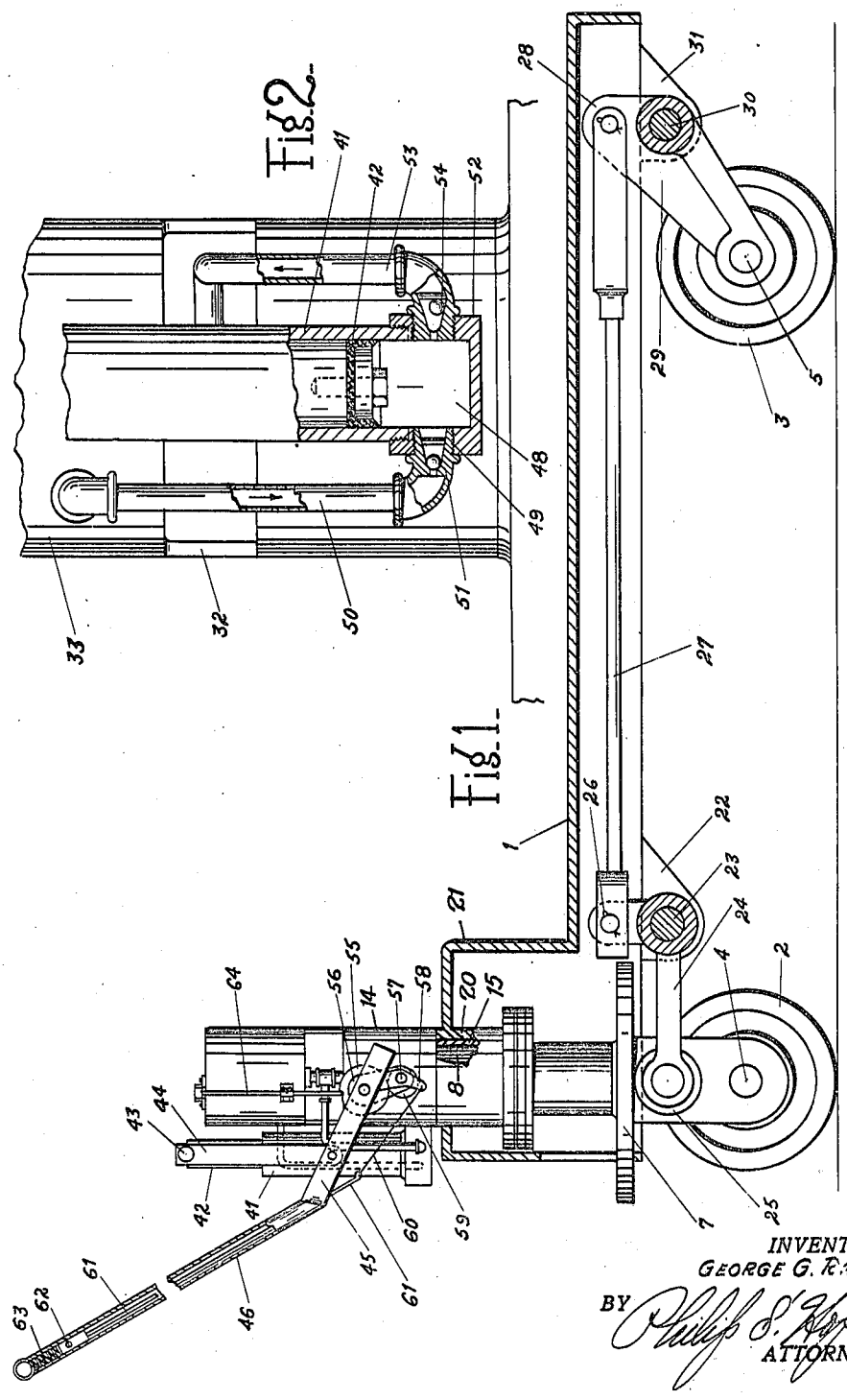
Jan. 19, 1932. G. G. RAYMOND 1,841,673

HYDRAULIC LIFT TRUCK

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HYDRAULIC LIFT TRUCK

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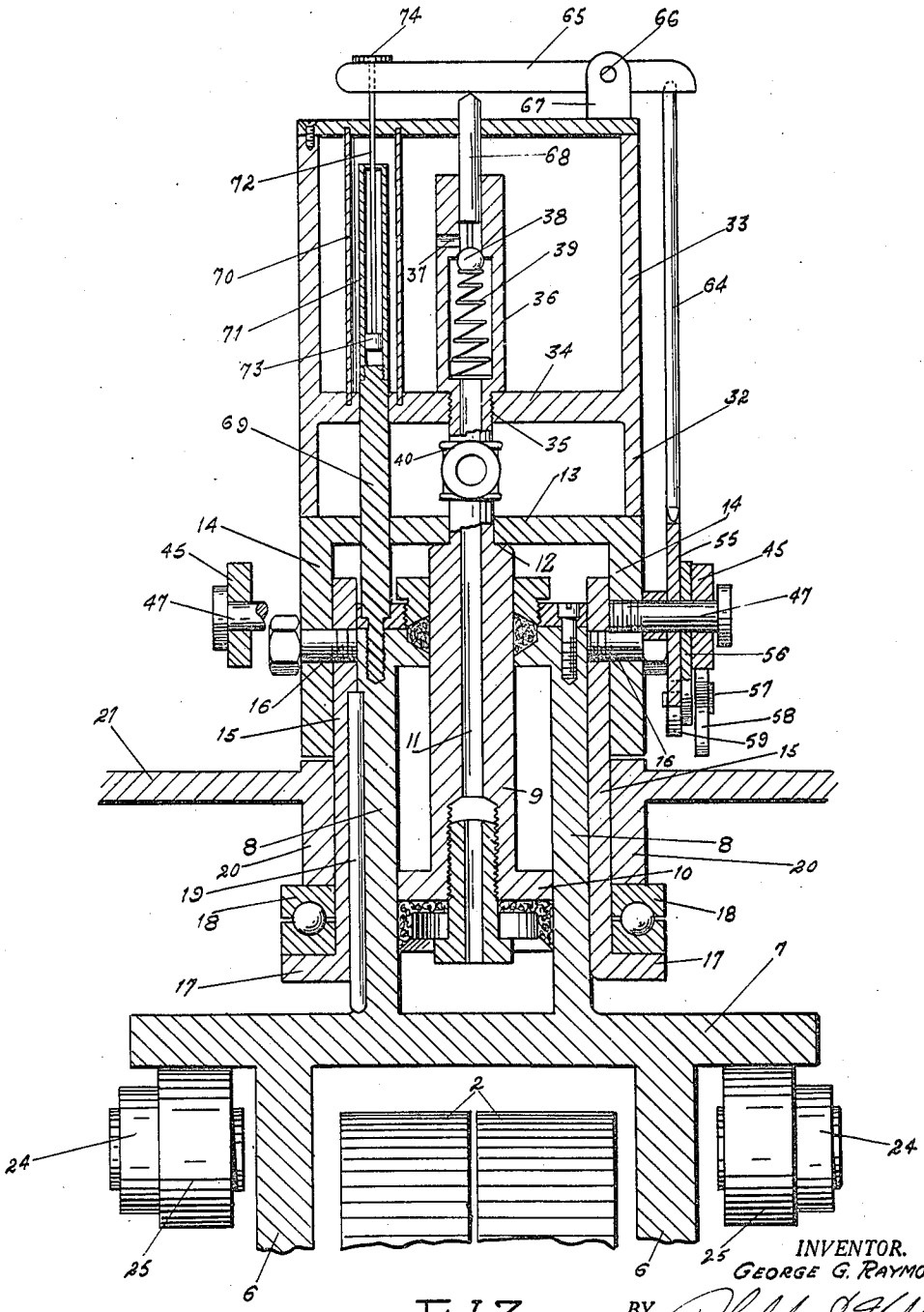


Fig. 3.

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UNITED STATES PATENT OFFICE

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HYDRAULIC LIFT TRUCK

Application filed May 28, 1929. Serial No. 366,601.

My invention relates to certain new and useful improvements in hydraulic lift trucks, and has for its primary object the provision of novel hydraulic platform lifting and lowering means for lift trucks.

Another object of the invention is to provide a novel and effective releasing means for the lift device, whereby the load platform may be quickly lowered and with a minimum of effort.

A further object of the invention is to provide automatic releasing means whereby if the lifting platform should be inadvertently raised beyond the safety point, the lowering device will automatically be operated, thus preventing further lifting of the platform.

Still another of my invention lies in the general assembly and arrangement of parts making for economy of manufacture, ease of assembly and operation.

Other detailed objects and advantages will be apparent as the description proceeds, reference now being had to the figures of the accompanying drawings forming a part of this application and wherein like reference numerals indicate like parts.

In the drawings:—

Figure 1 is a side view of my improved lift truck, certain parts being shown in section for clearness.

Figure 2 is a detail front view of a portion of the hydraulic lifting means.

Figure 3 is a detail cross sectional view of the hydraulic lift means.

My improved lift truck comprises the load platform 1 which may be of any desired shape or size, supported in a manner to be presently described in detail upon front wheels 2 and rear wheels 3 mounted upon the axles 4 and 5 respectively. The front axle 4 is supported between a pair of depending brackets 6 extending downwardly from a plate 7 extending upwardly from and rigid with which is a ram cylinder 8.

Adapted for longitudinal reciprocation within the cylinder 8 is a ram 9 provided with a head 10 at its lower end and extending through which ram is a longitudinal opening or passage 11 through which a fluid such as oil may be admitted beneath the head 10 for moving the ram 9 upwardly. The ram 9 is provided adjacent its upper end with a shoulder 12 engaging the underside of the top 13 of a housing 14 extending downwardly around the ram cylinder 8. Positioned between the ram cylinder 8 and the housing 14 is a cylindrical sleeve 15 to which the housing 14 is rigidly secured as by screws 16. The lower end of the sleeve 15 is provided with outwardly turned angular flange 17 seated upon which and encircling the sleeve 15 is a ball bearing or race 18. The sleeve 15 is keyed at one point to the ram cylinder 8 by means of the key pin 19, whereby the sleeve is reciprocable vertically with respect to the ram cylinder but rotatable therewith.

Supported upon the annular ball bearing 18 is an annular casting 20 integral with or rigidly secured to a housing or frame work 21 forming a part of the platform 1.

It will be obvious, therefore, from the foregoing description, that if the ram 9 is moved upwardly within the cylinder 8, the housing 14, sleeve 15, ball bearing 18, frame 21 and platform 1, will be raised therewith, sliding upon the ram cylinder 8. It will also be clear that rotation of the housing 14 will, through the medium of the sleeve 15, keyed to the ram cylinder 8, result in rotation of such cylinder, together with the plate 7 and the wheels 2 supported thereby.

Mounted in brackets 22 adjacent the front end of the load platform 1 and carried by said platform, is a shaft 23 upon which is pivotally mounted a pair of bell cranks 24, the front ends of which are provided with rollers 25 engaging the underside of the plate 7. The opposite ends of the bell cranks are provided with fastening means 26 for securing thereto the front ends of rods 27 extending rearwardly directly beneath the platform 1 and having their opposite ends secured to one end 28 of a bell crank 29 pivoted upon a shaft 30 supported in brackets 31 depending from the platform 1. The opposite ends of the bell cranks 29 support the axle 5 upon which the rear wheels 3 of the truck are mounted.

Obviously from the foregoing description,

upward movement of the platform 1 by the means above described, results in raising the shaft 23 supported between the brackets 22 on the platform and, due to the roller 25 on the bell crank 24 engaging the underside of the stationary plate 7, the bell crank 24 will be rocked on the shaft 23 as the platform is raised, resulting in a pulling forward on the rods 27 and the upper ends of bell cranks 29, thus causing the rear wheels 3 to be moved rearwardly or to the right in Figure 1, thus compensating for the raising of the front end of the platform and maintaining said platform horizontal and adequately supported at its rear end during such lifting movement.

The hydraulic means for raising the platform will now be described:—Suitably secured on the top of the head or housing 14 as by the legs 32 is a reservoir 33 adapted to contain oil or other liquid. The bottom 34 of this reservoir has threaded therethrough as at 35 a hollow spindle 36 provided adjacent its upper end with an opening or port 37 communicating between the hollow interior of the spindle and the reservoir 33. A ball valve 38 normally closes this passage, being maintained in position by a coil spring 39.

The lower projecting end of the hollow spindle 36 extending below the reservoir 33 is in alignment with the upper end of the hollow ram 9, said ram and said spindle being connected and the hollow passages therethrough brought into communication with each other by means of a nipple fitting 40.

Suitably supported adjacent the lower end of the head or housing 14 as shown clearly in Figures 1 and 2, is a pump cylinder 41 within which is reciprocable a piston 42. This piston 42 extends upwardly through the top of the cylinder 41 and has secured thereto a cross pin 43 extending between a pair of links 44 pivoted at their lower ends to the arms 45 of the lower bifurcated end of a handle 46, said arms 45 being pivotally mounted upon pivot pins 47 screwed or otherwise rigidly mounted in the sides of the head or housing 14. Obviously, therefore, upon up and down movement of the handle 46, the links 44 will reciprocate the piston 42 within the pump cylinder 41.

The lower end of the cylinder 41 opens into a chamber 48 on one side of which is an opening 49 communicating by means of the pipe 50 with the interior of the reservoir 33. A ball valve 51 is provided in the passage way between the pipe 50 and the chamber 48 whereby upon the upward or suction stroke of the piston 42, the ball will move away from its seat and draw oil into the chamber 48 from the reservoir 43 through the pipe 50.

The chamber 48 is provided on its opposite side with an opening 52 communicating by means of the pipe 53 with the nipple 40, and, therefore, with the passage 11 through the ram 9 into the ram cylinder 8. A ball valve 54 is adapted to close the opening 52 between the chamber 48 and the pipe 53 upon the suction or upward stroke of the pump piston 42 and to open such passage and permit the oil to flow therethrough and be forced downwardly through the ram 9 to the underside thereof, upon the downward or pressure stroke of the pump piston 42.

It will be clear, therefore, that with this construction, reciprocation of the pump piston 42 by means of the handle 46, will result in drawing oil from the reservoir 33 into the chamber 48 and forcing it outwardly through the pipe 53 and through the nipple 40 downwardly through the ram 9 to the underside thereof whereby to lift said ram within the cylinder 8, and consequently lift the platform 1 through the various elements and agencies heretofore described. Thus, an operator may upon moving the truck under a loaded skid platform for instance, merely reciprocate the handle 46 and raise the platform 1 to lift the skid or other load off the floor, whereupon the truck may be drawn or moved by the handle 46 from one place to another. Of course, means must be provided whereby the platform 1 may be lowered again in order that the truck may be withdrawn from beneath the load. This means will now be described:—

Loosely mounted upon the pivot pin 47 is a cam disk 55. Adjacent the cam disk 55 and also loosely pivoted upon the pin 47 is one end of a link 56, the lower end of which is provided with a pintle 57. Mounted upon one end of the pintle 57 is a lever 58 by means of which the pintle may be rotated. Eccentrically mounted upon the opposite end of a pintle 57 is a disk 59, the periphery of which engages with the periphery of the cam disk 55. Connected to the lever 58 as by means of the wire or link 60 is the lower end of a rod 61 extending upwardly through the hollow handle 46 and being turned outwardly of the upper end of the handle 46 as at 62 to provide a manipulating means therefor. A coil spring 63 within the upper end of the handle 46 normally urges the rod 61 downwardly. Engageable at its lower end with the upper edge of the cam disk 55 is a slidable rod 64, the upper end of which engages with one end of a lever 65 pivoted as at 66 to upstanding ears 67 upon the top of the reservoir 33. This lever 65 extends across the top of the reservoir 33 and engages at one point, centrally of such reservoir, with the upper projecting end of a pin 68 slidable through the top of the reservoir and the lower end of which slidably engages within the hollow spindle 36 and with the ball valve 28 therein.

From this mechanism just described, it will be understood that if the operator desires to lower the platform 1 after the same has been

raised by the hydraulic means described, it is necessary only to pull upwardly on the rod 61 carried within the handle 46, resulting in turning the pintle 57 in the lower end of the link 56, such turning drawing the eccentric disk 59 into tight engagement with the periphery of the cam disk 55, whereupon further pull on the rod 61 rocks the link 56 upon the pivot pin 47 and because of the engagement between the eccentric disk 59 and the cam disk 55, said cam disk 55 will be rotated to bring its cam portion into engagement with and to raise the rod 64, which in turn rocks the lever 56 on its pivot to depress the pin 68, thus moving the ball valve 38 away from its seat and permitting the oil under the ram 9 to flow upwardly through such ram, through the spindle 36 and back into the reservoir 33 through the passage 37.

It will be understood that the weight of the platform 1 whether loaded or not, will be sufficient to force the ram 9 downwardly to displace the oil, when the valve 38 is opened.

Means are also provided for automatically opening the valve 38 to permit lowering of the platform in the event that such platform is inadvertently raised beyond a point predetermined as a safe point. This means includes a rigid supporting pin 69 threaded at its lower end into the upper edge of the ram cylinder 8 and extending upwardly through the top 13 of the head or housing 14 and through the bottom 34 of the reservoir 33. The upper end of this pin 69 projects into the reservoir 33 within a tube 70 secured therein between the top and bottom of the reservoir. Screwed to the upper end of this rod 69 is a small tube 71 through the upper end of which passes a pin 72 carrying at its lower end within the tube 71 a head 73 adapted, when the platform and consequently the mechanism lifted thereby is raised, to engage at a predetermined point in the lifting with the upper closed end of the tube 71. The upper projecting end of the pin 72 is provided with a head 74 overlying the free end of the lever 65 above the reservoir whereby when the pin 72 is stopped in its upward movement by the upper end of the tube 71, further movement of the platform and associated parts, result in the head 74 engaging the end of the lever 65 and rocking said lever on its pivot 66 whereby to depress the release pin 68 and open the valve 38, thus permitting the escape of the oil upwardly through the ram 9 into the reservoir, until the platform and associated parts have been lowered again to the point where the head 74 ceases to operate the lever 65 in depressing the pin 68. At such point, of course, the coil spring 39 again moves the valve 38 into engagement with its seat and prevents further discharge of the oil from under the ram 9 and thus maintains the platform in its uppermost predetermined position.

From the foregoing description, it will be observed that I have provided a simple and effective hydraulic lift truck which may be manipulated with the utmost ease and without relying upon complicated lever and pawl and ratchet devices. The swivel arrangement between the platform and the front wheels 2 due to the ball race 18, permits ready swivelling and turning of the wheels 2 by means of the handle 46 and for guiding purposes.

Of course, changes may be made in details of construction and arrangement of parts without departing from the spirit and scope of my invention. I do not limit myself, therefore, to the exact structure herein shown and described other than by the appended claims.

I claim:

1. A lift truck comprising a platform, front and rear wheel supports therefor, said front wheel support being swivelled for steering, hydraulic lifting means vertically reciprocable on said front wheel support and swivelled therewith relatively to said platform, and connections between said lifting means and said platform.

2. A lift truck comprising a platform, front and rear wheel supports therefor, said front wheel support being swivelled for steering, hydraulic lifting means vertically reciprocable on said front wheel support and swivelled therewith relative to said platform, a pump on said lifting means, a steering handle pivoted to said lifting means and reciprocable to actuate said pump whereby to furnish energy for said lifting means, and connections between said lifting means and said platform.

3. A lift truck comprising a platform, front and rear wheel supports therefor, said front wheel support being swivelled and provided with an upstanding cylinder, a ram vertically reciprocable and rotatable therein, a sleeve around said cylinder and having connection with said ram for vertical reciprocation therewith, hydraulic means for raising said ram and sleeve, and connections between said sleeve and said platform.

4. A lift truck comprising a platform, front and rear wheel supports therefor, said front wheel support being swivelled and provided with an upstanding cylinder, a ram vertically reciprocable in said cylinder, a sleeve around said cylinder rotatable therewith and having connection with said ram for vertical reciprocation therewith, hydraulic means for raising said ram and sleeve comprising a reservoir and a pump for forcing fluid from said reservoir through said ram to the underside thereof in said cylinder, and connections between said sleeve and said platform.

5. A lift truck comprising a platform, front and rear wheel supports therefor, said front

wheel support being swivelled and provided with an upstanding cylinder, a ram vertically reciprocable in said cylinder, a sleeve around said cylinder rotatable therewith and having connection with said ram for vertical reciprocation therewith, hydraulic means for raising said ram and sleeve comprising a reservoir and a pump for forcing fluid from said reservoir through said ram to the underside thereof in said cylinder, and connections between said sleeve and said platform, and steering means adapted to operate said pump.

6. A lift truck comprising a platform, front and rear wheel supports therefor, said front wheel support being swivelled and provided with an upstanding cylinder, a ram vertically reciprocable in said cylinder, a sleeve around said cylinder rotatable therewith and having connection with said ram for vertical reciprocation therewith, hydraulic means for raising said ram and sleeve comprising a reservoir and a pump for forcing fluid from said reservoir through said ram to the underside thereof in said cylinder, a passageway for said fluid and connections between said sleeve and said platform, and steering means adapted to operate said pump, valves in the passageway of said fluid, and means carried by said steering means for controlling certain of said valves whereby the fluid may be permitted to flow back to said reservoir from said cylinder, thereby lowering said ram and platform.

7. A lift truck comprising a platform, front and rear wheel supports therefor, said front wheel support being swivelled and provided with an upstanding cylinder, hydraulic lifting means on said front wheel support rotatable therewith and reciprocable thereon and comprising a ram, a sleeve a pump and a reservoir, connections between said sleeve and platform, fluid passageways between said pump, reservoir and cylinder, valves in said passageways, and means operable at will controlling said valves to permit lowering of said lifting means.

8. A lift truck comprising a platform, front and rear wheel supports therefor, said front wheel support being swivelled for steering, hydraulic lifting means reciprocable on said front wheel support and mounted for rotation therewith relative to said platform, said support and lifting means being constructed and arranged for complete rotation with respect to said platform, and connections between said lifting means and said platform.

9. A lift truck comprising a platform, front and rear wheel supports therefor, said front wheel support being swivelled for steering, hydraulic lifting means reciprocable on said front wheel support and mounted for rotation therewith relative to said platform, said support and lifting means being constructed and arranged for complete rotation with respect to said platform, connections between said lifting means and said platform, and means carried by and so connected with said lifting means as to permit actuation of the same in any position of rotation thereof.

10. A lift truck comprising a platform, front and rear wheel supports therefor, said front wheel support being swivelled for steering, hydraulic lifting means reciprocable on said front wheel support and swivelled therewith relative to said platform, connections between said lifting means and said platform, a pump on said lifting means, a steering handle for said truck operable to actuate said pump in any position of rotation of said lifting means, valves for controlling said hydraulic lifting means, and means carried by said handle for actuating one of said valves.

11. A lift truck comprising a platform, front and rear wheel supports theerfor, said front wheel support being swivelled for steering, hydraulic lifting means reciprocable on said front wheel support and swivelled therewith relative to said platform, connections between said lifting means and said platform, a pump on said lifting means, a steering handle for said truck operable to actuate said pump in any position of rotation of said lifting means, valves for controlling said hydraulic lifting means, and means carried by said handle for actuating one of said valves, said valve actuating means and said valve being so constructed and arranged on said lifting means as to permit actuation of said valve in any position of rotation thereof.

In testimony whereof, I affix my signature.

GEORGE G. RAYMOND.