Oct. 17, 1944. E. J. DUNHAM ET AL 2,360,407

INDUSTRIAL TRUCK

Filed July 10, 1943 5 Sheets-Sheet 1

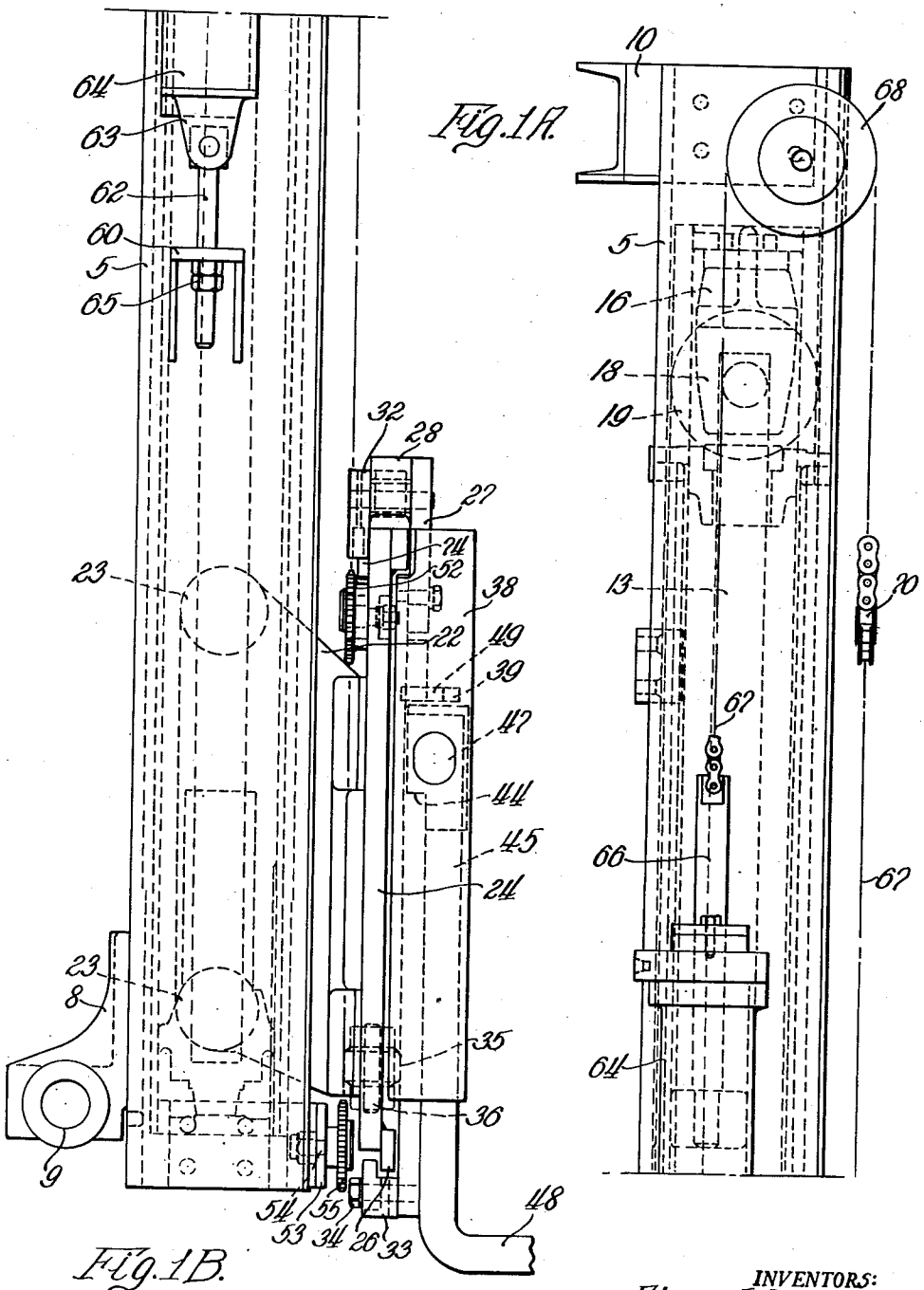


Fig. 1A.

Fig. 1B.

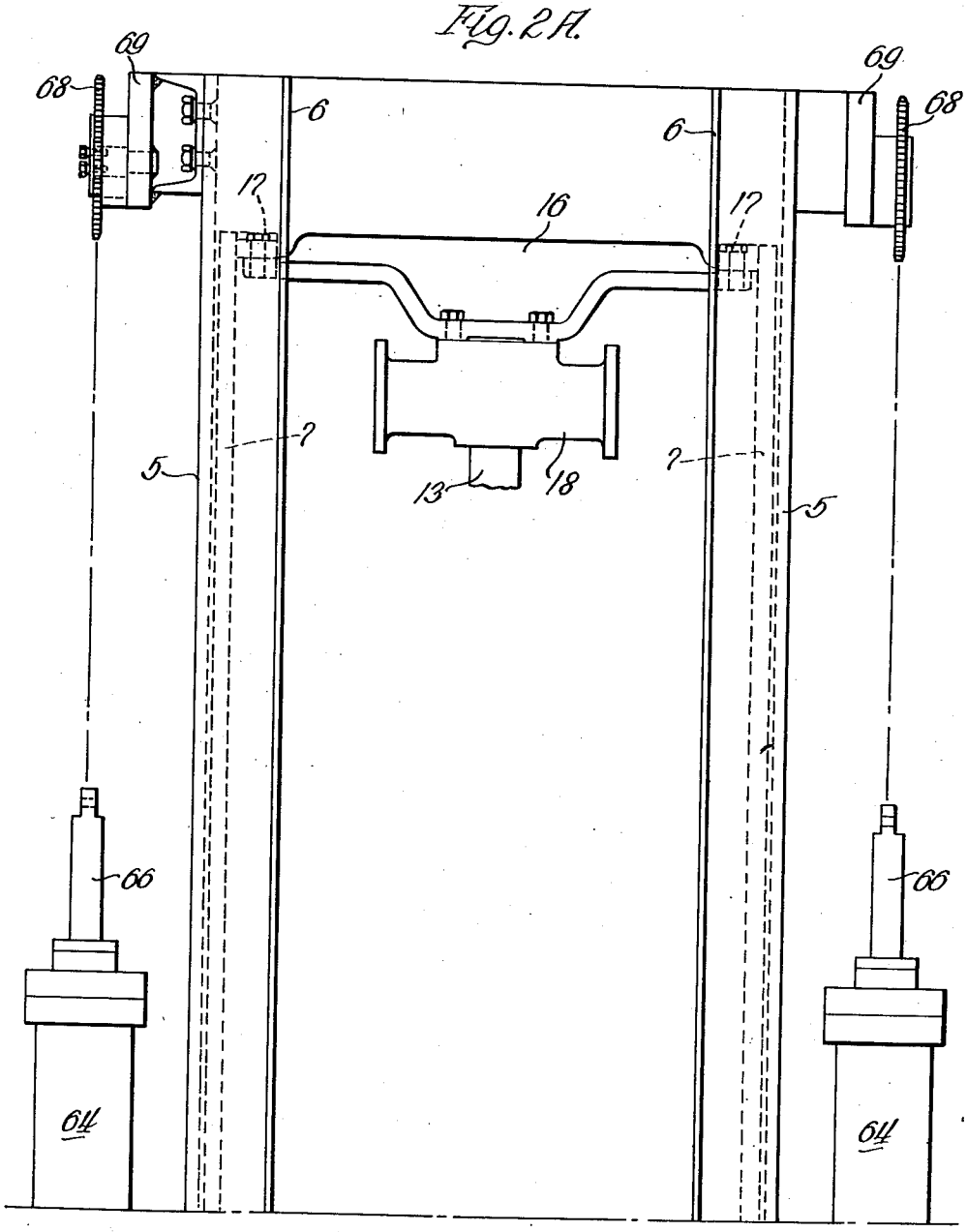
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INDUSTRIAL TRUCK

Filed July 10, 1943 5 Sheets-Sheet 2

Fig. 2A.



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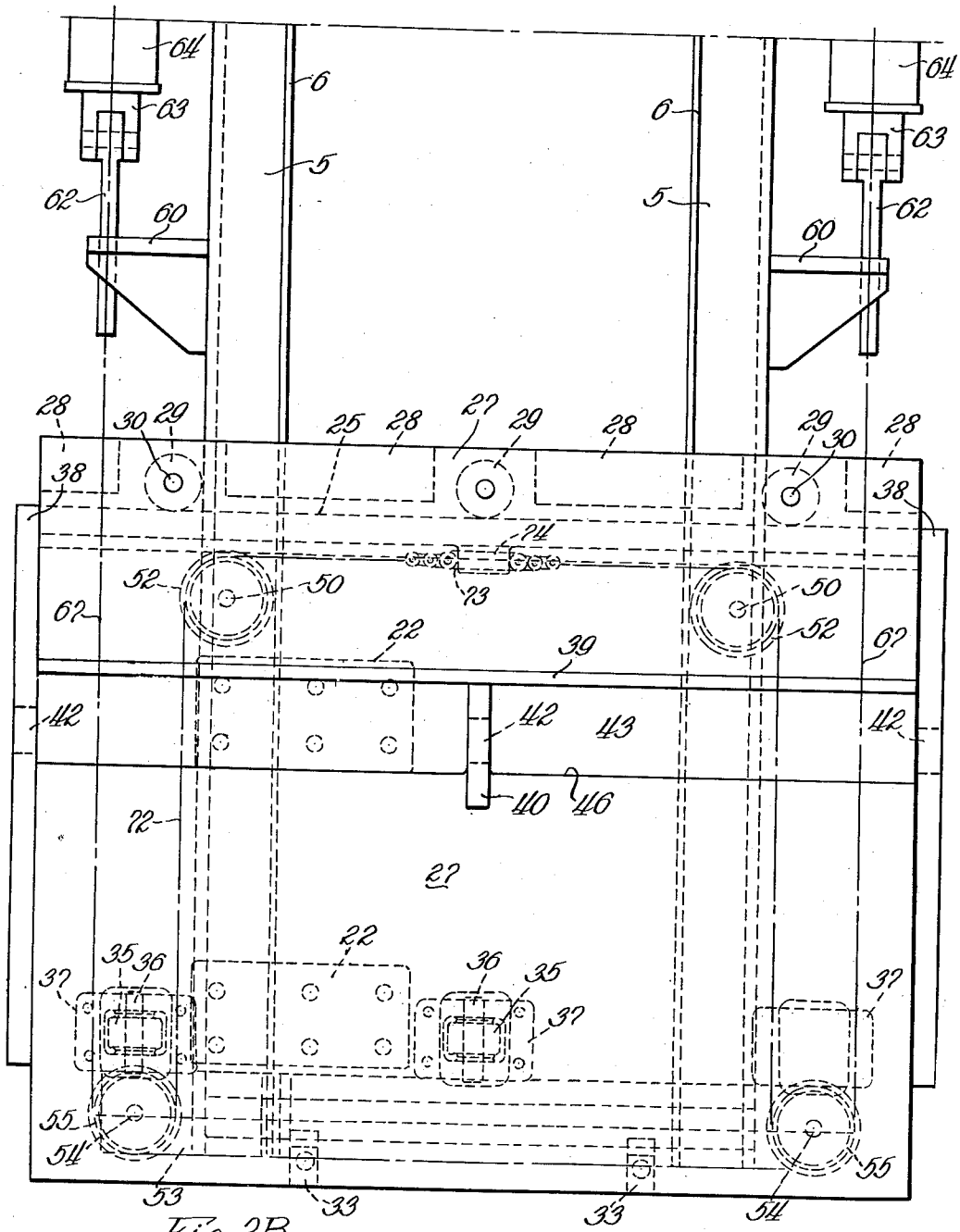


Fig. 2B.

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Oct. 17, 1944. E. J. DUNHAM ET AL 2,360,407

INDUSTRIAL TRUCK

Filed July 10, 1943 5 Sheets-Sheet 4

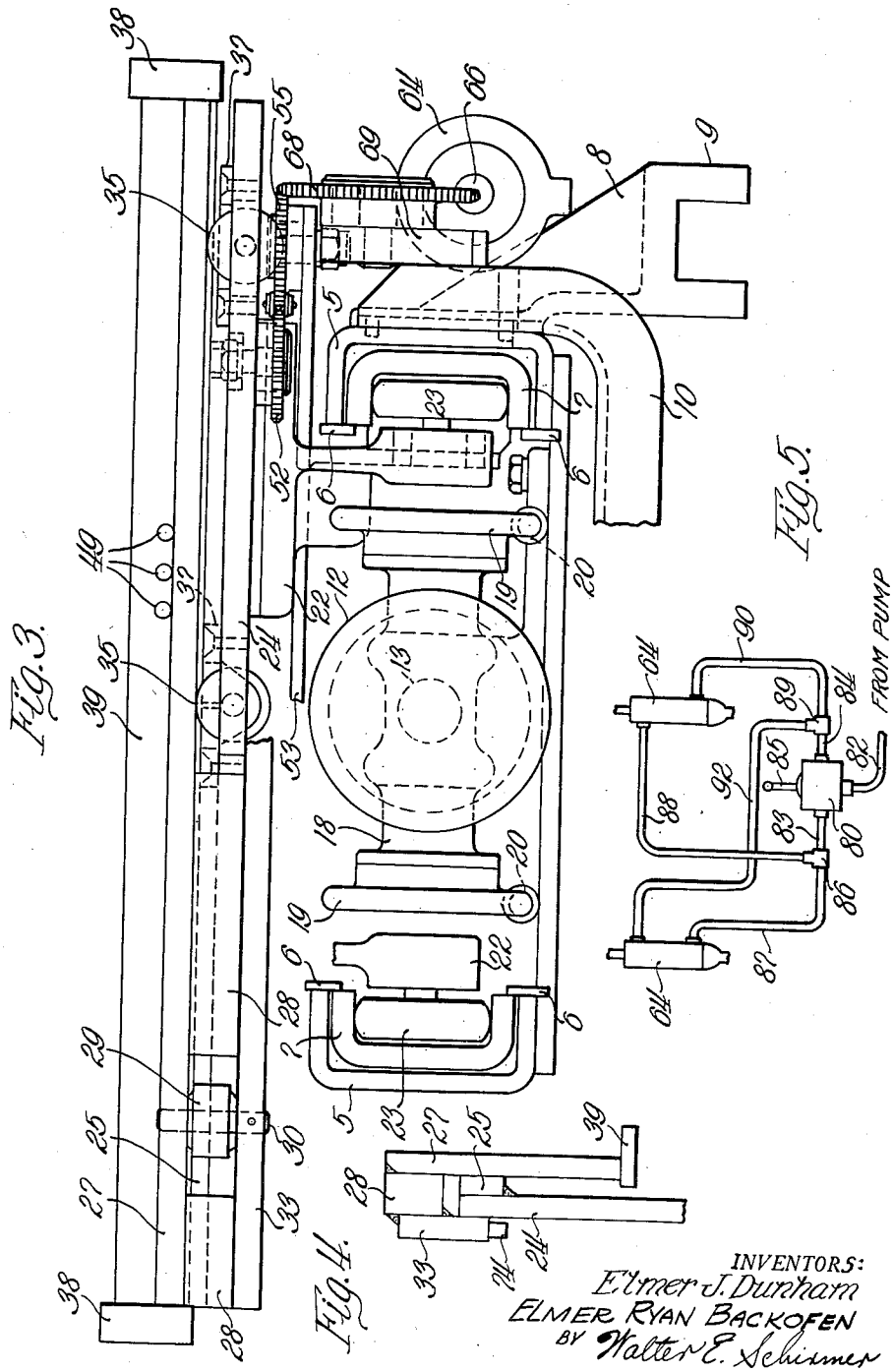


Fig. 3.

Fig. 5.

Fig. 4.

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INDUSTRIAL TRUCK

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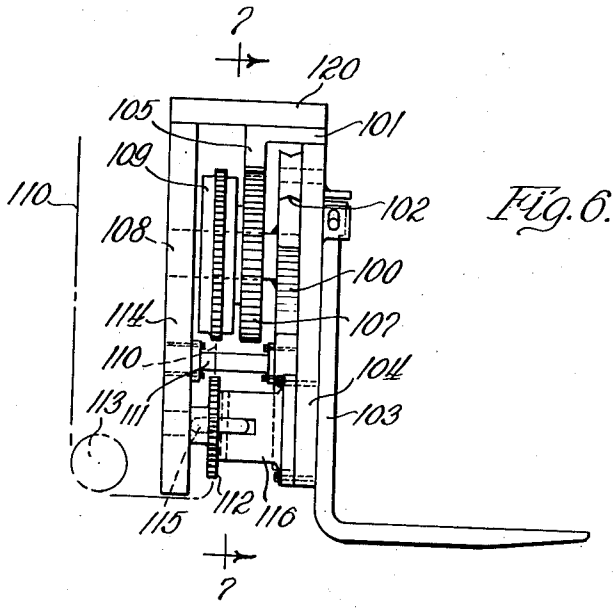
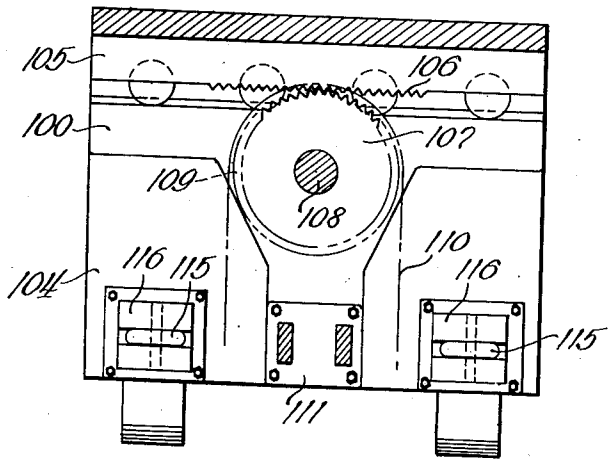


Fig. 6.

Fig. 7.



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INDUSTRIAL TRUCK

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Application July 10, 1943, Serial No. 494,440

19 Claims. (Cl. 214—113)

This invention relates to industrial truck, and more particularly is concerned with an improvement in such trucks providing for lateral shifting of the load carrying forks or fingers at the forward end of the truck.

In general, the present invention is applicable to industrial trucks of the type shown in the patent to E. J. Dunham 2,256,314 issued September 16, 1941. Such trucks are normally provided at their forward ends with a pair of vertically extending uprights or channels having suitable telescoping means, and hydraulic controls for raising and lowering a load supporting carriage mounted for vertical movement within the uprights. The load supporting carriage includes a vertical supporting plate upon which are mounted forwardly projecting load fingers adapted to be moved under a load to receive the same thereon, and then raised in position for transporting the load or for tiering or storing the same in warehouses or the like.

The present invention contemplates providing in such an industrial truck means whereby the finger supporting plate can be shifted laterally of the truck to accommodate picking up loads in narrow or confined spaces where the truck cannot maneuver into position to receive the load directly in line with the longitudinal axis of the truck. Under such circumstances the present invention provides means whereby the carriage can be shifted laterally in either direction to pick up an off-set load, the carriage then being returned to normal position in line with the longitudinal axis of the truck for transporting the load. It is to be understood, of course, that the same lateral movement can be effected when it is desired to discharge the load in an off-set position with respect to the axis of the truck.

One of the primary objects of the present invention is to provide a secondary plate on a load supporting carriage which is roller mounted for lateral movement and which is controlled by means of hydraulic actuated chains and sprockets to be shifted laterally in either direction relative to the uprights.

Another feature of the present invention is to provide a simplified construction which can be readily adapted to present type trucks without changing any of the basic construction of such trucks.

Still another object of the present invention is to provide, on the outer surfaces of the uprights, hydraulic cylinders and pistons which, through suitable chains and sprockets, control lateral shifting of the forward plate and fingers assembly of the load receiving carriage.

Other objects and advantages of the present invention will appear more fully from the following detailed description which, taken in conjunction with the accompanying drawings, will disclose to those skilled in the art the particular construction and operation of a preferred form of the present invention.

In the drawings:

Figures 1—A and 1—B comprise a side elevational view of the upright assembly embodying the present invention.

Figures 2—A and 2—B comprise a front elevational view, partly diagrammatic, of the upright construction shown in Figures 1—A and 1—B.

Figure 3 is a top plan view of the uprights and load supporting mechanism shown in Figures 1 and 2.

Figure 4 is a detailed view showing the mounting of the lateral shift plate on the load supporting carriage.

Figure 5 is a diagrammatic view of the hydraulic circuit for actuating the lateral shifting mechanism.

Figure 6 is a side elevational view, partly diagrammatic, of a modified form of the invention, and

Figure 7 is a rear elevational view, partly in section, on line 7—7 of Figure 6.

Referring now in detail to Figures 1, 2 and 3, the uprights which form the guide means for the load supporting mechanism are indicated at 5 and comprise laterally spaced channel members provided at their ends with plates 6 forming guides for the inner telescoping uprights 7 which have vertical sliding movement within the guiding uprights 5. The uprights 5 adjacent their lower ends are provided with brackets 8 which, as shown in Figure 1—B, are provided with suitable bosses 9 whereby they may be journalled on a supporting shaft to provide for forward and rearward tilting of the entire assembly about the lower ends thereof. The upper ends of the uprights 5 are rigidly spaced apart by means of a cross-member 10 of channel shaped section which is securely bolted to the webs of the uprights at their upper ends and extends therebetween at a point spaced slightly rearwardly of the uprights.

Extending vertically between the uprights 5 is hydraulic cylinder 12 which carries a piston 13 having an extending rod connected at its upper end to a cross head member 16 which member

is bolted at its ends as indicated at 17 to the upper ends of the inner slides 7. Immediately below the cross head 16 there is provided a support head 18 which, at its ends, is adapted to carry sprockets 19 over which a suitable chain 20 is trained whereby upon actuation of the hydraulic piston 13 the load supporting carriage is raised and lowered relative to the inner slides 7, while at the same time the slides 7 are moved vertically within the uprights 5 due to the connection of the cross head therewith.

Thus far, the construction of the uprights and the telescoping slides is conventional, and the details of this construction are not believed necessary of description. Suffice it to say that mounted within the channel shaped portion of the inner slide 7 is a bracket member 22 carrying rollers 23 spaced vertically within the inner slides 7. The bracket 22 at its forward end has rigidly secured thereto a back plate 24, and the chains 20 which are trained over the sprockets 19 are secured rigidly to the bracket so that the bracket 22 and back plate 24 move as a unit vertically within the inner slides 7.

The back plate 24, as shown more in detail in Figure 4, has welded thereto at the upper end a transverse bar 25 forming a spacing member and guide, and at its lower end, as indicated in Figure 1—B, is provided with a second transverse bar 26 for a purpose to be described hereinafter.

Mounted for rolling movement laterally of the plate 24 is a front plate 27 which, at its upper end, is provided with spaced block members 28 as shown more in detail in Figure 3. Intermediate the block members 28 there is provided rollers 29 supported on shafts 30 journalled between the upper end of the front plate 27 and a rear plate 32 which in turn depends downwardly below the upper edge of the back plate 24 as shown in detail in Figure 4, thus forming a channel shaped structure extending over the upper edge of plate 24 and bar 25 to lock the plate 27 against movement relative back plate 24. Three such rollers 29 are provided which carry the weight of the front plate 27 on the upper surface of the back plate 24. The lower end of the front plate 27 is provided with transverse angle shaped brackets 33 bolted or otherwise secured thereto as indicated at 34, which extend upwardly behind the depending bar 26 to provide a hooked type construction preventing separation of the lower end of front plate 27 from back plate 24.

Above the bar 26, the back plate 24 is provided with horizontally disposed rollers 35 mounted on shafts 36 and secured as an assembly unit in openings in the back plate 24 as by means of the brackets 37. This provides rolling action of the lower end of front plate 27 relative to the back plate 24 so that there will be no binding of the plate 27 as it is shifted laterally relative to the plate 24.

The front plate 27 at opposite ends thereof is provided with vertically extending flange members 38 which may be welded or otherwise suitably secured thereto and which form vertically projecting flanges at the side edges of the front plate 27. Extending transversely across the front plate 27 between the flanges 38 is a horizontally projecting plate or strip 39 which intermediate its ends is provided with a depending bracket portion 40 suitably apertured in horizontal alignment with apertures 42 in the end flanges 38. The end flanges 38 provide means for interconnecting the upper portion and lower portion of the back plate 27, these portions being separated by the space 43 within which projects the rearward extension 44 forged or otherwise formed at the upper ends of the fingers 45 whereby the fingers 45 have support upon the upper edge 46 of the lower portion of the back plate 27. The upper ends 44 of the fingers are provided with elongated openings 47 and a suitable rod extends through the aligned apertures 42 and through the openings 47 in the fingers to lock the fingers in position against separating movement, the bar being anchored at its ends in the end flanges 38.

The fingers 45 at the lower ends are provided with forwardly extending portions 48 upon which the load to be supported by the truck is carried. Preferably the fingers are adjustable laterally between the central plate or bracket 40 and the side flanges 38, and for this purpose the transverse strip 39 is provided with openings 49 through which pins may be extended into corresponding openings formed in the upper ends of the head portions 44 of the fingers. These pins serve to lock the fingers against lateral movement along the rod, and thus provide a predetermined spacing of the fingers which can be adjusted, depending upon the load to be carried.

The back plate 24 adjacent its upper ends is provide with horizontal stub shafts 50 upon which are mounted sprockets 52, these sprockets being arranged for rotation about the horizontal shafts and being disposed to the side of and slightly above the points at which the bracket 22 is bolted to the back plate 24.

The uprights 7 adjacent their lower ends are provide with a transverse plate or rod 53 which, as shown in Figures 1—B and 2—B, extends transversely between the lower ends of uprights 7 and preferably has rearward extensions 53 bolted or otherwise rigidly secured to the uprights. This rod 53 outwardly of the uprights 7 is provided with studs 54 carrying sprockets 55 disposed in the same vertical plane as the sprockets 52.

As will be noted in Figures 2—A and 2—B, the uprights 7 intermediate their ends are provided with laterally directed bracket portions 60 which are adapted to receive suitable links 62 pivotally connected at their upper ends to brackets 63 of the hydraulic cylinders 64. The links 62 are anchored against movement as by means of nuts 65 shown in Figure 1—B to prevent upward movement thereof out of the brackets 60. The pistons 64 are of similar design and are provided with upwardly extending piston rods 66 having the piston ends 66' thereof disposed within the cylinder 64. The piston rods 66 are connected by means of the chain 67 which is trained over sprockets 68 carried by suitable brackets 69 secured to the upper ends of the upright assembly. From the sprockets 68, the chain extends downwardly to the sprockets 55 carried by the transverse bar 53 at the lower ends of the uprights, the chain being interrupted intermediate its ends by a link 70 which rotates the links in the lower half of the chain at right angles to the links in the upper half of the chain so that they are in position to be trained over sprockets 55 which rotate in a vertical plane at right angles to the plane of the sprockets 68.

After being trained about the sprockets 55, the chain is led upwardly as indicated at 72 and is trained over the sprockets 52 carried by the back plate 24. The chain intermediate the sprockets 52 is provided with a connector link 73 which is connected as by means of bracket 74 to the front

plate assembly 27. Thus, the two ends of the chain are connected to the piston rods 66 and the chain is then continuously trained over sprockets 68, thence over sprockets 55 and thence over sprockets 52 with the link 73 being connected to the bracket 74 so that upon any lateral shifting of the link 73 the bracket 74 will be correspondingly shifted, and consequently will roll the front plate assembly 27 on the rollers 29 and 35 laterally in one direction or the other thereby shifting the forks 45 laterally of the machine into position to pick up offset loads.

The control system for producing this lateral movement is shown diagrammatically in Figure 5 and consists of a control valve 80 having an intake 82 leading from the pump, and having outlets 83 and 84 respectively. When the valve lever 85 is actuated in one direction, the fluid pressure from the pump is directed through outlet 83 and T 86 into lines 87 and 88 leading respectively to the lower end of one cylinder 64 and the upper end of operating cylinder 64. As a result, one of the pistons 66 is moved upwardly while the other piston is moved downwardly. This moves the chain 67 over the sprockets to produce lateral movement of the connector link 73 in one direction to shift the front plate assembly 27 laterally. When the valve lever 85 is moved in the opposite direction, fluid under pressure is directed through outlet 84 and T 89 into conduits 90 and 92 leading to the respective opposite ends of the cylinders 64 which in turn results in moving the chain in the opposite direction to provide opposite shifting of the front plate assembly 27.

Thus, movement of the control lever 85 in opposite directions produce opposite movement of the front plate assembly laterally of the back plate 24, thereby shifting the forks of the truck laterally to facilitate picking up of offset loads. It is, of course, apparent that other types of control systems might be employed for actuating the piston and cylinders 64.

In Figures 6 and 7 a modified construction for the plate assembly is shown in which a T-shaped stationary back plate for the load supporting carriage is indicated at 100, and at its upper end is provided with a bevel edge 102. The front plate assembly includes laterally spaced fingers 103 mounted on a vertical plate 104 having plate 101 provided with a depending flange portion 105 formed with a rack 106 adapted to be engaged by the segmental gear 107 carried on the shaft 108. The gear 107 is rotated by means of a sprocket 109 also carried on the shaft 108 and receiving a chain 110 trained over the sprocket and thence downwardly over sprockets corresponding to sprockets 68.

The shaft 108 extends between a plate 114 which is fixed to the vertically movable bracket corresponding to the bracket 22 of Figures 1 and 3, and the back plate 100. A second spacing and supporting bracket 111 extends between plates 100 and 114 adjacent the lower end thereof. Suitable rollers 115 are carried in brackets 116 secured to the lower end of the front plate 104 to provide for rolling movement of the front plate 104 relative the back plate 100. Preferably the plate 104 is provided with grooved pulleys or rollers 117 engaging in the bevel edge 102 of the back plate 100, whereby it is guided for lateral movement relative to the plate. A suitable protecting plate 120 is disposed over the upper edge of the plate 114. It will be apparent that in this embodiment of the invention, rotation of the gear 107 in opposite directions will cause opposite lateral shifting of the fork assembly.

It is therefore believed apparent that we have provided a novel type of lateral fork shifting mechanism for an industrial truck of the class described, which has the advantages of adaptability to trucks now in use, and provides for picking up offset loads in situations where, because of narrow aisles or the like, it is impossible to line the truck up longitudinally with the load.

We are aware that various changes may be made in certain details of the present construction, and therefore do not intend to be limited except as defined by the scope and spirit of the appended claims.

We claim:

1. In a lift truck having a vertical mast at one end thereof, a load supporting carriage mounted for vertical movement in said mast and comprising a back plate restrained against lateral movement, a front plate having vertically spaced anti-friction means, means mounting it for lateral movement on said back plate, hydraulically controlled means mounted on said mast, and chain means connected between said hydraulic means and said front plate for shifting said front plate laterally upon actuation of said hydraulically controlled means.

2. The lift truck of claim 1 wherein said load supporting carriage is provided with forwardly projecting lift fingers, means for supporting said fingers on said front plate, and means for adjusting the spacing of said fingers on said plate.

3. In a lift truck having a pair of load supporting uprights, a load carriage mounted for vertical movement in said uprights including a back plate, a pair of laterally spaced sprockets on said back plate, a pair of laterally spaced sprockets at the lower ends of said uprights, a pair of sprockets at the upper end of said uprights, cylinders supported on said uprights intermediate their ends, pistons in said cylinders, a chain connected at its ends to said pistons and trained about said sprockets to extend laterally between said two plate sprockets, a front plate supported on and mounted for lateral shifting movement on said back plate, and means connecting the lateral portion of said chain to said front plate.

4. The truck of claim 3 further characterized by means for simultaneously actuating said pistons for movement in opposite directions to shift said front plate laterally.

5. The truck of claim 3 further characterized by means providing rolling contact between said plates.

6. The truck of claim 3 further characterized by means coacting between said plates preventing separation of said plates.

7. In combination, an upright assembly for one end of a lift truck, a load-supporting carriage vertically movable in said assembly and including forwardly disposed plate members, one of said members being rigidly secured to said carriage and the other of said members being laterally shiftable relative to said first member, load-carrying forks supported on said movable plate member, hydraulically controlled means supported on said upright assembly, and means actuated by said last-named means and connected to said movable plate member for shifting the same laterally.

8. The combination of claim 7 wherein roller means is provided between said plate members for facilitating relative movement therebetween.

9. The combination of claim 7 wherein said movable plate member has means overhanging the upper and lower edges of said rigid plate member preventing separating movement therebetween.

10. The combination of claim 7 wherein said lateral shifting means comprises interengaging rack and pinion means on said plate members.

11. A load supporting carriage for an industrial lift truck having a vertical mast at one end thereof, comprising means guided for vertical movement in said mast, a vertical plate rigidly secured to said means, a second plate having rollers in the upper end thereof supporting it on said first plate for lateral movement relative thereto, rollers on said first plate engaging the lower vertical surface of said second plate, interengaging means preventing separation of said plates, load-carrying fingers mounted on and projecting forwardly of said second plate, and means carried by said mast and connected to said second plate for selectively shifting the same laterally in either direction.

12. The carriage of claim 11 wherein said interengaging means comprises guide means carried by said second plate overlying the upper and lower edges of said first plate.

13. A load supporting carriage for an industrial truck comprising a back plate rigidly guided for vertical movement only, a front plate comprising upper and lower portions spaced apart to form a transverse gap therebetween, end plates secured to the lateral edges of said portions to form a unit construction, means on the upper end of the upper plate portion overhanging the upper edge of said back plate and having rollers engaging said edge to support said front plate for lateral movement relative to said back plate and lift fingers carried by said front plate and having boss portions at the upper ends thereof projecting into said gap and supported on the upper edge of said lower plate portion.

14. The carriage of claim 13 wherein said front plate has means for locking said fingers in selected laterally spaced positions thereon.

15. In a load-supporting carriage for an industrial truck, a plate construction comprising upper and lower plate portions spaced apart vertically and held in position by side members secured to the lateral edges of both portions, and angle-shaped lift fingers having head portions projecting into the transverse gap between said plate portions and supported on the upper edge of the lower plate portion.

16. The combination of claim 15 wherein said upper plate portion is provided with means for locking said fingers in selected laterally spaced positions.

17. The combination of claim 15 wherein said plate construction has means locking said fingers against lateral shifting movement relative thereto.

18. In an industrial truck having a vertical mast at one end thereof provided with a load supporting carriage adapted to traverse said mast, a plate carried by said carriage and supported thereon for lateral shifting movement, load carrying fingers supported on said plate, hydraulic means including pistons mounted on opposite sides of said mast, and a chain member connected at its ends to said pistons and having an intermediate portion anchored to said plate whereby selective actuation of said pistons causes said chain member to shift said plate laterally relative to said carriage.

19. In an industrial truck having a vertical mast at one end thereof provided with a load supporting carriage adapted to traverse said mast, a front plate comprising upper and lower portions spaced apart to form a transverse gap therebetween, end plates secured to the lateral edges of said portions to form a unitary plate construction, a transversely extending rod supported at its ends by said end plates in line with the gap in said front plate, fingers carried on said rod and having bosses at the upper ends thereof projecting into said gap and supported on the upper edge of said lower plate, and means mounting said front plate assembly for lateral shifting movement on said carriage.

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