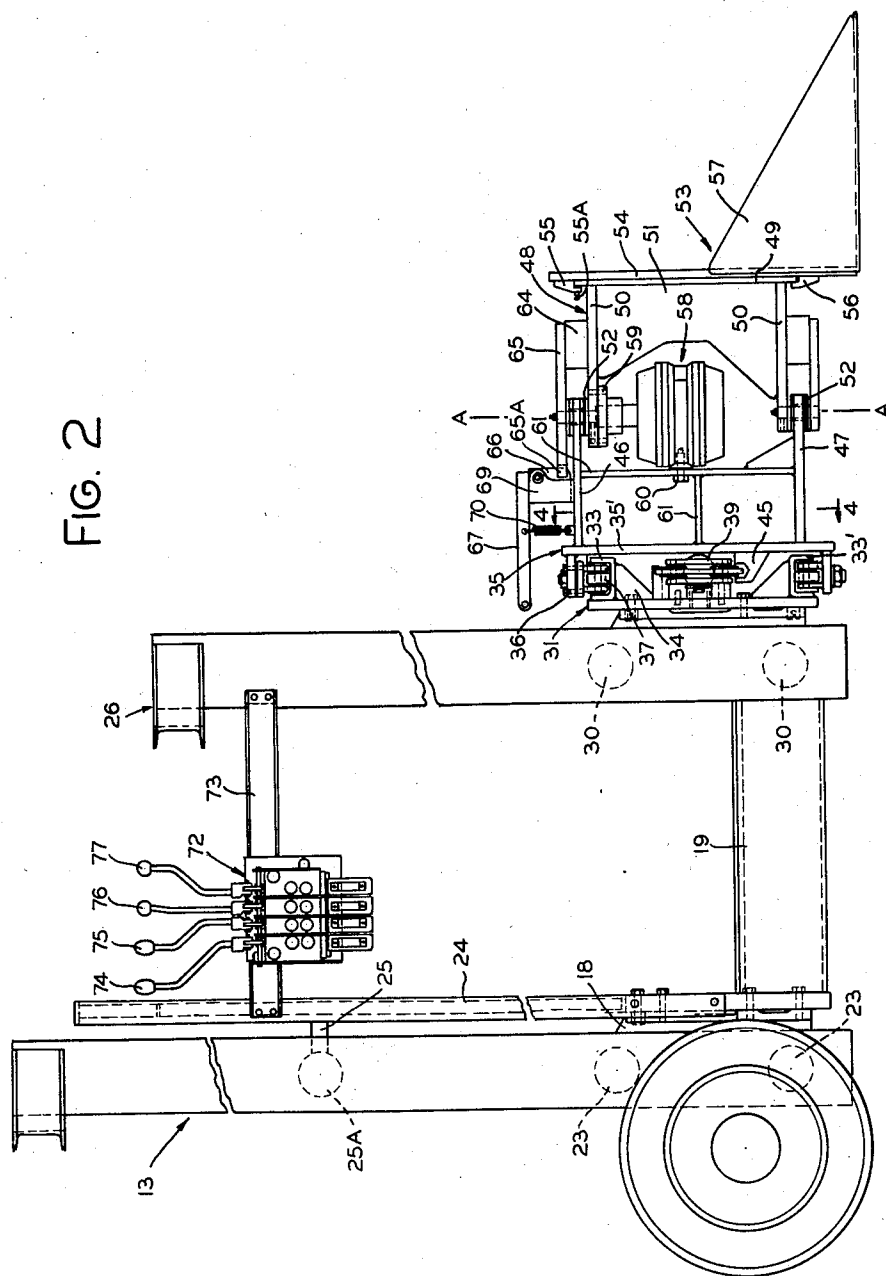
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INDUSTRIAL LIFT TRUCK

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Fig. 2



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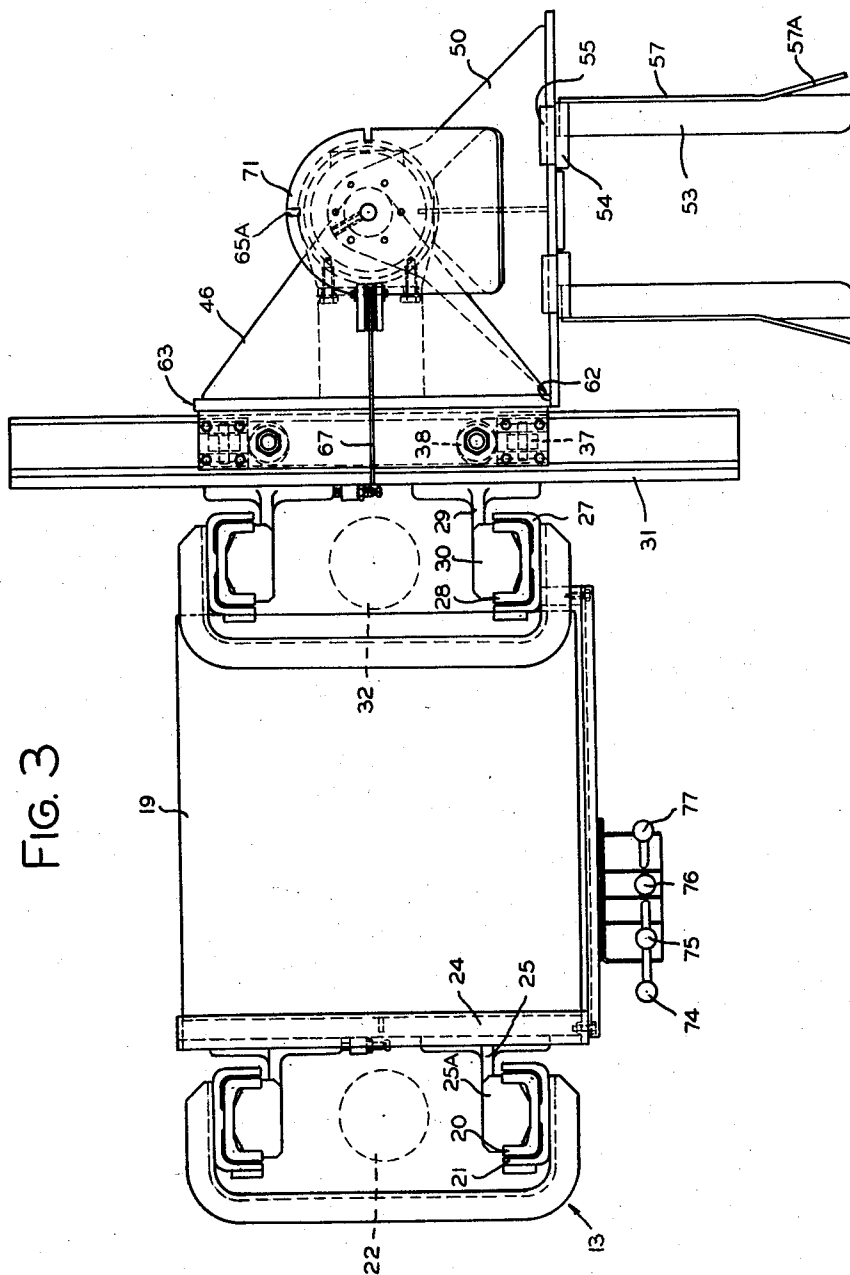
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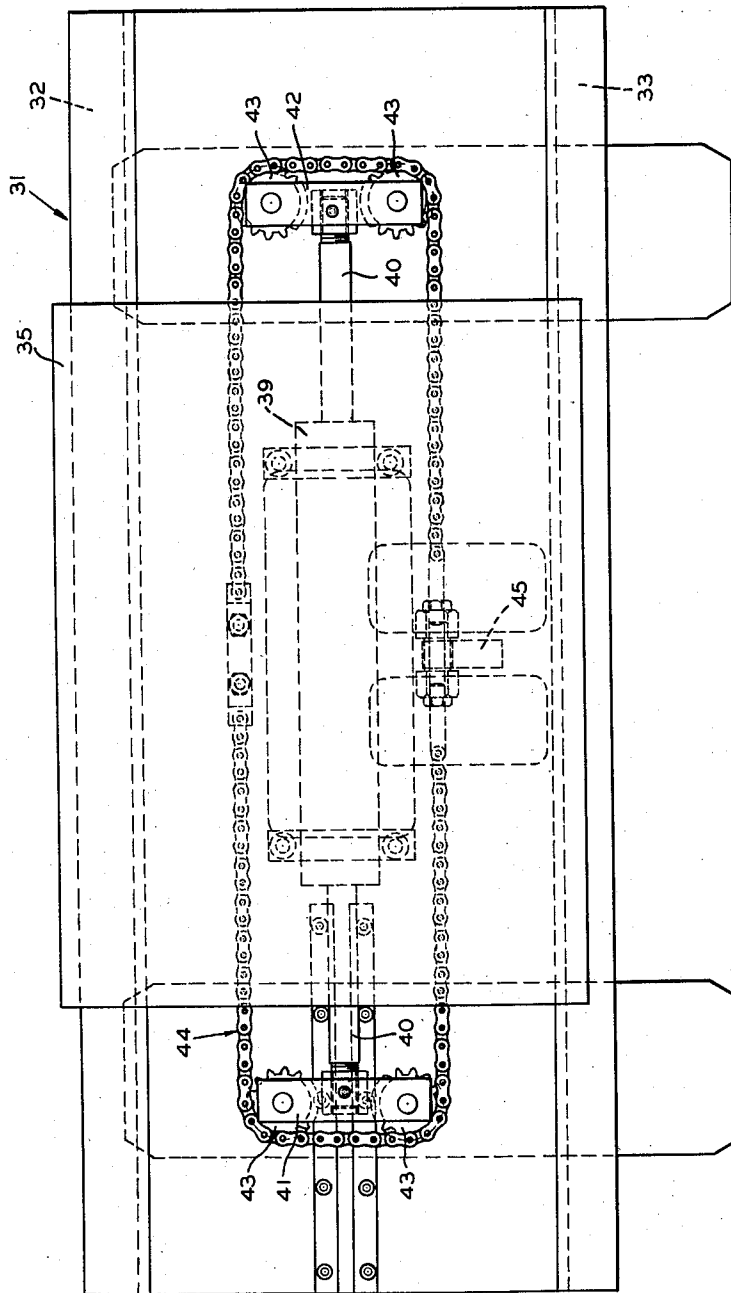
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FIG. 4



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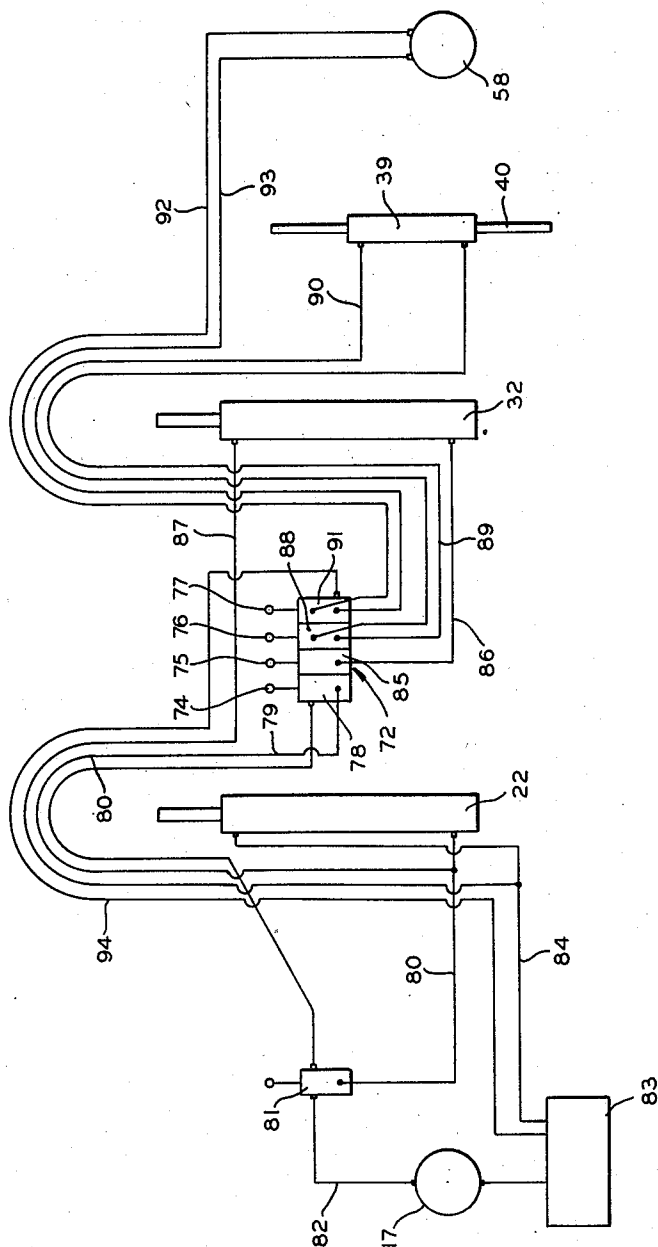
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5 Sheets-Sheet 5

FIG. 5



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2,910,204

INDUSTRIAL LIFT TRUCK

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Application July 5, 1957, Serial No. 670,219

10 Claims. (Cl. 214—730)

This invention relates to industrial lift trucks and more particularly to trucks such as are adapted for transporting, stacking and tiering boxes, bales, loaded pallets and the like in confined narrow areas, as the aisles of a warehouse.

Conventionally, such lift trucks are provided with a vertical mast having its lower end either rigidly or pivotally mounted forwardly of the truck, and, on which mast, a loading fork or the like is arranged to be raised and lowered. Engagement of the fork with a box or other load is usually obtained by steered manipulation of the truck and, for which reason, relatively wide aisles between each tier or stacks have been necessary to provide adequate room in which the truck can turn to load and unload.

It is therefore a principal object of the present invention to provide an industrial lift truck with means by which it can load and unload from the side as well as from forwardly of the truck without having to turn the truck itself. Not only does this permit a much narrower working aisle between tiers so as to leave more useable storage area in the warehouse but it also simplifies the procedure of loading and unloading and considerably speeds up the stacking or unstacking or operation.

More specifically, it is an object of the present invention to provide a carriage which may not only be raised and lowered relative to the vertical mast of a lift truck but also may be shifted laterally of said mast and further supports a loading fork or other load engagement member for swinging movement about a vertical axis. By such an arrangement, the loading fork may be manipulated to permit, for example, loading boxes from a conveyor forwardly of the truck and then by raising, rotating and laterally shifting the fork stacking the boxes in tiers on either side of the truck.

A further object of the invention is to provide an operator's riding platform which will move vertically on the truck's mast and which platform will support the side loader such as described, the control for manipulating the side loader as well as raising and lowering of the platform on the mast being located for convenient access by an operator riding on the platform. By such an arrangement the operator can move vertically with the load so that, at all times, he will be in a position to visably gauge the relationship of the loading fork to the load and therefore more accurately manipulate the fork to pick up or deposit a load regardless of whether it is being stacked in high tiers or being removed from such storage places.

A further object of the invention is to provide a double tandem upright intermediate construction which is provided an operator's control platform from which the operator can control all movements of the loading fork as he rides up and down on the platform, the platform being supported for vertical movement on the primary upright, the loading fork being supported for vertical movement on the secondary upright, and said secondary upright being supported by the platform.

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Since one of the contemplated uses of the invention will be unloading boxes or the like from a conveyor belt and stacking on either side, or in reverse, it is a further object of the invention to provide means by which the fork or other load engagement member may be accurately positioned for forward as well as side loading and unloading operations. Thus, it is a feature of the invention that stop means are provided which will limit the rotation of the forks to a 180° swing and at which limits the forks will face in directions at 90° to the longitudinal axis of the truck. Further it is proposed to provide releasable means such as a hand manipulatable spring-tensioned catch by which the forks may be positively aligned at a position midway of its swing, that is directly ahead of the truck, so as to be in line, for example, with the conveyor during a loading or unloading operation.

A further object of the invention is to provide a simple, and uncomplicated but relatively strong construction for mounting a loading fork or the like on a truck which will permit the fork to be raised and lowered through a vertical plane, moved laterally of the truck in a horizontal plane and also rotated to selectively face forward or to either side of the truck.

Still another object is to provide such a construction which will also be convenient to operate and, in addition, economical and practical to manufacture.

Thus it is a feature of a loading device constructed according to the present invention, in addition to those previously described, that the primary and auxiliary uprights or masts each comprise a pair of telescopically arranged members which may be retracted into a compact structure or extended to obtain maximum lift of the platform and/or elevation of the fork relative to the platform.

A further feature is the provision of auxiliary means spaced above the primary means by which the platform is mounted to move vertically on the primary mast so as to provide support for off center loads being manipulated by the loading fork at elevated levels.

Still another feature of the invention is the provision of the support, which is mounted for vertical movement on the auxiliary mast, with forwardly disposed upper and lower oppositely faced channel members in which is slidably supported a carriage to which the loading fork is rotatably supported, said carriage having thrust rollers bearing in said channel members in vertical as well as horizontal planes to permit a smooth sliding yet positive support of the fork in a manipulation thereof sidewise of the truck.

Many other objects and advantages of the invention will be at once, or will become, evident to those skilled in the art from the more specific description of a preferred embodiment of the invention which follows and it will be understood that said description to follow is not to be taken in a limiting sense but merely as illustrative of how the invention may be practiced in accordance with the spirit of the invention as defined in the appended claims.

Now referring to the drawings:

Figure 1 is a side elevational view of an industrial truck to which the described device embodying the present invention has been applied;

Figure 2 is a side elevational view on a larger scale showing details of the device;

Figure 3 is a top plan view of the device with the loading fork turned at 90° to the right of its position as illustrated in Figure 2;

Figure 4 is a view taken along lines 4—4 in Figure 2 looking in the direction indicated by the arrows; and

Figure 5 is a schematic view of the hydraulic system employed to manipulate the movable parts of the device, such as the loading fork and platform.

Now referring to the several views wherein like refer-

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ence numerals are used to identify like parts, an industrial lift truck 10 is illustrated in Figure 1 having driving wheels 11 at the forward end thereof, and steering wheels 12 at the rear end thereof. The truck, adjacent its forward end is provided with a vertical mast 13 which may be pivotally mounted for limited fore and aft movement although, preferably for the purposes of the present invention, will be rigidly mounted, and is suitably counter-balanced. The truck 10 is provided with a driver's seat 14 which is disposed adjacent the steering column 15 operatively connected to the rear steering wheels 12. A conventional hand steering wheel 16 is mounted at the upper end of the column 15 and is adapted to be manipulated by an operator of the truck when seated on seat 14. The truck 10 is provided with a power plant, such as an internal combustion engine, having pump means 17 associated therewith for developing fluid under pressure which is used for raising and lowering a carriage 18 guided for vertical movement within mast 13. Fluid under pressure is also used for actuating the device of the present invention in a manner to be described hereinafter.

As best shown in Figures 2 and 3, the device of the present invention comprises a platform 19 secured by bolts or the like to carriage 18. Preferably vertical mast 13 comprises an inner pair 20 and an outer pair 21 of telescopically arranged channel-like upright members and has a hydraulic cylinder 22 interposed between said pairs for raising and lowering carriage 18. This carriage 18 which supports platform 19 is mounted by means of suitable rollers 23 within the inner telescoping channel uprights 20, and through a suitable chain or cable means controlled by the hydraulic cylinder, may be raised and lowered relative to the mast 13, with the inner upright 20 telescoping upwardly from the stationary upright 21 for extreme high lift of platform 19. The details of this mechanism are more or less conventional, and it is not believed necessary to describe the same more specifically herein. This mechanism may, for example, be of the type which is disclosed in detail in Patent No. 2,514,052, granted July 4, 1950, to Alfred Wayne Gunning.

Platform 19 is provided with a safety rack 24 which is attached to the rear edge of the platform to protect an operator riding on the platform from said uprights 20 and 21 as he is raised and lowered relative thereto. To provide additional support for off center loads, auxiliary brackets 25 are secured to rack 24 in spaced relation above the connection of carrier 18 with the platform 19, and provided with auxiliary rollers 25A which also ride in inner channel uprights 20.

Mounted on the forward side of platform 19 is auxiliary or forward mast 26 which is of a construction similar to the primary or rear mast 13 in that it comprises a pair of U-shaped channel uprights 27 rigidly secured at their lower ends to the forward edge of platform 19 and have a pair of telescoping inner channel uprights 28 mounted for sliding movement therein and within which are rollers 30 carried by brackets 29 connected to member 31 for raising and lowering the same relative to said forward mast 26 through the operation of hydraulic cylinder 32 interposed between the pairs of telescopically arranged uprights. Raising and lowering of said member 31 on said mast 26 is also accomplished through suitable means such as a cable or chain controlled by the hydraulic cylinder 32, the inner uprights 28 telescoping upwardly from the fixed uprights 27 for extreme high lift of member 31 relative to platform 19.

As seen best in Figure 2, member 31 comprises a supporting plate having a pair of oppositely faced U-channelled guides 33 and 33' secured adjacent its upper and lower edges on the forward side thereof so as to be in spaced parallel relation and being braced by means 34. Said guides 33 and 33' are of a sufficient length to extend laterally of the forward mast 26 and beyond the limits of the platform on either side and serve to support a carriage 35 for movement longitudinally thereof.

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Said carriage includes a plate 35', to the upper and lower edge portions of which is welded or otherwise secured at opposite sides, rearwardly extending arms 36 to each of which are secured a pair of thrust rollers 37 and 38 which ride in upper and lower channel guides 33 and 33' to slidably support carriage 35 thereon. Rollers 37 are rotatably supported in a vertical plane so as to engage the base of said channelled pieces while rollers 38 are rotatably supported in a horizontal plane at right angles to rollers 37 so as to engage the sides of the channel guides, thus substantially eliminating play to obtain positive support while permitting smooth sliding movement of the carriage 35 in directions transversely of mast 26 and platform 19.

Motion of carriage 35 is accomplished as seen best in Figures 3 and 4, by means of hydraulic cylinder 39 which is mounted on plate 31 intermediate a pair of upper and lower guides 33 and 33'. Said cylinder 39 has a double ended piston rod 40 operatively associated therein on the ends of which are supported cross pieces 41 and 42, each carrying a pair of sprockets 43 for drivingly engaging continuous chain 44 which is secured by means 45 to carriage plate 35. It will be apparent that, by appropriate displacement of fluid in cylinder 39, piston rod 40 can be caused, through supports 41 and 42, sprockets 43, chain 44, and connection 45, to drive carriage plate 35 in a direction either to the left or to the right of platform 19 as may be desired, the carriage plate moving 2 inches for each inch of travel of the piston rod 40.

Projecting forwardly of carriage plate 35 and adjacent the upper and lower edges thereof are secured a pair of pivot plates 46 and 47 between which is rotatably supported a loading device indicated generally at 48 and which comprises a vertically extended attachment plate 49 to which are welded a pair of rearwardly extended horizontal pivot plates 50 reinforced by spacer 51 and rotatably connected by means 52 to said plates 46 and 47 of carriage 35.

Detachably mounted on attachment plate 49 is the loading member which, in the described embodiment, is illustrated as a pair of fork tongs 53, each of which includes an upright portion 54 which lies flat against attachment plate 49 and is provided with guide portions 55 and 56 on their rear side to fit over the upper and lower edges of plate 49, said forks 53 each being further provided with side guides 57 having outwardly deflected ends 57A. By the aforesaid means of attachment, forks 53 are laterally adjustable on the upper and lower edges of said attachment plate 49 to a desired spacing in accordance with the size of boxes or the like being loaded and may be subsequently locked in place by tightening lock nut 55A so that it bears against plate 49. Rotation of the loading device 48 is powered through actuation of a suitable hydromotor 58, said hydromotor 58 being operatively connected at 59 to the upper end of pivot plates 50. Hydromotor 58 is mounted on carriage 35 by means 60 to cross brace 61 and reinforced by another brace 61. Stops 62 and 63 are provided on carriage plate 35 for limiting the side rotation of the forks 53 to a 180° swing, at the ends of which swing the loading fork 53 will be facing in a direction at right angles to the longitudinal axis of the truck and parallel to the direction in which carriage 35 is movable on guides 33 and 33'.

Mounted on upper plate 50 is spacer 64 which rigidly supports alignment plate 65 to rotate with the loading member 48 about vertical axis A—A. The rear edge of said alignment plate 65 has a notch 65A in which portion 66 of hand lever 67 engages. Hand lever 67 is pivotally connected by means 68 between bosses 69 mounted on upper plate 46 or carriage 35, so as to move with said carriage 35 and is maintained in a normally horizontal position through spring 70, which thereby acts to hold portion 66 in notch 65A. Notch 65A is preferably located so that when engaged by portion 66 the loading forks 53 will be directly in line or parallel with the longitudinal

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axis of the truck and midway of their swing as limited by stops 62 and 63.

Portion 66 may be moved out of notch 65A by lifting handle 67 against the tension of spring 70 to permit hydromotor 58 to swing the loading forks 53 from a position forwardly of the truck as seen in Figure 2 to one facing sidewise of the truck, as illustrated in Figure 3, portion 66 following along the curved edge 71 of alignment plate 65 as the forks are rotated either to the left or right side positions, and spring 70 serving to automatically force portion 66 back into notch 65A as loading device 54 is swung to relocate forks 53 in their forward position.

Remote control means indicated generally as 72 (Fig. 2) are mounted on a cross piece 73 connecting safety rack 24 and auxiliary mast 26 and are at a height for convenient operation by an operator standing on platform 19. Said control means 72 preferably comprises four operating levers 74, 75, 76 and 77 by means of which all of the required motions may be imparted to the platform 19 and to the loading forks 53.

As seen best in Figure 5, lever 74 operates a valve 78 connected through hose line 80 to base of cylinder 22 which elevates platform 19 on the primary mast 13. Said valve 78 receives oil through line 79 delivered by pump 17 from sump 83 through valve 81 which is connected to pump 17 by line 82, and line 84 vents top of cylinder 22 to sump 83. Thus by suitable manipulation of lever arm 74 fluid may be pumped into cylinder 22 to raise the platform or evacuated therefrom to permit lowering of the platform. Figure 5 also illustrates that main valve 81 (located in the truck 10) is also connected to line 80, as is conventional whereby the raising and lowering of platform 19 may be controlled either from the truck 10 or through the operation of lever 74 on the platform 19.

The next lever 75 serves to control the elevation and lowering of side loader carriage 31 on mast 26 through the operation of a valve 85 which is connected via hose line 86 to the base of the auxiliary lift cylinder 32. This valve also receives oil through line 80 which is connected to pump 17 through valve 81 by means of line 82. Cylinder 32 is connected to the sump 83 by vent line 87 which is connected to vent line 84. Lever 76 serves to operate valve 88 which is connected by hose line 89 to one side of cylinder 39 and to the opposite side through line 90 whereby through suitable actuation piston 40 may be driven to the right or to the left so as correspondingly shift carriage 35 to move the loading device to the left or right of the truck as may be required. Finally, lever 77 serves to operate valve 91 which is connected via hose 92 and 93 to opposite sides of the hydromotor 58 and thus serve to rotate the same in one direction or the other and correspondingly swing the loading device 48. Valves 88 and 91 are also connected to pump 17 through valve 81 by means of lines 80 and 82. All four valves discharge, when not operating, directly to the sump 83 through line 94; and return oil from cylinder 39 and hydromotor 58 also goes to sump 83 via line 94 when either valve 88 or valve 91 is operated.

In utilizing the loading device, the operator will normally ride on the platform 19 so as to have visible command of the loading operation. Assuming that the loading forks 53 are in their forward position, as determined by lever 67, to pick up boxes or other objects being delivered on a conveyor belt with which the truck 10 is aligned, the boxes are picked up on the loading forks 53 and raised by the operation of lever 74 which simultaneously serves to raise the platform 19 on which the operator is riding. Optionally and depending on the level at which the boxes are to be stacked, lever 75 may be alone operated, in which event the platform will not be raised; or both levers 74 and 75 may be operated, depending on the convenience and/or requirement of the operator. Lever 77 may be then operated after raising lever 67, to actuate the hydromotor and swing the forks with their load until member 49 abuts stops 62 or 63

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as the case may be and so that the load faces sidewise of the truck. Conceivably, where the loading operation takes place in narrow aisles it may be necessary to move the load sidewise coincidentally with rotation in order to clear the corner of the load. In this case, the carriage 35 might be moved first to the right, for example, by suitable actuation of lever 76 to relocate axis A—A before actuating lever 77 to provide sufficient room for a swing to the left of the forks 53 about said axis to unload. Thereupon the operator will operate lever 76 to move the loading forks toward the tier or stack where it is to be discharged.

To withdraw the forks and rotate them to their forward position, levers 76 and 77 are respectively actuated in reverse, portion 66 riding back along edge 71 of plate 65 until it catches in notch 65A under the tension of spring 70 to automatically stop the swing of the forks under the action of the hydromotor 58 whereupon the forks are again in their forward position and can be lowered to pick up the next box.

One of the important advantages of the construction thus far described lies in the fact that the platform and side loading mechanism are comprised as a unit which may be readily mounted on the mast of conventional industrial lift trucks so as to temporarily or permanently adapt such trucks to this new utility. It is also to be understood that other means than the described loading forks 53 might be rotatably mounted on carriage 35.

It will thus be evident that all of the objects, advantages and features of the invention have been demonstrated as obtainable in a convenient simple, practical manner.

Now having described my invention, I claim:

1. A load supporting carriage for an industrial lift truck having a vertical mast and a member mounted on said mast for vertical movement relative thereto, said load supporting carriage comprising a platform to be secured to said member, a secondary mast on said platform, a support movably mounted on said mast, a slide member mounted on said support for transverse horizontal movement laterally of the platform and a load engaging member pivotally secured to said slide member for swinging movement to either side about a vertical axis whereby loads may be engaged to either side as well as forwardly of a truck on which said load supporting carriage is mounted.

2. A load supporting carriage according to claim 1 wherein said platform is provided with a vertical mast on which the support is mounted for vertical movement thereon whereby the load engaging member may be raised and lowered relative to the platform.

3. A load supporting carriage according to claim 2 wherein control means are provided on said platform for raising and lowering the platform, raising and lowering the support relative to the platform, for moving the slide member laterally of the platform and for swinging the load engaging member.

4. A load supporting carriage according to claim 1 including stop means for limiting the extent to which the load engaging member may be swung.

5. A load supporting carriage according to claim 1 including releasable means by which the swing of the load engaging member may be arrested to hold the load engaging member in a predetermined position intermediate the limits of its swing.

6. A loading device for use with an industrial truck comprising a primary vertical telescoping mast, a platform mounted on said primary mast so as to be elevatable relative thereto, a secondary vertical telescoping mast supported by the platform, and load engagement means carried by said secondary mast for vertical movement with respect thereto, said load engagement means being mounted to swing about a vertical axis from a position facing forwardly of the truck to a position at right angles thereto.

7. A loading device according to claim 6 including

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means for releasably holding said load engagement means in said position facing forwardly of the truck and stop means for limiting the extent to which said means may be swung to either side thereof.

8. A loading device according to claim 6 wherein the load engagement means is rotatably supported from a carriage, said carriage being slidably mounted on a support for horizontal movement in a direction laterally of the truck, and said support being mounted on the secondary mast for vertical movement thereon.

9. In an industrial lift truck having a vertical mast, the combination of a platform vertically movable on said mast, an auxiliary vertical mast mounted on the platform, a support movably mounted on said auxiliary mast, a slide member mounted on said support to move in a horizontal plane in directions laterally of said truck, and load engagement means rotatably supported by said slide member for swinging movement about a vertical axis, means limiting the extent of said swinging movement, and control means on said platform for controlling the raising and lowering of the platform, the raising and lower-

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ing of said support relative to the platform, the lateral adjustment of the slide member on said support and the swinging of the load engagement means on said slide member.

10. The combination according to claim 9 further including means operable by an operator riding on said platform to releasably arrest the swing of the load engagement means so as to hold the same in a position where it faces forwardly of the truck.

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