April 21, 1942. W. STUEBING, JR 2,280,104

LIFT TRUCK

Filed Dec. 14, 1940 3 Sheets-Sheet 1

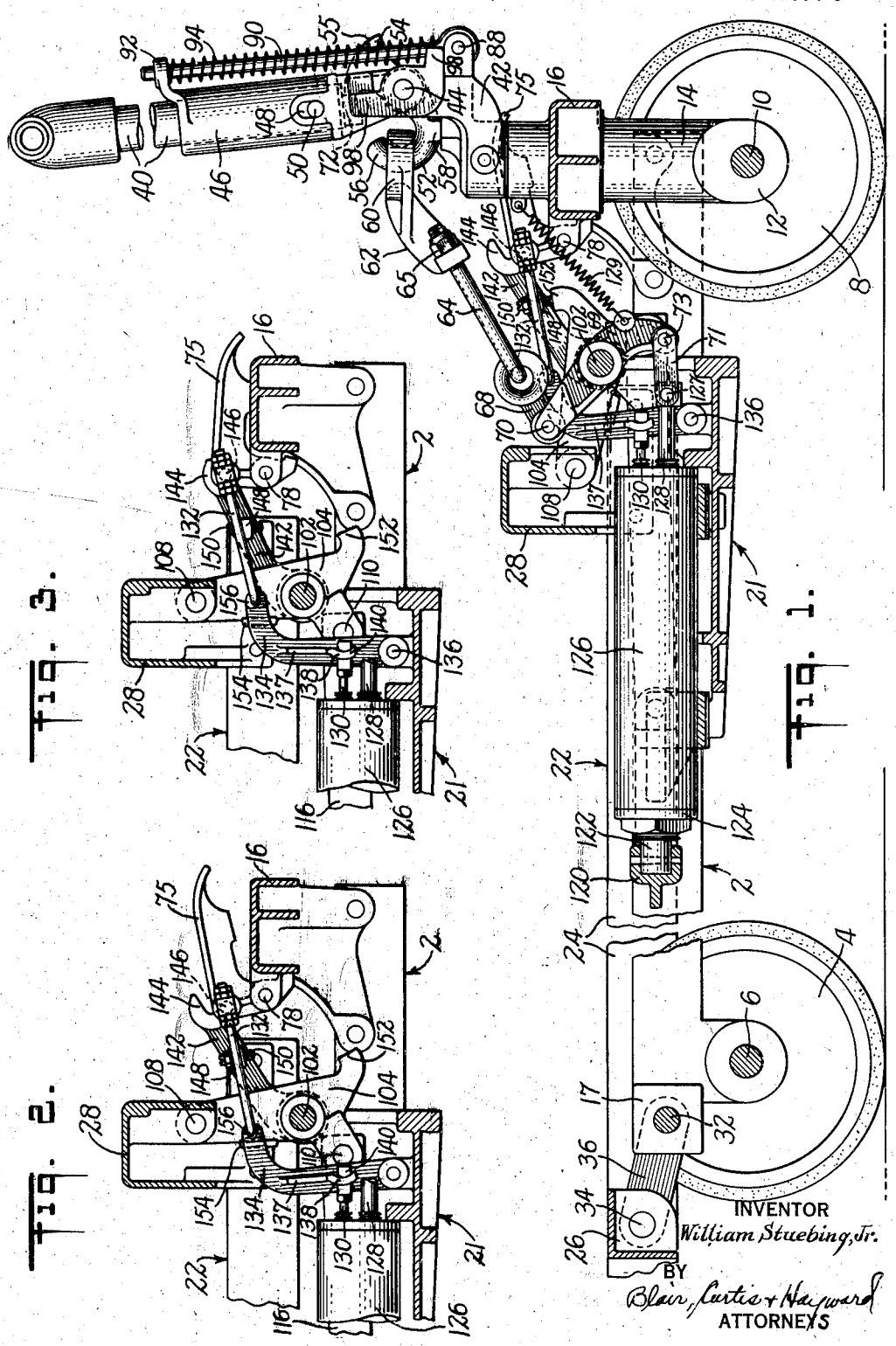


Fig. 1.

Fig. 3.

Fig. 2.

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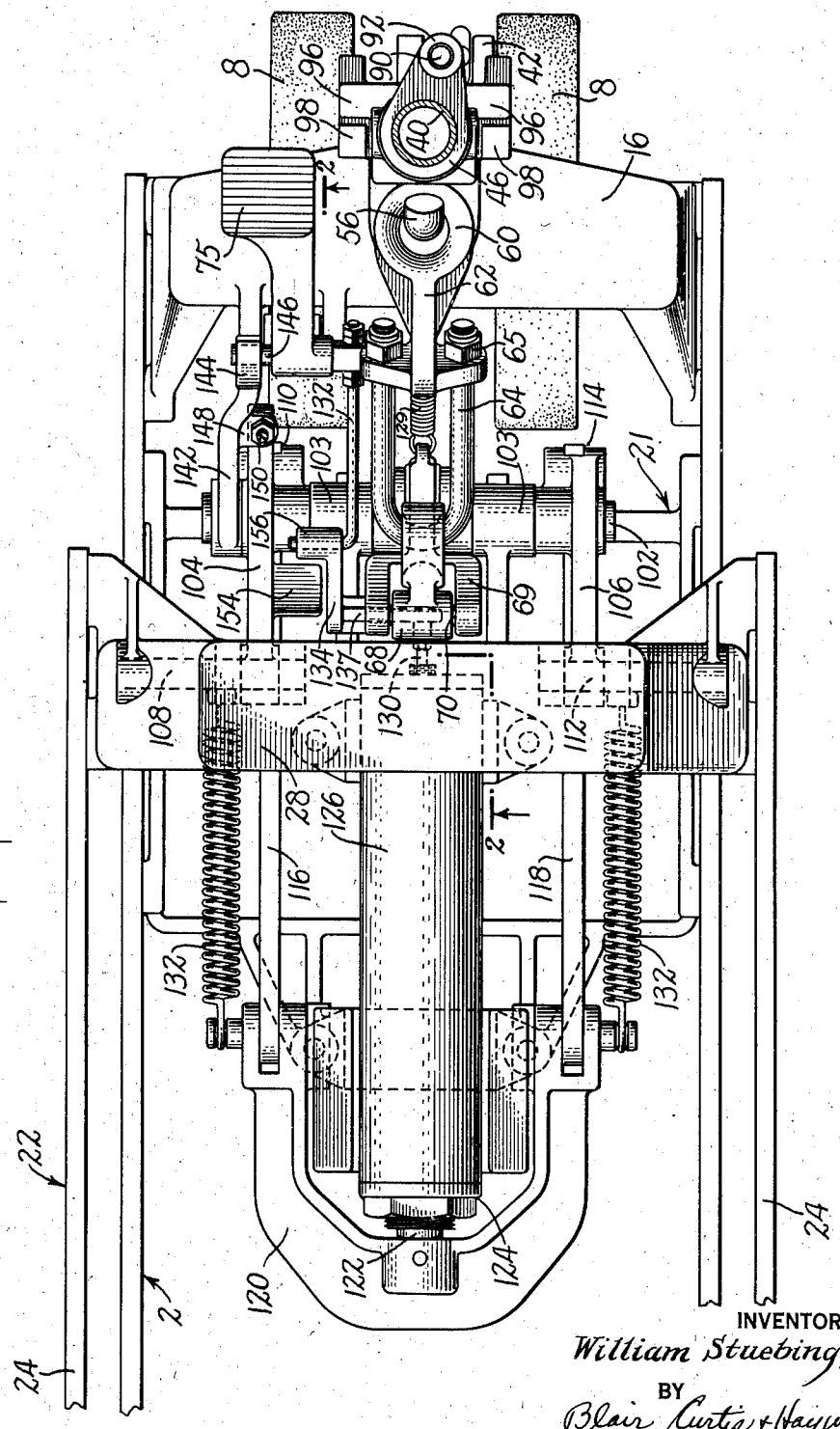


Fig. 4.

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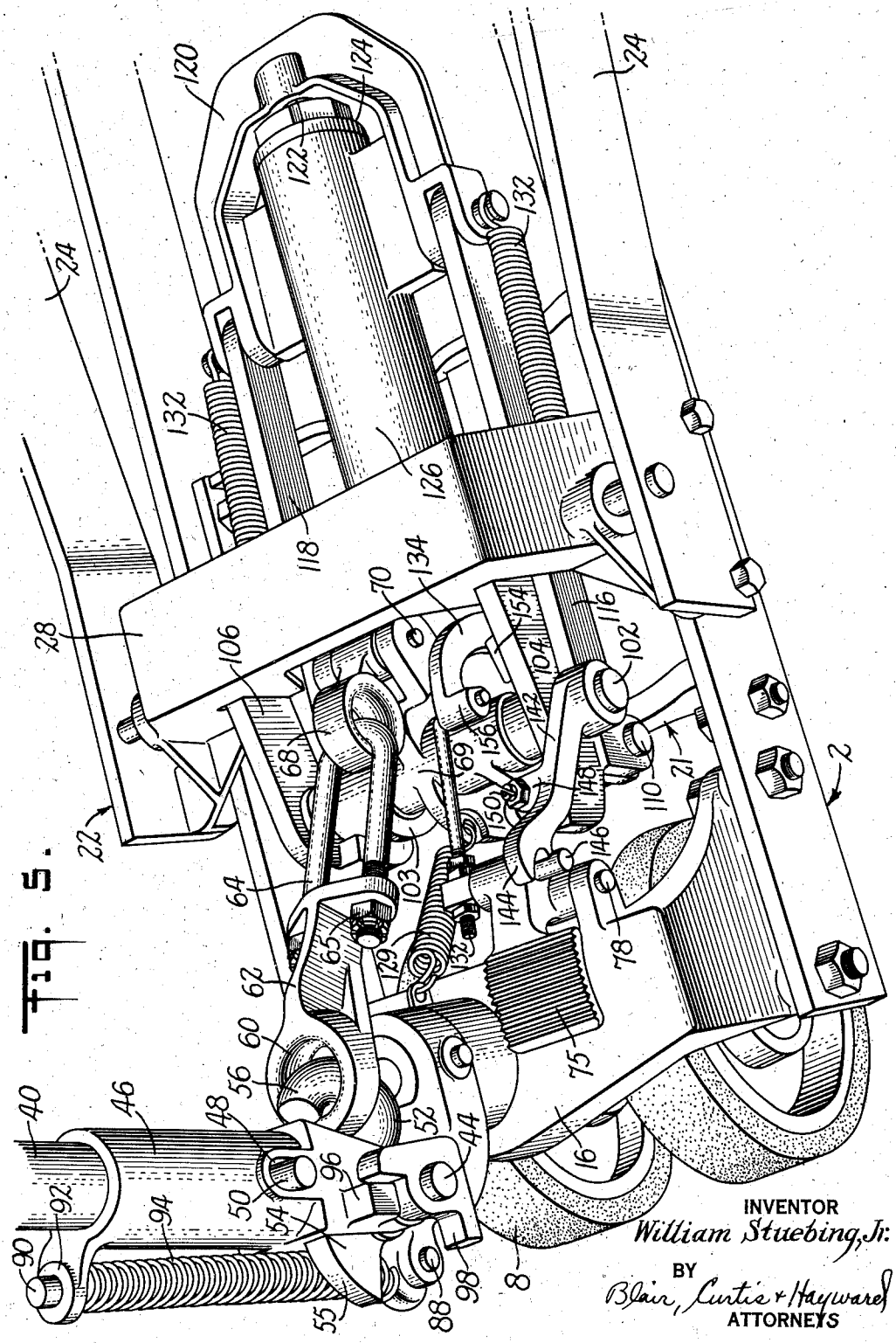


Fig. 5.

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2,280,104

LIFT TRUCK

William Stuebing, Jr., Cincinnati, Ohio, assignor to Lift Trucks Incorporated, Cincinnati, Ohio, a corporation of Ohio

Application December 14, 1940, Serial No. 370,090

12 Claims. (Cl. 254—10)

This invention relates to lift trucks and more particularly to hand operated lift trucks where the lifting operation is performed by swinging the steering handle.

An object of this invention is to provide a manually operated mechanism which may be used, for example, for lifting movable platforms of the type where a quantity of material is piled on the platform and the platform is then moved. A further object is to provide an efficient and dependable means for lifting a load and for moving the load. A still further object is to provide a mechanism of the above character which is sturdy in construction and efficient in operation, and which is light in weight and economical to manufacture. A further object is to provide a mechanism which may be used with perfect safety under a wide variety of conditions. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combination of elements, and arrangements of parts as will be exemplified in the structure to be hereinafter described and the scope of the application of which will be indicated in the following claims.

In the drawings in which one embodiment of the invention is disclosed:

Figure 1 is a side elevation partly in section and with the central portion of the frame broken away;

Figure 2 is a sectional view on the line 2—2 of Figure 4;

Figure 3 is similar to Figure 2 but shows certain parts of the apparatus at a different stage in the cycle of operations;

Figure 4 is a top plan view of the forward end of the truck with certain parts broken away for clarity; and,

Figure 5 is a perspective view of the mechanism shown in Figure 4.

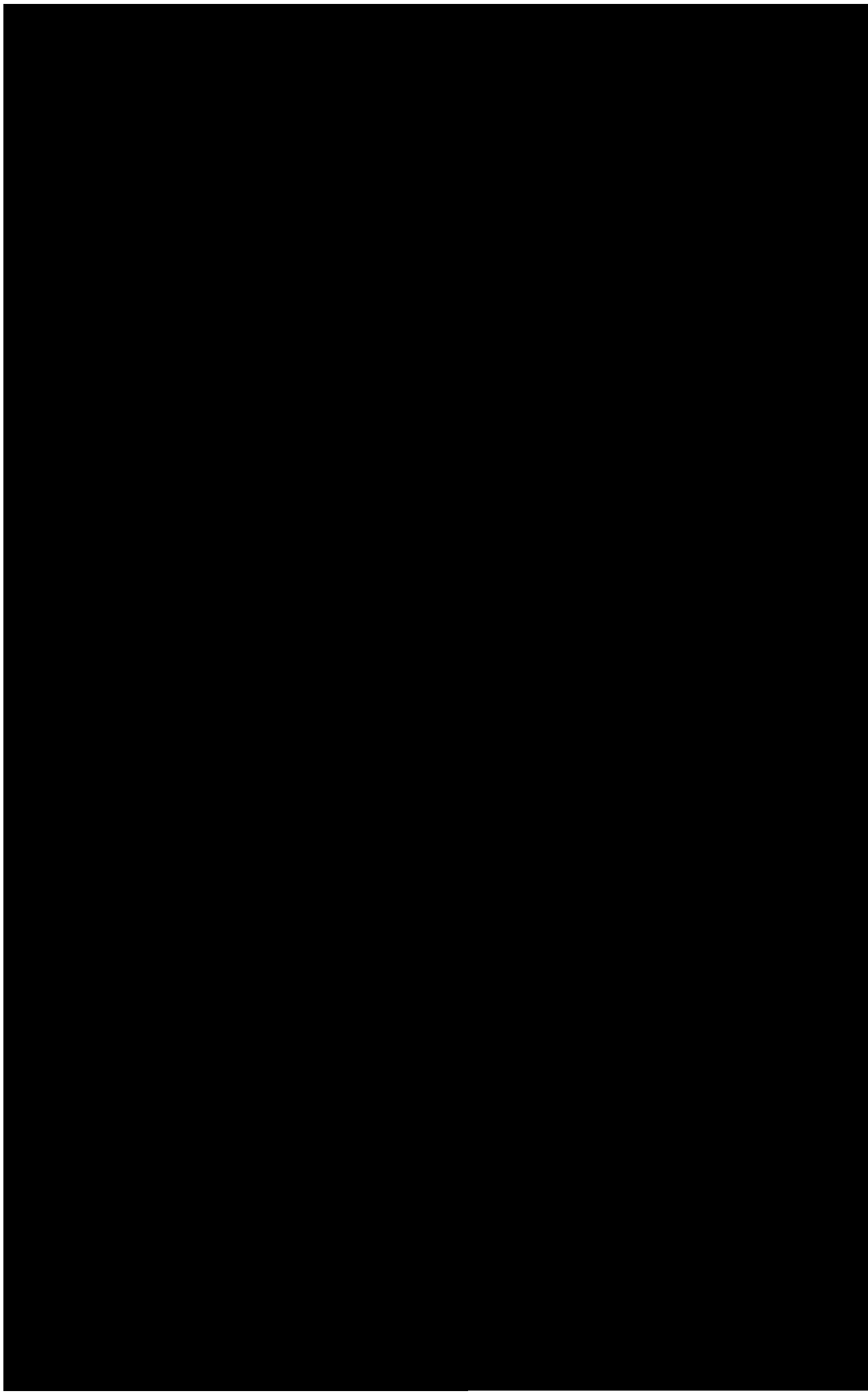
This application is related to my application, Serial No. 317,069, filed February 3, 1940, entitled "Lift truck" and issued December 10, 1940, as Patent No. 2,224,166, and material shown here and not covered in this patent is covered in the present application.

In the illustrative embodiment of the invention, the lift truck is completely manual and it is used to lift loads and move the loads from one place to another. A lower frame or chassis is provided with wheels, and this chassis carries a lifting frame which may be moved to and from a raised position, in which position it supports the load. The truck is provided at its forward end with a steering handle and it may be backed beneath a load such as a movable platform upon which is piled the material to be lifted and moved. With the lifting frame beneath the platform, the lifting frame is raised by swinging the steering handle with the result that the load is lifted and fully supported by the lift truck. The lift truck is then moved and the load is carried to the new location whereupon the lifting frame is lowered, releasing the load.

In the present embodiment the lifting frame is raised by means of a hydraulic ram which is operated by swinging the steering handle there being a releasable mechanical connection between the steering handle and the hydraulic ram. The hydraulic ram is of such a character that it acts as an automatic latching means to hold the lifting frame in partially or fully elevated position, and it also acts as a check to retard the descent of the lifting frame. This embodiment is also provided with safety means which prevents the operator from elevating the lifting frame beyond a certain predetermined limit.

Furthermore, when a load is elevated and the operator wishes to release it, it is desirable that he be free to attend to the truck and to guide the load as it settles. Accordingly, with the present embodiment, the load is automatically latched in partially or fully raised position, and when the release treadle is actuated the hydraulic ram is rendered ineffective except as a check until the lifting frame and the load have fully returned from the elevated position. Thus, the operator need only actuate the treadle and he is then free to give his attention to the control of the load and the truck.

Referring particularly to Figure 1 of the drawings, a lower frame 2 is provided with a pair of rear wheels 4 mounted upon an axle 6 and at the right with a pair of front wheels 8 mounted upon an axle 10. Axle 10 is mounted in a fork 12, rigidly secured to the lower end of a king bolt 14. King bolt 14 extends through a crosshead 16 which forms the forward end of the lower frame 2. The lower frame 2 is provided at the rear with reinforcing brace structure 17 which carries a shaft 32, and at the forward end with a frame construction, generally indicated at 21, which acts as a reinforcing means and which also supports the mechanism for elevating the lifting frame 22. The lifting frame 22 is formed by a U-shaped side member 24 extending along the sides and the rear of the truck, a rear brace structure 26 and a saddle-like front



which are to the left and downwardly. Thus, the lifting axle is subjected to directly opposed forces with the forces on the ends of the axle tending to balance the force on the center of the axle. Axle 102 is sufficiently sturdy to remain rigid when subjected to these forces, and thus the forces tend to counterbalance each other through the axle, and to the extent that they do counterbalance each other, the forces are not transmitted to the frame.

With the steering handle raised as in Figure 1, if it is desirable to disengage the steering handle from the linkage mechanism, the steering handle is lifted upwardly through steering-handle sleeve 46, and the handle is then swung down with the extreme end of the latching portion 72 riding upon the surface 55 of the disc segment 54. Thus, the steering handle is held in this extended position and may be used as a handle to pull, push and otherwise manipulate the truck. If the steering handle is pulled outwardly when it is not in the raised position, spring 129 immediately returns the elements, including the segment-hook to the position shown, and the handle is held extended. As shown best in Figure 5, upon opposite sides of the steering-handle sleeve 46 are stops 96 which cooperate with suitable stops 98 on bracket 42 to limit the swinging movement of handle 40.

When the handle is held extended by segment 54, the operator may at any time raise the handle to the vertical position, and the handle automatically drops to the position shown in Figure 1, with latch 72 falling behind the rear of the segment. Thus, the handle is held from falling and may be used to elevate the lifting frame when desirable. The front cross-frame 28 acts as a load bumper and limits the movement of the truck under a load. The truck is therefore backed under the load as far as it will go, and the load is then raised by a pumping movement on the steering handle 40.

As indicated above, the hydraulic ram 124 acts as an automatic latching mechanism to hold the load at the end of each stroke, and it continues to act in this capacity while the truck is being wheeled about to thereby move the load to its new location. When the load is elevated, it may be released by stepping on a foot treadle 75 which is rockably mounted by means of a pivot 78 on head 16. Referring to Figure 5, treadle 75 is connected through an adjustable release rod 132 to the upper end of a release lever 134 which is pivoted at its lower end (see Figure 2) on a pivot 136, carried by the frame construction 21. Release lever 134 is provided with an outwardly extending flange 136 which has an arcuate portion 138 connected to the load releasing rod 130. Accordingly, load releasing rod 130 is provided with a T-extension 140, the cross-member of which engages the right-hand surface of the arcuate portion 138, and the longitudinal portion of which extends through a hole in the arcuate portion 138 and is adjustably attached to the load releasing rod. As pointed out above, the load releasing rod is held inwardly by a spring, and when the rod is pulled to the right, a valve is opened which releases the load. The spring acting on the load releasing rod normally holds foot treadle 75 in the position shown in Figure 2, and when the foot treadle is depressed, as shown in Figure 3, the load releasing rod is pulled outwardly sufficiently to release the load.

As has been indicated, it is desirable that the load releasing operation be carried on automatically when once it is started, and in the present embodiment this is accomplished by providing a releasable latch for holding treadle 75 in its depressed position (Figure 3). Accordingly, a treadle-locking arm 142 (see also Figure 5) is mounted to rock freely upon the extended end of lifting axle 102, and the end of the treadle-locking arm is provided with a latch portion 144 which is adapted to engage the latch pin 146 rigidly carried by treadle 75. When the treadle is in its raised position, the treadle-locking arm is held upwardly as shown in Figures 5 and 2, but when the treadle is depressed (as shown in Figure 3) the treadle-locking arm falls, and its latching portion 144 interengages with the latch pin 146 and holds the treadle depressed. Thus, the operator may remove his foot and the load continues to descend.

The treadle-locking arm 142 is provided with a side bracket 148 which carries an adjustable set screw 150, and lifting arm 104 is provided with a heel portion 152. When the lifting frame is moving downwardly, heel portion 152 swings toward the position shown in Figure 1, and set screw 150 is so adjusted that its lower end is engaged by the heel portion when the lifting frame has returned from the elevated position. Due to this engagement, heel portion 152 pushes treadle-locking arm 142 upwardly out of engagement with latch pin 146, and treadle 75 is released, and the spring acting on load releasing rod 130 returns the elements to the position of Figure 1. Thus, when the treadle is pushed down, the lifting frame automatically returns to the position of Figure 1, and the return of the lifting frame automatically releases the treadle and closes the valve of releasing rod 130 so that the mechanism is conditioned for further use in lifting a load. The adjustments of set screw 150 and load releasing rod 132 are held by suitable lock nuts.

It is important that safety means be provided to prevent the elevation of the lifting frame beyond a desirable limit. This is particularly important in the present embodiment where the lifting is accomplished by operating a hydraulic ram as this type of mechanism gives to the operator tremendous power in moving the lifting frame. Thus, if mechanical stops were provided to limit the elevation of the lifting frame, the mechanism might be damaged or broken without the operator realizing that he has reached the limit of movement of the lifting frame. In the present embodiment, this difficulty is avoided by providing means to open momentarily the release valve whenever the lifting frame reaches the maximum elevation which is desirable. Accordingly, lifting arm 104 is provided with an integral lug 154 which is adapted to engage the sleeve 156 (see also Figure 4) of release lever 134 when the lifting arm swings beyond a certain limit. Insofar as the elevating of the lifting frame is accomplished by swinging the lifting arms 104 and 106, lug 154 engages sleeve 156 of the release lever at any time that the lifting frame is moved beyond a certain predetermined desirable limit. This engagement swings the release lever 134 and pulls releasing rod 130 (see Figure 2) to the right sufficiently to open the releasing valve, and the hydraulic ram therefore ceases to hold the lifting frame until the releasing valve is permitted to reclose. Thus, when the lifting frame is raised during a particular pumping stroke to the point where the releasing valve is opened, the lifting frame is not held in this position but immediately begins to drop. This dropping or

return movement of the lifting frame is sufficient to move lug **154** to the left and permit releasing lever **134** and releasing rod **130** to return to their normal positions so that the releasing valve is reclosed. Thus, even if the load is fully elevated, the pumping operation may be continued indefinitely without danger of injury to the mechanism, as the lifting frame will always return at the end of a stroke the same distance it was raised during that stroke. During this time, the movement of releasing lever **134** causes treadle **75** to swing downwardly, but this movement is not sufficient to permit treadle-locking arm **142** to fall, and the load is not dropped below the position where lug **154** disengages sleeve **156**.

As many possible embodiments may be made of the above invention and as many changes might be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth, or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In lift truck apparatus of the class described, the combination of: a base frame; a lifting frame mounted upon said base frame to be moved upwardly to thereby lift the load; operating means to manually raise said lifting frame and to hold said lifting frame in its raised position; releasing means to render said operating means ineffective and operable when said lifting frame is raised to thereby permit the return of said lifting frame to its lower position; and means operated by the movement of said lifting frame and effective when said lifting frame reaches its lower position to render said releasing means ineffective.

2. In apparatus of the character described, the combination of: a chassis comprising a supporting frame having mounted thereon a set of wheels and a steering handle; a lifting frame mounted upon said chassis and adapted to be moved to and from a raised position where it engages and lifts a load; means to elevate said lifting frame comprising, a hydraulic pump which is automatically operable as a holding means to hold said lifting frame in its elevated position until it is released, and means to detachably connect said steering handle and said hydraulic pump; releasing means to render said hydraulic pump ineffective as a holding means so that said lifting frame will be returned from its raised position; and means to hold said releasing means in its effective position during the entire return movement of the lifting frame from its raised position.

3. In apparatus of the character described, the combination of: a chassis comprising a supporting frame having mounted thereon a set of wheels and a steering handle; a lifting frame mounted upon said chassis and adapted to be moved to and from a raised position where it engages and lifts a load; means to elevate said lifting frame comprising, a hydraulic pump which is automatically operable as a holding means to hold said lifting frame in its elevated position until it is released, and means to detachably connect said steering handle and said hydraulic pump; releasing means to render said hydraulic pump ineffective as a holding means so that said lifting frame will be returned from its raised position; and means to automatically operate said releasing means when said lifting frame approaches a permissible limit to thereby prevent excessive raising of said lifting frame.

4. In apparatus of the character described, the combination of: a chassis comprising a supporting frame having mounted thereon a set of wheels and a steering handle; a lifting frame mounted upon said chassis and adapted to be moved to and from a raised position where it engages and lifts a load; operating means to elevate said lifting frame comprising, means detachably connected to said steering handle to impart a lifting movement to said lifting frame when said steering handle is swung from its vertical position toward its horizontal position, said operating means including means to hold said lifting frame in raised position; releasing means to release the lifting frame when elevated comprising, a lever-linkage assembly, a foot treadle rockably mounted and operably connected so that when it is swung downwardly movement is transmitted to said lever-linkage assembly, a treadle latching means to hold said treadle in depressed position, and means to release said latch when the lifting frame has returned from its raised position.

5. In apparatus of the character described, the combination of: a chassis comprising a supporting frame having mounted thereon a set of wheels and a steering handle; a lifting frame mounted upon said chassis and adapted to be moved to and from a raised position where it engages and lifts a load; operating means to elevate said lifting frame and to hold said lifting frame in elevated position comprising, a hydraulic ram having a releasing rod which is operated to release the hydraulic ram and permit the lifting frame to move from its raised position, and means to operate said hydraulic ram; releasing means to operate said releasing rod comprising, a vertically extending releasing lever pivoted at its lower end and having an arcuate side flange operably connected to said releasing rod, an elongated linkage means connected at one end to the upper end of said releasing lever, a rockable treadle connected to the other end of said elongated linkage means and mounted upon said supporting frame, a latching means to automatically hold said treadle in one extreme position, said operating means including a spring which tends to hold said treadle in the other extreme position, and disengaging means associated with said lifting frame to automatically disengage said latching means when the lifting frame has completely returned from its elevated position.

6. In apparatus of the character described, the combination of: a chassis comprising a supporting frame having mounted thereon a set of wheels and a steering handle; a lifting frame mounted upon said chassis and adapted to be moved to and from a raised position where it engages and lifts a load; hydraulic lifting means to move said lifting frame to a raised position, said lifting means being automatically operable as a holding means to hold said lifting frame in its raised position, and including a releasing means which may be operated to permit the return of said lifting frame from its raised position; and safety means which is moved to an operable position when the lifting frame approaches the permissible limit in its raising movement, said safety means being effective to operate said releasing means when said lifting frame approaches said permissible limit and to hold said releasing means effective until said lifting frame returns from said permissible limit.

7. In lift truck construction, the combination of: a chassis including, a front axle structure, a

rear wheel structure, a plurality of supporting wheels carried by said front and rear axle structures, a yoke carrying said front wheel structure, a king bolt upon said yoke, a steering handle swingably mounted on said king bolt; a lifting frame mounted on said chassis to be moved upwardly to thereby lift the load; and operating means to raise said lifting frame and to hold said lifting frame in its raised position comprising, linkage means which is detachably connected to said steering handle, a hydraulic ram carried by said chassis and having a plunger which is extensible from one end thereof, a U-member having its two arms slidably engaging opposite sides of said hydraulic ram and having its center portion mechanically engaged by said plunger, a pumping lever mechanically connecting said linkage means to said hydraulic ram so that mechanical power may be transmitted from said steering handle through said linkage means to operate said hydraulic ram, lifting means to transmit the lifting movement from said U-member to said lifting frame, and safety means which is operated when said lifting frame approaches its maximum desirable elevation which safety means prevents the operating means from raising said lifting frame beyond said maximum desirable elevation.

8. In lift truck apparatus, the combination of: a chassis construction; a lifting frame mounted upon said chassis to be moved upwardly to thereby lift the load; and a means to elevate said lifting frame including, a hydraulic ram carried by said chassis and having a lifting plunger and a pumping rod with the lifting plunger being adapted to move outwardly when said pumping rod is operated, a lifting shaft mounted upon said chassis, a pumping lever rockably mounted upon the central portion of said lifting shaft and having one arm mechanically connected to said pumping rod and another arm which may be connected to an actuating mechanism, and a pair of lifting arms mounted on said lifting shaft upon opposite sides of said lifting lever, said lifting arms being connected to said lifting frame and to said lifting plunger and being adapted to transmit the lifting movement from said hydraulic ram to said lifting frame, said lifting arms being effective during the lifting operation to exert forces on said lifting shaft which are diametrically opposed to the forces then being exerted on said shaft by said pumping lever.

9. In lift truck construction, the combination of: a chassis comprising a plurality of longitudinal members which carry a plurality of wheels and a cross-frame structure; a lifting frame mounted upon said chassis and connected thereto by a plurality of substantially parallel link members which are moved from substantially horizontal position toward a vertical position to thereby raise said lifting frame, said link members including a lifting arm through which lifting movement of the lifting frame is transmitted; and operating means to transmit lifting movement to said lifting arm comprising, a hydraulic ram mounted in a substantially horizontal position upon said cross-frame structure, a horizontally positioned transverse shaft carrying said lifting arm and providing a support for one end of said lifting frame, and a pumping arm mounted upon said shaft to transmit pumping movement to said hydraulic ram, said pumping arm being effective to exert forces on said shaft during each pumping stroke which forces are diametrically opposed to the forces then being exerted on said shaft by said lifting arm.

10. In lift truck apparatus of the class described, the combination of: a base frame; a load-engaging means mounted upon said base frame to be moved upwardly to thereby engage and lift the load; operating means to raise said load-engaging means and automatically operable as a holding means to hold said load-engaging means in its raised position and including a releasing means which may be operated to permit the return of said load-engaging means from its raised position; and means which is moved to an operable position when said load-engaging means approaches the permissible limit of its raising movement, said means being effective to operate said releasing means when said load-engaging means approaches said permissible limit and to hold said releasing means effective until said load-engaging means retreats from said permissible limit.

11. In lift truck apparatus of the class described, the combination of: a base frame; a load engaging and supporting structure mounted upon said base frame and having load-engaging means to be moved upwardly to thereby engage and lift the load, said structure including lifting arm means pivotally mounted and adapted to swing to thereby impart the lifting force to said load-engaging means; operating means to impart the lifting force to said lifting arm means to raise said load-engaging means, said operating means being automatically operable as a holding means to hold said load-engaging means in its raised position and including a releasing means which may be operated to permit the return of said load-engaging means from its raised position; and safety means to limit the upward movement of said load-engaging means and operable when said load-engaging means approaches the permissible limit of its raising movement, said means comprising cooperating means upon said lifting arm means and said releasing means which cooperate mechanically so that the movement of said lifting arm means is effective to operate said releasing means when said load-engaging means approaches said permissible limit and so that said releasing means is thereafter held operative until said load-engaging means retreats from said permissible limit.

12. In lift truck apparatus of the class described, the combination of: a base frame; a load-engaging means mounted upon said base frame to be moved upwardly to thereby engage and lift the load; operating means to raise said load-engaging means and automatically operable as a holding means to hold said load-engaging means in its raised position and including a releasing means which may be operated to permit the return of said load-engaging means from its raised position; manual means to operate said releasing means and including a latching means to hold said releasing means operative; and latch-releasing means which is moved to an operable position when said load-engaging means reaches its lower position to thereby render said latching means ineffective.

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