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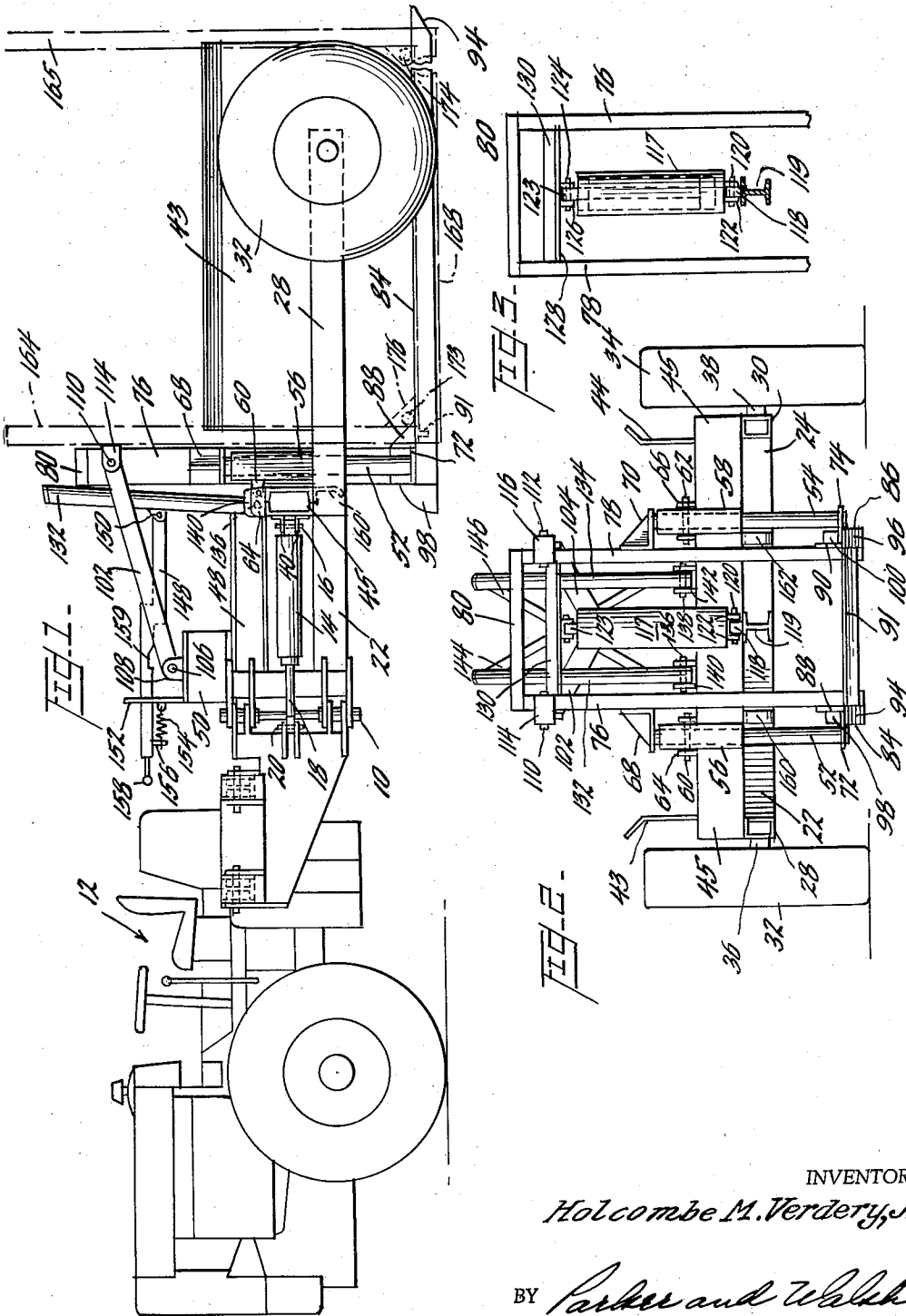
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3,101,153

FORK LIFT DEVICE

Filed Sept. 12, 1960

3 Sheets-Sheet 1



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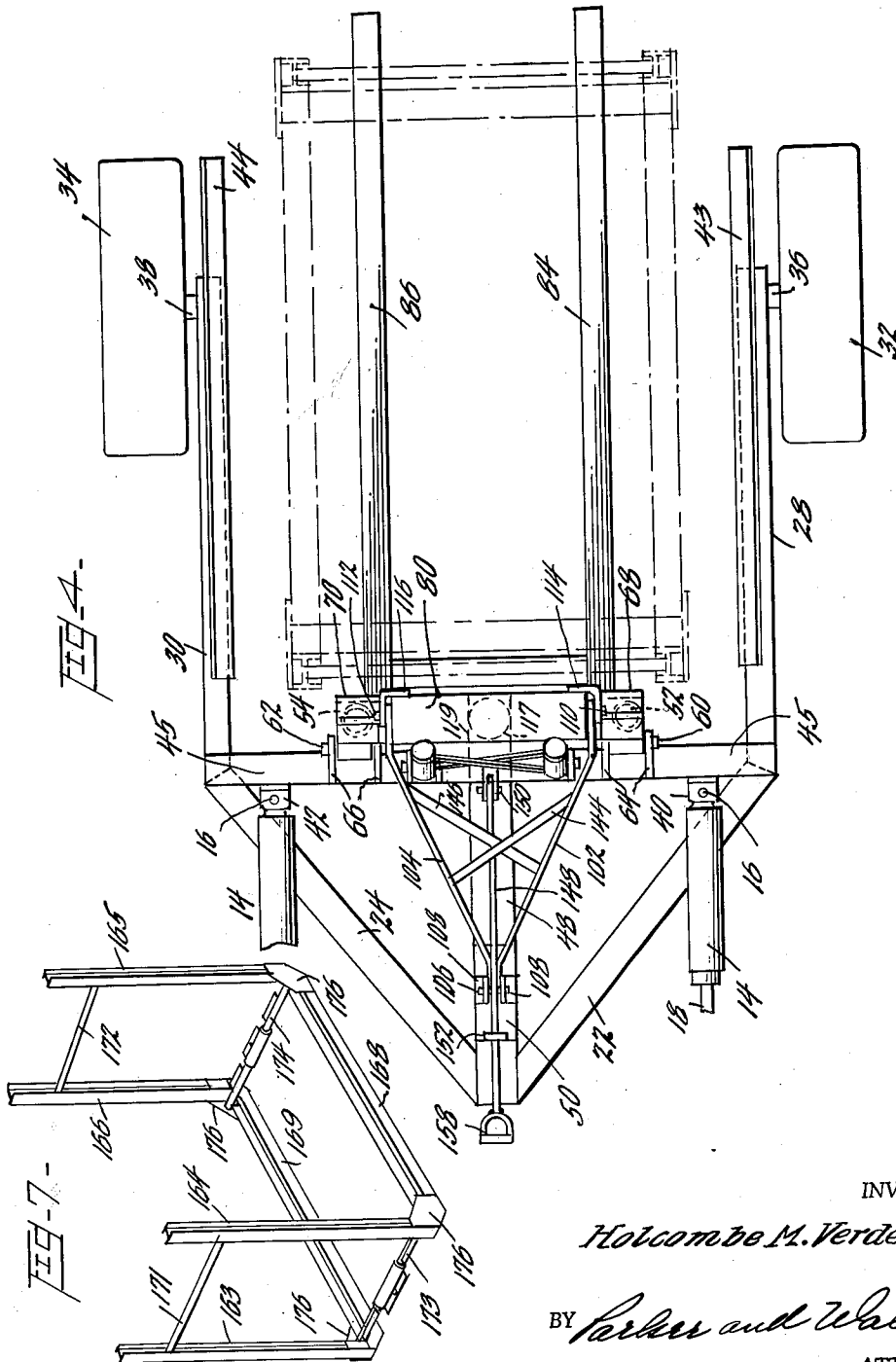
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3 Sheets-Sheet 2



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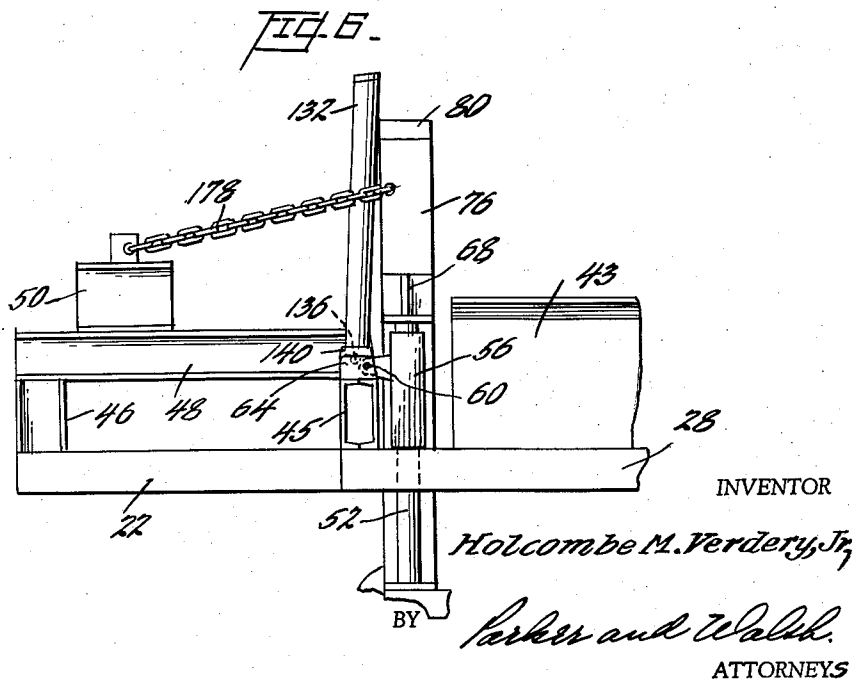
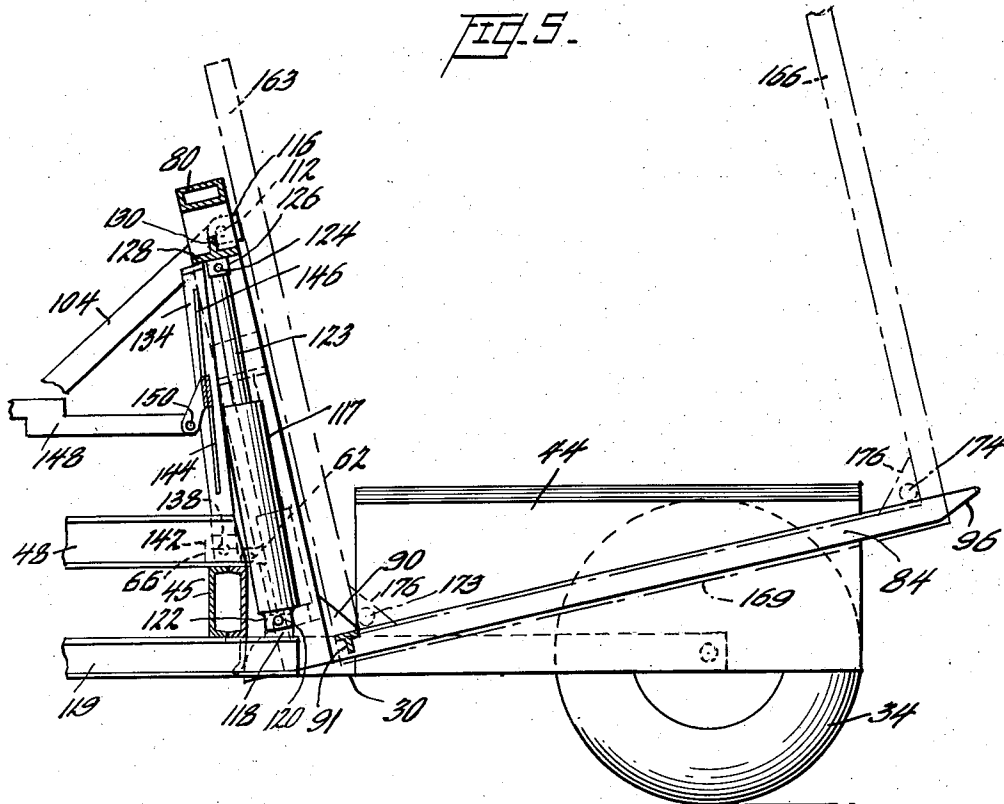
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3 Sheets-Sheet 3



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FORK LIFT DEVICE

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Filed Sept. 12, 1960, Ser. No. 55,286

11 Claims. (Cl. 214-700)

This invention relates to a fork lift device, and in particular to a power lift which is adapted to the problems involved in the loading and transportation of pulpwood in forest areas where access and movement is difficult.

Sizeable pay loads may be carried by trucks but the dense growths in forests of pulpwood trees, together with the rough terrain, render their use impractical. At present, most pulpwood is loaded on a hauling truck at the stumps where the wood is cut. This requires a great deal of cutting of bushes, stumps and trees to improvise a road for movement of the truck, entailing much expense in the preparation, and in the maintenance and depreciation of the truck. Where maneuvering of the truck is required, over and above straight line travel, the cost is still further increased, and as a consequence, wood is carried, manually, over large distances in many instances. Furthermore, due to its large capacity, a truck is subject to bogging down, and its loading height is far from convenient.

I have found that by collecting the logs in bundles on racks in the areas of cutting operation, they may be picked up by a suitable lift device, which is relatively small in size and adapted to the crowded areas, and carried expeditiously to a marshalling point, in a more maneuverable area, where they can be loaded on a truck or flatcar. For this purpose I provide a cage-like holder for the bundles of logs, and a cooperating fork-like device which not only lifts the loaded cage, but also tilts it forwardly so that the cage and the load are secure against dislodgement in travelling over rough terrain, without the need for any fastening devices, and the stresses on the system are minimized. Although the racks may be spotted in the woods for loading and ultimate pick-up by the fork-lift and transport to a central point, it will in many cases be highly convenient for the rack to remain on the lift truck and moved about for loading, thus reducing the distance the wood must be hand-carried and enabling adjustment of the height of the rack during loading.

It is therefore an object of the invention to facilitate the movement of logs in inaccessible forest areas. Another object is to achieve efficient movement of logs even though handled in relatively small bundles. A further object is to provide a low loading height and to transport bundles of logs in a lift truck, over rough terrain without recourse to load-fastening devices.

These and other ends are attained by the present invention, a preferred form of which is described in the following specification, as illustrated in the drawings, in which:

FIGURE 1 is a side elevational view of a fork-lift device coupled to a two-wheel towing tractor, and in position to lift a log-holding cage or rack, the latter being shown in phantom;

FIGURE 2 is a rear elevational view of the lift truck, as seen from the right of FIGURE 1;

FIGURE 3 is a fragmentary view showing a portion of the lift truck in front elevation, as seen from the left of FIGURE 1;

FIGURE 4 is a top plan view of the lift truck;

FIGURE 5 is a view similar to FIGURE 1 showing a portion of the lift truck, enlarged, with the lift fork raised and tilted forwardly, some parts being shown in cross-section;

FIGURE 6 is a fragmentary view of a portion of the lift truck, showing a modified radius member for tilting the lift fork; and

FIGURE 7 is a view in perspective, on reduced scale, of the loading cage.

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Referring to the drawings by characters of reference, there is shown, in FIGURE 1, a fork-lift truck coupled by a pintle 10 to a two-wheeled tractor indicated as a whole by the numeral 12, steering of which is accomplished by a pair of hydraulic cylinders 14 pivoted at 16 to the lift truck, and with piston rods 18 swivelled at 20 to the tractor.

The fork-lift truck may be described generally as consisting of two main parts—the truck proper and the lifting fork element. As best seen in FIGURE 4, the main frame of the truck comprises a forward, triangular frame, with angularly disposed members 22, 24 meeting at a forward apex and from the ends of which a pair of side members 28, 30 extend rearwardly. As shown, all of these main frame members are tubular, and rectangular in cross-section, although other forms comporting with strength requirements may be employed. A pair of supporting wheels 32, 34 are separately journaled in hubs 36, 38 fixed to the side, frame members 28, 30. Brackets 40, 42, to which the steering cylinders 14 are pivoted are secured to a beam 45 to be latter described. A pair of outwardly flared fenders 43, 44 carried by side members 28, 30, insure centering of the logs at the wheel area.

Carried on the forward triangle of the main frame is a superstructure on which are mounted various components of the truck presently to be described. Thus, there is supported on the front ends of side members 28, 30, a tubular beam 45, which may be conveniently assembled from two channel members. At the apex of the triangle, an I-beam 46 (FIG. 6) vertically disposed on the frame members 22, 24 has a height equal to that of the transverse beam 45, and supports, with the latter, the ends of a longitudinally disposed, horizontal I-beam 48 which bisects the apex angle of the triangle. The I-beam 48, in turn, supports a similarly disposed short section of I-beam 50.

Except for the radius rod arrangement for tilting the lift-fork, and the lift cylinder unit, the sole attachment of the left-fork to the truck resides in a pair of round rods 52, 54, slidably carried in a pair of blocks 56, 58 of square section, having cylindrical bores and mounted for swinging movement by means of pivots 60, 62 in brackets 64, 66 carried on the cross beam 45, the mounting tubes being located about midway of each half of the beam. The slide rods 52, 54 are attached to upper brackets 68, 70 and lower brackets 72, 74 carried by the side members 76, 78 of the vertically disposed frame of the lift-fork unit, the rods being on opposite sides of the frame, and in spaced relation thereto. The side pieces of the rectangular frame are connected by a top cross beam 80. As in the case of the truck frame these members are preferably tubular in section for strength without undue weight.

A pair of fork tines 84, 86 extend rearwardly from the bottom of the lift, being secured, as by welding, to the outer sides of uprights 76, 78 at the bottom thereof, with corner bracing furnished by triangular extensions 88, 90 on the brackets 72, 74, and cross bracing by a transverse beam 91 of T-section adjacent the vertical framework. The tines 84, 86 which may be of any suitable form such as I-beam, T-beam, channel beam or tubular, are bevelled as at 94, 96 at their rear ends for riding over minor obstacles on the ground. Also carried by the vertical framework of the lift, forwardly thereof, and generally aligned with the fork tines, are a pair of rounded heel members 98, 100, the purpose of which will be later set forth.

From the structure thus far described, it will be seen that the entire fork frame, including the tines, may move generally vertically by sliding movement of the guide rods 52, 54 in the cylinders 56, 58, and that the entire assembly may also swing about the pivots 60, 62. This swinging is automatically accomplished in direct relation to the degree of sliding movement of the frame by means of a pair of radius rods or bars 102, 104 swingable on a pivot

105 carried by anchoring brackets 108 mounted on the top of the short I-beam 50 on the superstructure of the truck, the bars diverging in a rearward direction and being attached at their rear ends by pivots 110, 112 to brackets 114, 116, secured on the outer faces of vertical posts 76, 78 of the lift-fork frame.

Power means for lifting the fork assembly is provided in a hydraulic cylinder 117 (FIG. 2), operating to produce a thrust between the truck frame and the forklift frame. Thus, the cylinder is supported from beneath by an I-beam 119 secured at the apex of the forward triangle of the truck frame and to the underside of the cross-beam 45, and extending rearwardly of the latter at least as far as the width of lift frame members 76, 78. Mounted on the top of beam 119 in this extended region is a pillow block 118 carrying a pin 120 pivotally engaged in bores in the depending ears 122 of the cylinder. The piston rod 123 of the hydraulic cylinder is pivoted by means of a transverse pin 124 to a U-bracket 126 secured to and depending from the lower horizontal flange 128 of a cross beam 130 of inverted T-section extending between lift frame uprights 76, 78 just below the top frame member 80. It will now be evident that as the hydraulic cylinder is extended it will exert a thrust between the truck bed (through I-beam 119), and the lift frame (through T-beam 130) to lift the frame, and hence the fork tines 84, 86. During this movement, due to the anchorage of arms 102, 104 the pivot point 110 is constrained to movement in a circular path, and as a consequence, the vertical lift-fork frame is caused to tilt forward progressively due to the fixed, pivotal anchorage of the cylinder blocks 56, 58 in which the guide rods of the lift assembly slide. It is this tilting action which requires the pivotal connections of the two parts of the hydraulic cylinder unit, since one part is fixed on the truck body and the other swings with the lift frame. With pivotal connections, as shown, the relative movement is fully compensated. The slanted position of the lift frame not only provides a more favorable position of the center of gravity, but minimizes the chance of the load creeping rearwardly and slipping off during travel, as would be the case if the use of conventional lift-forks were attempted in areas of rugged terrain. In the raised and tilted position of the lift assembly, the truck is ready for towing. At an accessible loading point, the rack is lowered and left to be later lifted onto a transport truck for hauling to a wood yard.

In order to avoid dependence upon the hydraulic system during transport, a positive latching means for the raised assembly is provided in a pair of detents or pawls 132, 134 pivoted by pins 136, 138 in U-brackets 140, 142 secured to the top of cross beam 45, and the detents located closely adjacent the vertical lift frame so that their tops may be swung into holding position under the top cross beam 80 of the frame. The pawls, which are stabilized at their outer ends by a brace in the form of crossed members 144, 146, are controlled by a pull rod 148 pivoted at 150 to the center of the X-frame brace and supported, in sliding relation, in an opening in an upright bracket 152 on the I-beam section 50. The pull rod is biased rearwardly, by a tension coil spring 154 secured to bracket 152 and a lug 156 on the rod, so that the pawls will slip automatically into locking position after top beam 80 has passed beyond the upper ends of the pawls. For retraction of the latter to permit lowering of the lift frame, the rod 148 is provided with a pull handle 158 on its forward end. The pawl may be locked in withdrawn position by means of a notch 159 which locks behind bracket 152 to hold rod 148 against return. As another feature which protects vulnerable parts from the hazards of travel over rough terrain, a pair of plates 160, 162, having forwardly flared bottom end portions are secured to the underside of cross beam 45 in position to be engaged by heels 98, 100, so as to assume the reaction stresses due to the load and thus protect the slide rods, cylinder blocks and pivots

from sudden, high, acute stresses. This becomes particularly important if the tilt control rods should break.

The loading rack, or cage for the pulpwood shown in phantom in several figures of the drawing in its cooperative relation to the fork-lift is shown, per se, in FIGURE 7. This may partake of many forms, the important considerations being an upwardly open structure consisting basically of four upright posts 163, 164, 165 and 166 connected at their bottoms by a pair of longitudinal members 168, 169, and lateral cross members 171, 172 and 173, 174. The logs will be loaded transversely to longitudinal members 168, 169. Since this arrangement entails stresses on the corner posts in the direction of longitudinal posts 168, 169, corner bracing as by the webs 176 may be desirable. It follows, also, that suitable strength or bracing at the base may obviate the need for the upper cross bars 171, 172. The lower cross bars 173, 174 should be located at a suitable height above the ground to accommodate the tines of the liftfork. As shown in FIGURE 7, this is conveniently accomplished by securing the cross members to the corner web plates 176.

In FIGURE 6 is shown a modified form of the tilt control wherein the radius rods and their pivots have been replaced by a pair of chains 178. This is not only simple and economical, but permits a slack in the control so that the fork, when lowered, may follow the contour of the ground.

While a certain preferred embodiment has been shown and described, the same is not limiting, since various modifications, such as alternations, additions and substitution of equivalents will be apparent to those skilled in the art, in the light of this disclosure, and the invention should not, therefore, be deemed as limited except as shall appear from the spirit and scope of the appended claims.

I claim:

1. A lift and transport device comprising a main frame having a triangular forward section and a pair of separate side members extending rearwardly from the ends of the base of said triangular section and each mounting a wheel, a pair of blocks with cylindrical bores articulated to said forward section at the rear thereof, on a common, horizontal axis extending transversely of said frame, a lift unit having a frame with generally vertical side members and top and bottom cross members, a rod of circular cross-section carried by each of said side members, in parallel and spaced relation thereto, said rods being slidably mounted in the bores of the respective, said blocks, a pair of arms, each pivoted at one end to a fixed mounting on said forward section, and with their other ends pivoted to the said side members on a common, horizontal axis above the axis of articulation of said blocks, a hydraulic cylinder unit with one part pivoted to said forward section and the other part pivoted to the frame of said lift unit, a spring-biased latch adapted to engage and hold said lift unit frame in raised position, and cam means on said lift unit frame and on said forward section adapted to contact in the raised position of the lift unit, to relieve the stresses on said rods and blocks.

2. A lift and transport device comprising a main frame having a triangular forward section and a pair of separate side members extending rearwardly from the ends of the base of said triangular section and each mounting a wheel, a pair of blocks with cylindrical bores articulated to said forward section at the rear thereof, on a common, horizontal axis extending transversely of said frame, a lift unit having a frame with generally vertical side members and top and bottom cross members, a pair of tines extending rearwardly from the bottoms of said side members, and having bevelled rear ends, a rod of circular cross-section carried by each of said side members in parallel and spaced relation thereto, said rods being slidably mounted in the bores of the respective said blocks, a pair of arms, each pivoted at one end to a fixed mounting on said forward section

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and with their other ends pivoted to the said side members on a common horizontal axis above the axis of articulation of said blocks, a hydraulic cylinder unit with one part pivoted to said forward section and the other part pivoted to the frame of said lift unit, latch means on said forward section adapted to engage and hold said lift unit frame in raised position, and cam means on said lift unit frame and on said forward section adapted to contact in the raised position of the lift unit, to relieve the stresses on said rods and blocks.

3. A lift and transport device comprising a main frame having a forward section and a pair of separate side members extending rearwardly from the rear of said forward section and each mounting a wheel, a pair of blocks with cylindrical bores generally vertically disposed and mounted on the rear of said forward section for swinging movement on a common horizontal axis extending transversely of said frame, a lift unit having a frame with generally vertical side members and top and bottom cross-members, a pair of tines extending rearwardly from the bottoms of said side members and having bevelled rear ends, a rod of circular cross-section carried by each of said side members in parallel and spaced relation thereto, said rods being slidably mounted in the bores of the respective said blocks, a pair of arms each pivoted at one end to a fixed mounting on said forward section and with their other ends pivoted to the said side members on a common horizontal axis above the axis of swing of said blocks, a hydraulic cylinder unit with one component pivoted to said forward section and the other component pivoted to the frame of said lift unit, latch means on said forward section adapted to engage and hold said lift unit frame in raised position, and cam means on said lift unit frame adapted to contact said forward section in the raised position of the lift unit to relieve the stresses on said rods and blocks.

4. A lift and transport device comprising a main frame having a forward section and a pair of separate side members extending rearwardly from the rear of said forward section and each mounting a wheel, a pair of tubes generally vertically disposed and mounted on the rear of said forward section for swinging movement on a common horizontal axis extending transversely of said frame, a lift unit having a frame with generally vertical side members and top and bottom cross members, a pair of tines extending rearwardly from the bottoms of said side members and having bevelled rear ends, a rod carried by each of said side members in parallel and spaced relation thereto, said rods being slidably mounted in the respective said tubes, a pair of arms each pivoted at one end to a fixed mounting on said forward section and with their other ends pivoted to the said side members on a common horizontal axis above the axis of swing of said tubes, a hydraulic cylinder unit with one component pivoted to said forward section and the other component pivoted to the frame of said lift unit, latch means on said forward section adapted to engage and hold said lift unit frame in raised position, and cam means on said lift unit frame adapted to contact said forward section in the raised position of the lift unit to relieve the stresses on said tubes and rods.

5. A lift and transport device comprising a main frame having a forward section and a pair of separate side members extending rearwardly from the rear of said forward section and each mounting a wheel, a pair of tubes generally vertically disposed and mounted on the rear of said forward section for swinging movement on a common horizontal axis extending transversely of said frame, a lift unit having a frame with generally vertical side members and horizontal cross members, a pair of tines extending rearwardly from the bottom of said lift unit frame and having bevelled rear ends, a rod carried by each of said side members in parallel and spaced relation thereto, said rods being slidably mounted in the respective said tubes,

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a tension member attached to a fixed part of said forward section and to said lift unit frame at a point above the said axis of swing of said tubes, whereby to constrain said point to motion in a circle as the lift unit slides in said tubes, a hydraulic cylinder unit with one component pivoted to said forward section and the other component pivoted to the frame of said lift unit, latch means on said forward section adapted to engage and hold said lift unit frame in raised position, and cam means on said lift unit frame adapted to contact said forward section in the raised position of the lift unit.

6. A device as in claim 5, said tension member comprising a chain.

7. A lift and transport device comprising a main frame having a forward section and a pair of separate side members extending rearwardly from the rear of said forward section and each mounting a wheel, a pair of tubes generally vertically disposed and mounted on the rear of said forward section for swinging movement on a common horizontal axis extending transversely of said frame, a lift unit having a frame with generally vertical side members and horizontal cross members, a pair of tines extending rearwardly from the bottom of said lift unit frame and having bevelled rear ends, a rod carried by each of said side members in parallel and spaced relation thereto, said rods being slidably mounted in the respective said tubes, a tension member attached to a fixed part of said forward section and to said lift unit frame at a point above the said axis of swing of said tubes, whereby to constrain said point to motion in a circle as the lift unit slides in said tubes, a hydraulic cylinder unit with one component pivoted to said forward section and the other component pivoted to the frame of said lift unit, latch means on said forward section adapted to engage and hold said lift unit frame in raised position, and cam means on said lift unit frames adapted to contact said forward section in the raised position of the lift unit.

8. A lift and transport device comprising a main frame having a forward section and a pair of separate side members extending rearwardly from the rear of said forward section and each mounting a wheel, a pair of tubes generally vertically disposed and mounted on the rear of said forward section for swinging movement on a common horizontal axis extending transversely of said frame, a lift unit having a frame with generally vertical side members and horizontal cross members, a pair of tines extending rearwardly from the bottom of said lift unit frame, a coupling and guide rod carried by each of said side members in parallel and spaced relation thereto, said rods being slidably mounted in the respective said tubes, a tension member attached to a fixed part of said forward section and to said lift unit frame at a point above the said axis of swing of said tubes, whereby to constrain said point of movement in a circular path as the lift unit slides in its mountings, and a hydraulic cylinder unit with one component pivoted to said forward section and the other component pivoted to the frame of said lift unit.

9. A lift and transport device comprising a main frame having a forward section and a pair of separate side members extending rearwardly from the rear of said forward section and each mounting a wheel, a pair of tubes generally vertically disposed and mounted on the rear of said forward section for swinging movement on a common horizontal axis extending transversely of said frame, a lift unit having a frame with generally vertical side members and horizontal cross members, a pair of tines extending rearwardly from the lower portion of said lift unit frame, a coupling and guide rod carried by each of said side members in parallel and spaced relation thereto, said rods being slidably mounted in the respective said tubes, a tension member attached to a fixed part of said forward section and to said lift unit frame at a point above the said axis of swing of said tubes, whereby to constrain said point of movement in a circular path as the lift unit slides in its mountings, and power means providing a

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thrust between said forward section and said lift unit frame to lift the latter.

10. A lift and transport device comprising a main frame having a forward section and a pair of separate side members extending rearwardly from the rear of said forward section and each mounting a wheel, a pair of tubes generally vertically disposed and mounted on the rear of said forward section for swinging movement on a common horizontal axis extending transversely of said frame, a lift unit having a generally vertical frame with a pair of vertical slide rods spaced from the frame and rearwardly extending tines, a pair of tubes mounted on the rear of said forward section for swinging movement on a common, horizontal axis extending transversely of said frame and slidably receiving said rods, a tension member attached to a fixed part of said forward section and to said lift unit frame at a point above the said axis of swing of said tubes, whereby to constrain said point to movement in a circular path as the lift unit slides in its mountings, and power means providing thrust between said forward section and said lift unit frame to lift the latter.

11. A lift and transport unit having a truck frame in-

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cluding a pair of spaced-apart, rearwardly-extending beams, a pair of wheels, one each being supported upon each of the said beams, and a laterally-extending beam located forwardly of said rearwardly-extending beams; a forklift frame arranged generally vertically between the rearwardly-extending beams, having load-bearing tines extending rearwardly and a pair of upwardly extending guide rods, means slidably receiving said rods and pivoted on a horizontal axis on said laterally extending beam, means to raise the fork-lift frame in its slide mounting and means extending from a forward portion of the truck frame to an upper portion of the fork-lift frame constraining a portion of the fork-lift frame to movement forwardly and downwardly as the fork-lift frame is raised.

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