

Oct. 23, 1945.

E. A. DROTT ET AL

2,387,568

INDUSTRIAL TRUCK

Filed Jan. 7, 1943

5 Sheets-Sheet 2

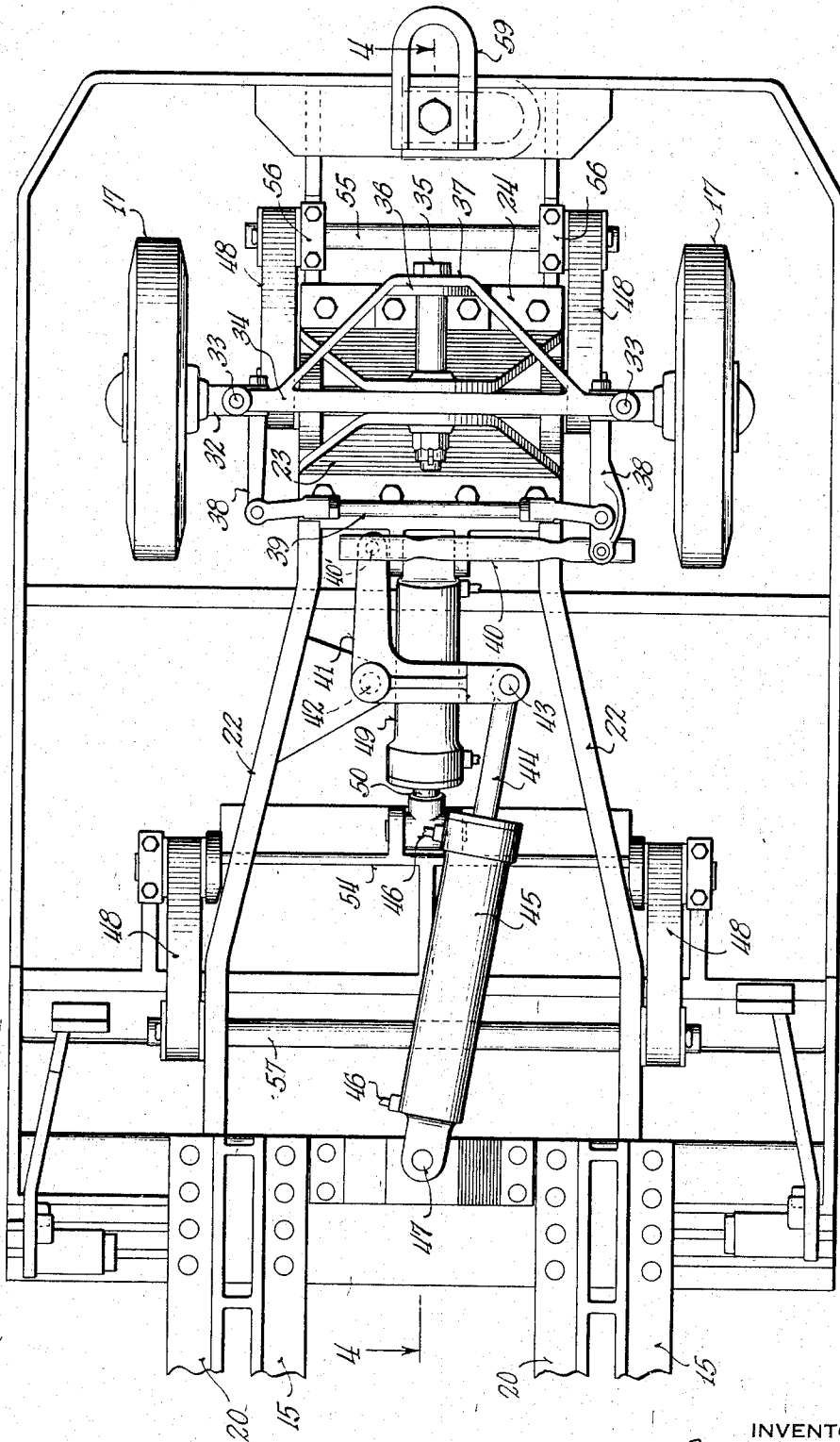


Fig. 3

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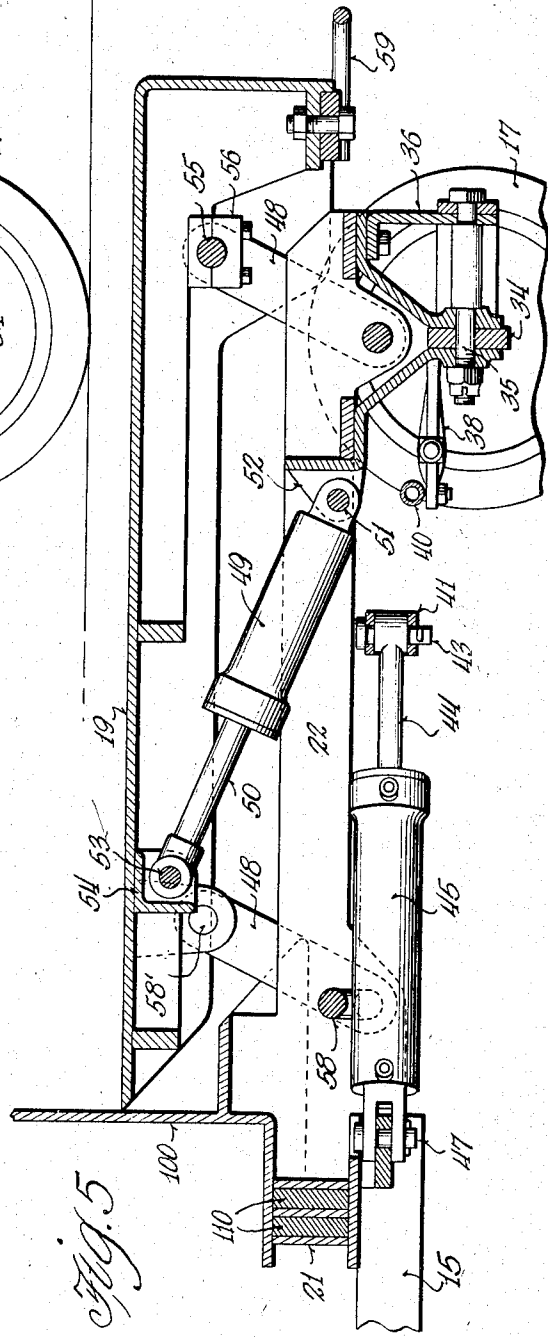
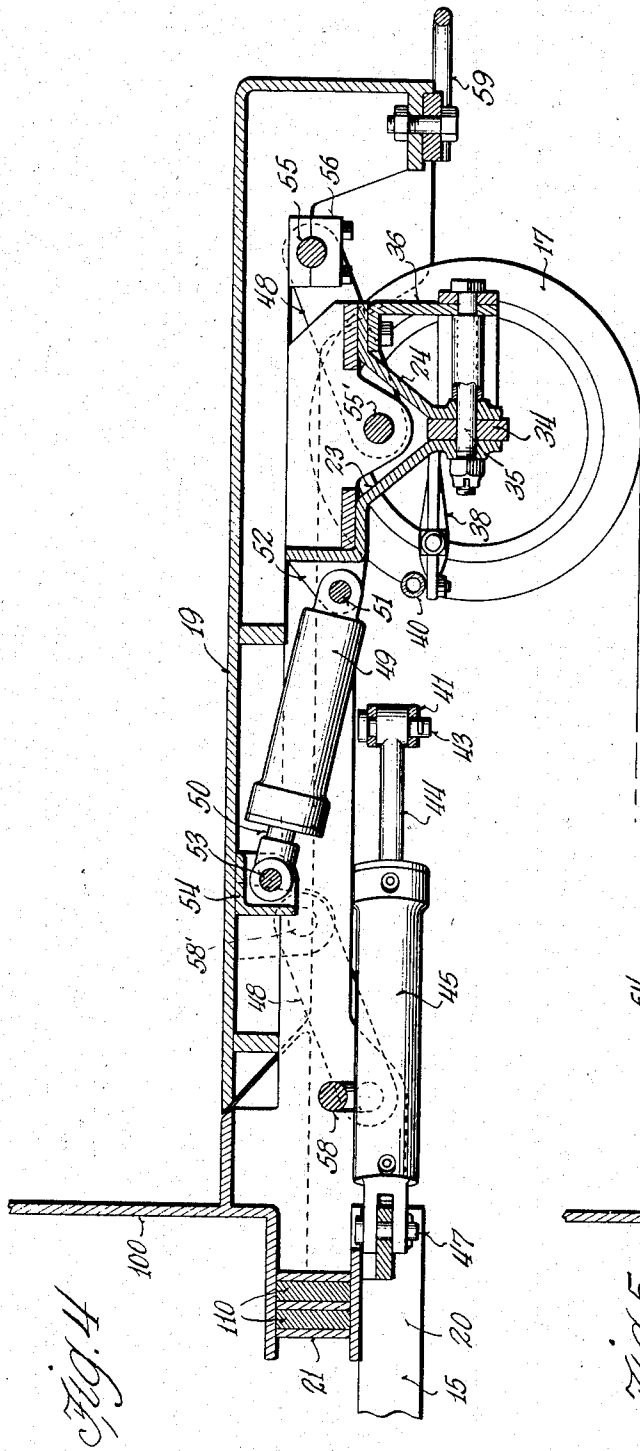
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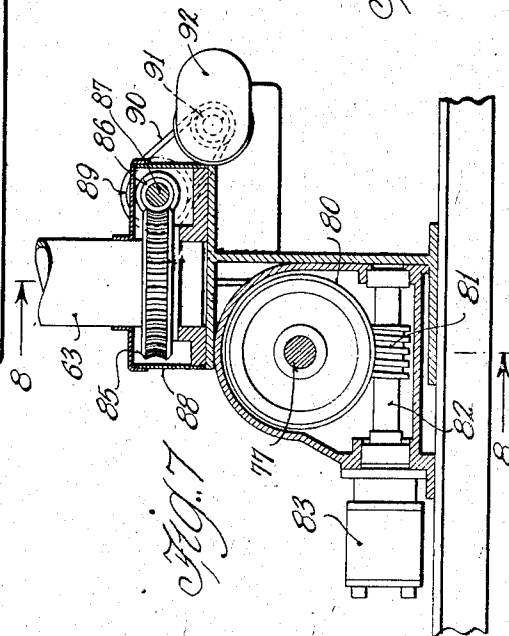
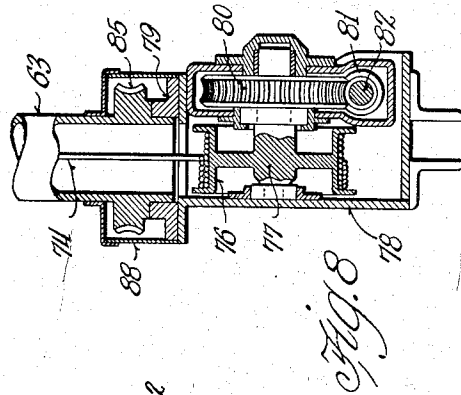
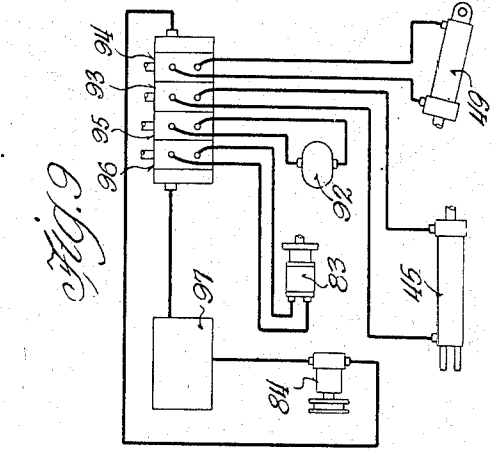
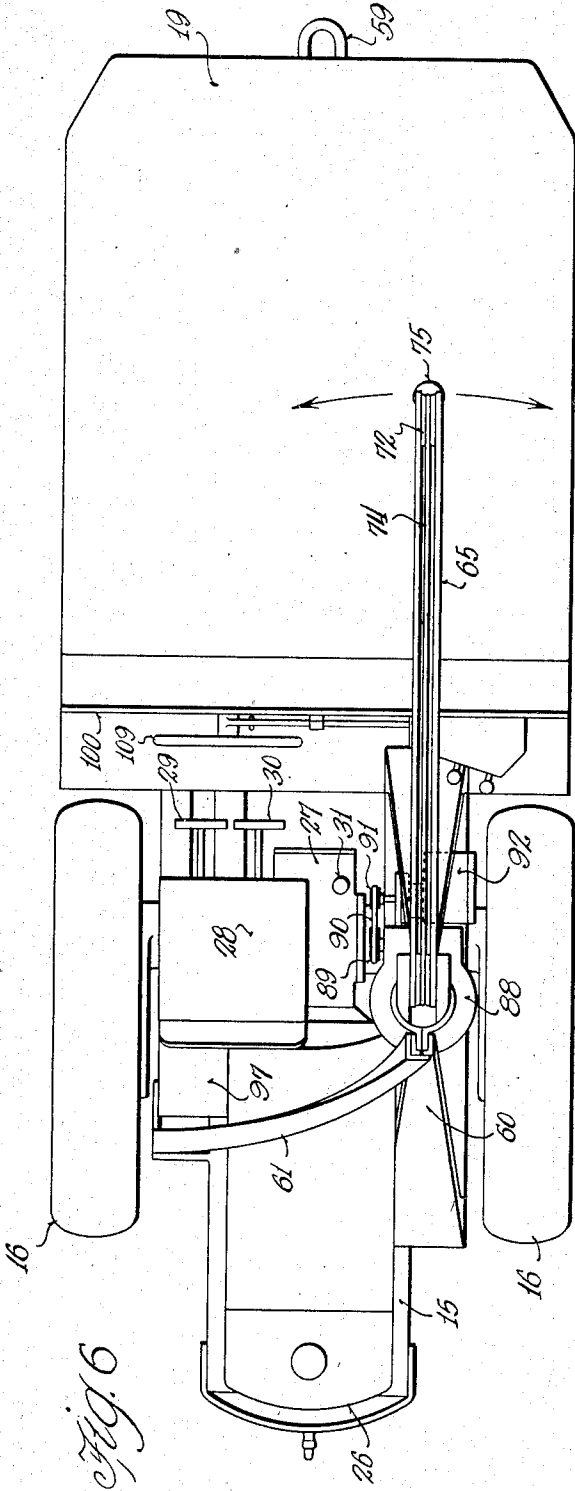
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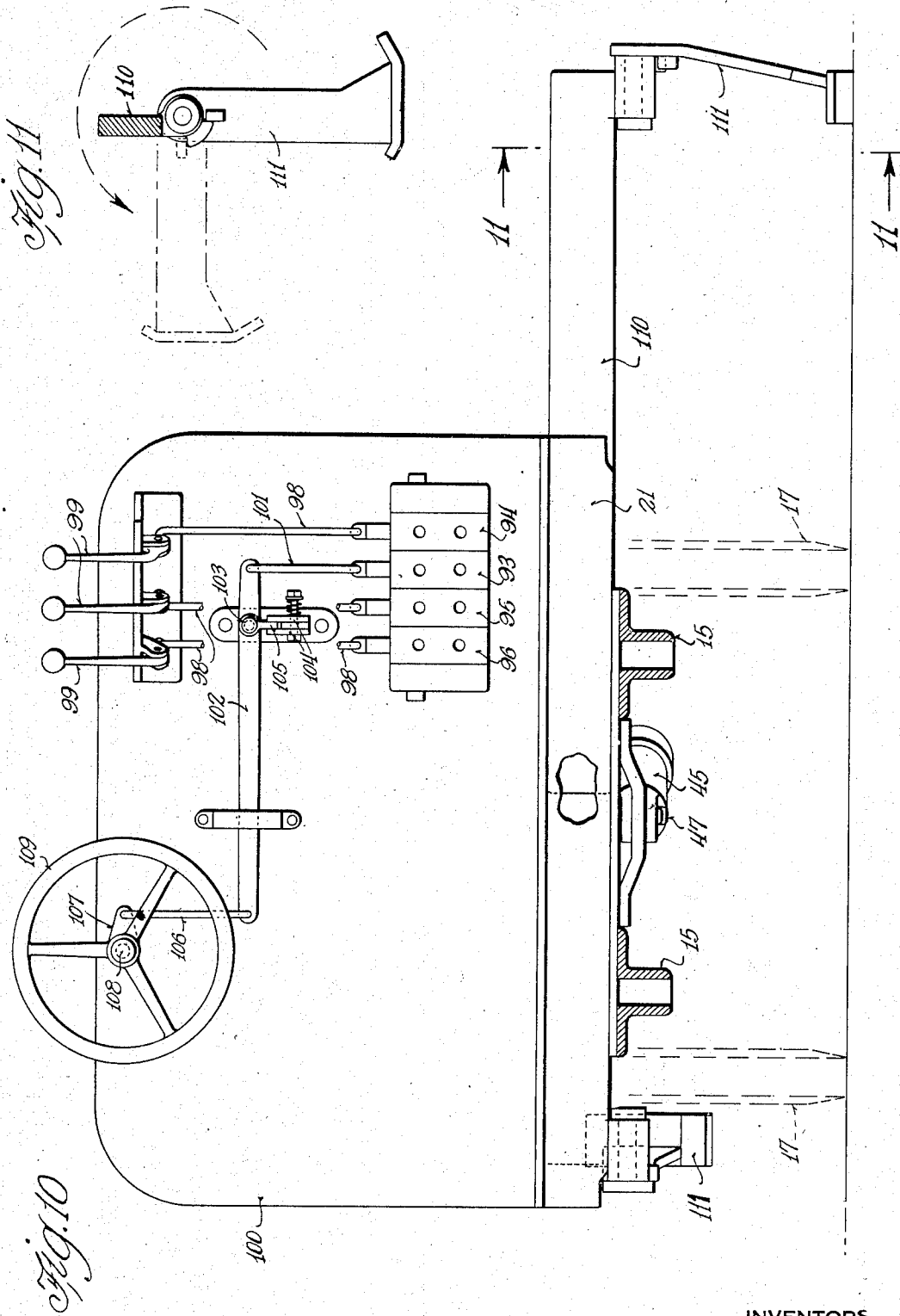
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UNITED STATES PATENT OFFICE

2,387,568

INDUSTRIAL TRUCK

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Application January 7, 1943, Serial No. 471,572

4 Claims. (Cl. 214-65)

The invention relates to industrial trucks.

The general object of the invention is to provide a truck by which heavy loads may be raised and transported from one part of a plant to another and in which the loads may also be swung from one side of the truck to the other. More particularly, the invention includes a novel arrangement of swinging hoist or jib crane in which the crane may be swung through an angle of three hundred sixty degrees which makes the apparatus useful in the loading of box cars and of other limited clearance places. The apparatus also includes a loading platform which may be raised and lowered relative to the floor and used in conjunction with the hoist to handle different items of material.

A further object of the invention is to provide an industrial truck having an elevating platform and a swingable hoist the movements of which, preferably with the steering of the truck, are hydraulically controlled. The truck is driven by a small internal combustion engine which drives the pump for furnishing fluid to the hydraulically operated units, and the driver's seat is located over the engine's transmission with the control levers for the engine and each of the hydraulically operated units within easy reach.

The invention further consists in the several features hereinafter described and more particularly defined by claims at the conclusion hereof.

In the drawings:

Fig. 1 is a side elevation view of a truck embodying the invention;

Fig. 2 is a detailed sectional view taken on the line 2-2 of Fig. 1;

Fig. 3 is a bottom plan view of the forward portion of the truck;

Fig. 4 is a detailed sectional view taken generally on the line 4-4 of Fig. 3;

Fig. 5 is a view similar to Fig. 4 showing the platform in raised position;

Fig. 6 is a plan view of the truck;

Fig. 7 is a detailed vertical sectional view through the boom swing mechanism;

Fig. 8 is a detailed sectional view taken on the line 8-8 of Fig. 7;

Fig. 9 is a diagrammatic view of the hydraulic circuit layout;

Fig. 10 is a detailed transverse sectional view taken on the line 10-10 of Fig. 1;

Fig. 11 is a detailed sectional view taken on the line 11-11 of Fig. 10.

The truck includes a wheeled vehicle having a frame 15, propelling wheels 16, front steering wheels 17, a jib crane or hoist 18, and an elevating platform 19.

The frame 15 includes side bars 20 suitably connected together at intervals by cross braces including the cross bar 21 and side bar extensions 22 connected together by transversely extending front axle supporting plates 23 and 24. The frame has the power plant including the internal combustion engine 25, its radiator 26, and its transmission 27 mounted thereon. The transmission is adapted to drive the propelling wheels 16, but no details of this have been shown as the invention does not reside in special features of the transmission.

The driver's seat 28 is disposed over a part of the transmission, so that the driver is in convenient reach of the brake pedal 29, the clutch pedal 30, and the gear shift lever 31.

The front steering wheels 17 are each mounted on the spindle of a steering knuckle 32 of usual construction mounted on a pin 33 for horizontal swinging movement about a supporting axle 34 which is vertically pivotally mounted at its center on a pin 35 carried by and clamped to the two plates 23 and 24. The pin 35 is also braced by a bracket 36 secured to the plate 24 and disposed adjacent a yoke portion 37 of the axle 34. Each steering knuckle has a rearwardly extending arm 38 operatively connected to the other by a link 39, and one of them connected to one end of a radius rod 40 whose other end has a ball joint connection 40 with one arm of a bell crank lever 41 pivotally supported on the frame at 42 and having its opposite end operatively connected at 43 with the outer end of the rod portion of the piston 44 which works in a cylinder 45 having fluid pressure connections 46 at both ends and pivotally supported at its closed end on a pin 47 secured to the frame. Operation of the hydraulic fluid on the piston will move it to swing the lever 41 to the right or the left or to hold it steady and produce through the rod 40 and arms 38 a similar control of the steering wheels 17.

The elevating platform 19 is connected to the truck frame by pairs of links 48 pivotally connected to the frame and which act in conjunction with an hydraulic cylinder 49 and piston 50 to elevate the platform and hold it in elevated position. In its lowered position the platform rests directly on the frame of the machine as shown in Fig. 4. The cylinder 49 is pivotally connected at one end by a pin 51 to lugs 52 on the front axle carrying plate 23, and the rod portion of the piston 50 is pivotally connected by the pin 53 with brackets 54 on the bottom of the platform 19. With this arrangement, introduction of hydraulic fluid under pressure at the closed end of

the cylinder 49 causes the piston 50 to move outwardly, and this shifts the platform 19 upwardly and toward the left as viewed in Fig. 5, thus raising the platform above the frame of the truck. The height to which the platform is raised depends upon the travel of the piston 50, and this piston may be held in any desired set position, with the platform 19 correspondingly held, by the holding of hydraulic fluid in both ends of the cylinder 49. From Fig. 3 it will be noted that the upper pivots for the forward set of links 48 comprises a shaft 55 mounted in suitable bearings 56 carried by the platform and that the lower pivots for the rearward set of links 48 comprises a shaft 57 carried by the extensions 22 and bent at 58 to avoid interference with the steering control cylinder 45. The lower ends of each forward link are mounted on a pivot shaft 55', and the upper end of each rearward link has its pin 58' journalled in separate bearings on the platform 19. The platform 19 has a chain attaching eye 59 secured to the forward end thereof. Chain eye 59 being pivotally mounted can be swung to either right or left side disappearing under platform 19, thereby using the vertical front end of platform 19 as a pusher.

A mast or derrick frame 60 is built up on one side of the chassis and has its axis substantially within the plane of the load sustaining area of the wheels 16 so as to distribute the weight of the load between said wheels. This frame 60 includes a cross brace 61 and a collar 62 in which the hollow tubular mast or standard 63 is free to rotate. The upper end 64 of the mast is bifurcated to receive the inner end of the overhanging jib or boom 65 to which it is pivotally connected for vertical, angular, or swinging movement by a bolt 66. This vertical movement of the jib 65 is limited by an adjustable connection between said jib and mast comprising pin 67 passing through spaced web portions 68 on the boom and adapted to register with any one of a series of holes 69 in the web portion 70 of the mast.

A pulley 71 is mounted on the bolt 66 and another pulley 72 is pivotally mounted on a bolt 73 on the outer end of the boom 65. A hoist rope or cable 74 has a hoisting hook 75 at one end, runs over the pulleys 71 and 72 and down through the mast 63, and is wound on a drum 76 whose shaft 77 is rotatably mounted in a casing 78 mounted on the frame beneath the mast 63 whose foot sets in the flanged collar 79 on the top of said casing. The shaft 77 has a worm wheel 80 mounted thereon meshing with a worm 81 formed on a drive shaft 82 of a reversible rotary hydraulic motor 83. With this arrangement, rotation of the motor 83, by hydraulic fluid from a rotary pump 84 driven by the engine 25, will through the worm and worm wheel 81 and 80 rotate the drum 76 to haul in or pay out cable 74 to raise or lower a load that may be mounted on its outer end.

For turning the crane, the lower end of the mast 63 has a worm wheel 85, formed integral therewith or secured thereto, which meshes with a worm 86 on a shaft 87 journalled in the upper portion of a casing 88 mounted on the top of the casing 78. This shaft has a sprocket 89 mounted thereon connected by a chain 90 with a sprocket 91 on the drive shaft of a reversible rotary hydraulic motor 92. With this arrangement, rotation of the motor 92 will through the chain and sprocket reduction and the worm and worm wheel reduction cause a slow rotation of

the mast in the desired direction, and on stopping of the motor 92 the worm 86 and worm wheel 85 will form a lock to hold the mast 63 with boom 65 in any desired position. With this construction, boom 65 including the mast 63 may be turned through a complete circle or more than three hundred sixty degrees, so that the crane may pick up and discharge loads at any point within its turning radius.

Each one of the hydraulically operated units 45, 49, 92, and 83 is under the control of its valve 93, 94, 95, and 96, respectively, which control the flow of pressure fluid from the pump 84 and the return of fluid to the reservoir 97.

As shown in Fig. 10, the valves 94, 95, and 96 are each connected by a link 98 with an operating lever 99 mounted on a dash 100 within reach of the operator in his seat 28.

The valve 93, controlling the cylinder 45 which controls the steering, is operatively connected by a link 101 to one end of a lever 102 carried on a pivot pin 103 which is yieldingly urged to a mid-position by a pair of spring pressed plates 104 engaging a lug 105 on said pin 103. The other end of the lever 102 is operatively connected by a link 106 with a crank arm 107 on a shaft 108 provided with a hand wheel 109. With this arrangement, when the wheel 109 is in the position to dispose the lever 102 substantially horizontal, the valve 93 is in its mid-position, so that the spindles 32 are in line with the axle 34. When the wheel 109 is turned counterclockwise, the wheels 17 will be turned toward the left, and when said wheel 109 is turned clockwise or to the right, the wheels 17 will be turned toward the right. In this way the operator's control of the steering of the truck is effected.

Where very heavy loads are handled, provision is made for stabilizing the truck by providing an extensible cross bar 110 to which legs 111 are pivotally secured. As shown in Fig. 10, the leg 111 at one side has been dropped down into contact with the ground or floor, and the leg 111 may also be dropped down into contact with the ground to act as a brace member in case of heavy loads.

With this apparatus the operator may readily guide the truck about an industrial plant, making turns through the turning of the wheel 109 and running the forward or platform carrying end under a piece of machinery or other article to be lifted and then raising this machinery from its fixed seating by elevating the platform through the operation of a hydraulic mechanism including the cylinder 49 and then proceed with the platform in its raised position to a place of deposit for the load which may then be taken off of the platform either by moving it to a position above skids upon which it may be deposited by the lowering of the platform or connecting it up to the hoist hook 75 and operating the cable 74 so as to lift the load above the platform and then operating the motor 92 so as to turn the mast 63 and boom 65 to the desired angular position so as to swing the load with the boom 65 out over the side of the vehicle to a position of deposit, and then the load may be lowered through the reverse operation of the motor 83 and the consequent lowering of the cable 74.

We desire it to be understood that this invention is not to be limited to any particular form or arrangement of parts except in so far as such limitations are included in the claims.

What we claim as our invention is:

1. In a vehicle of the character described, the

combination with a frame, of an elevating platform mounted thereon, raising and lowering means for said platform, a hoist carried by said frame including a rotatable standard mounted on said frame and having a radially disposed load carrying member swingable over said platform and laterally of said frame, a hoisting cable mounted on said standard and member, power operated means mounted on said frame for operating said cable, and power operated means mounted on said frame for turning said standard through a complete revolution relative to said frame.

2. In a vehicle of the character described, the combination with a frame, of an elevating platform mounted thereon, raising and lowering means for said platform, a hoist carried by said frame including a standard rotatably mounted on said frame and having a radially disposed load carrying member swingable over said platform and beyond the sides of said frame, said hoist adapted to make a complete revolution relative to said frame, and a reversible hydraulically operated rotary motor operatively connected to said standard to turn the same relative to said frame.

3. In a vehicle of the character described, the combination with a frame, of an elevating platform mounted thereon, raising and lowering means for said platform, a hoist carried by said

frame including a standard rotatably mounted on said frame and having a radially disposed load carrying member swingable over said platform and beyond the sides of said frame, said hoist adapted to make a complete revolution relative to said frame, a reversible hydraulically operated rotary motor, a drive connection between said motor and standard including a worm and worm wheel for turning said standard, a hoisting cable mounted on said standard and member, a hoisting drum for said cable, and a reversible hydraulically operated motor for driving said drum.

4. In a vehicle of the character described having a wheel supported frame including a pair of front steering wheels, hydraulically operated means for controlling the positioning of said wheels for steering the vehicle, an elevating platform mounted at one end of said frame, hydraulically operated means for raising and lowering said platform, a hoist carried by said frame including a rotatable standard and having a boom swingable over said platform and to the side of said vehicle, a hoisting cable mounted on said standard and boom, hydraulically operated means for operating said cable, and hydraulically operated means for angularly turning said hoist.

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