July 7, 1931. E. J. ABBE 1,813,597

LOAD HANDLING METHOD AND APPARATUS

Original Filed Aug. 27, 1928 3 Sheets-Sheet 1

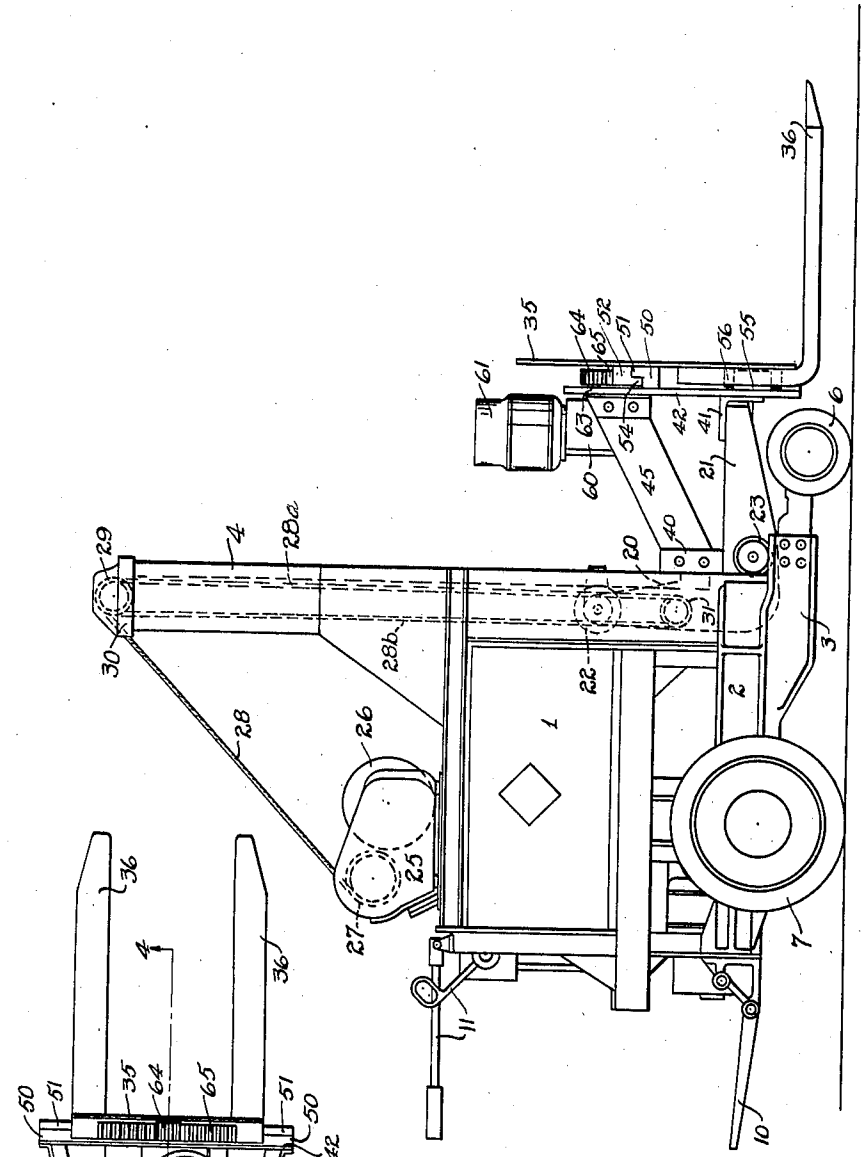


FIG_1

FIG_2

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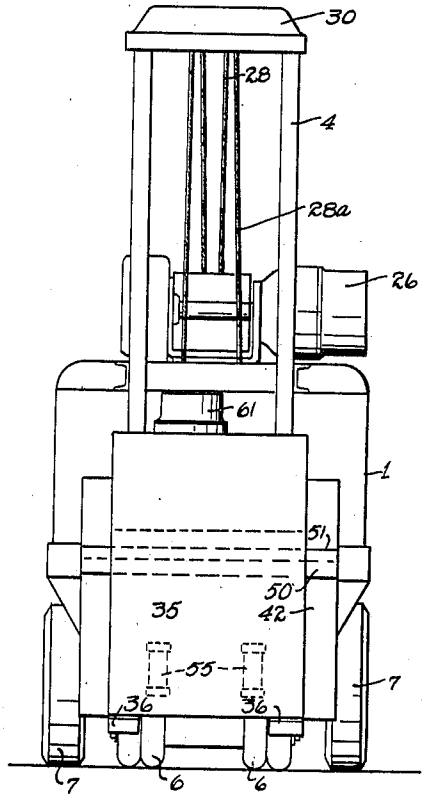
Attorney

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LOAD HANDLING METHOD AND APPARATUS

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FIG_3



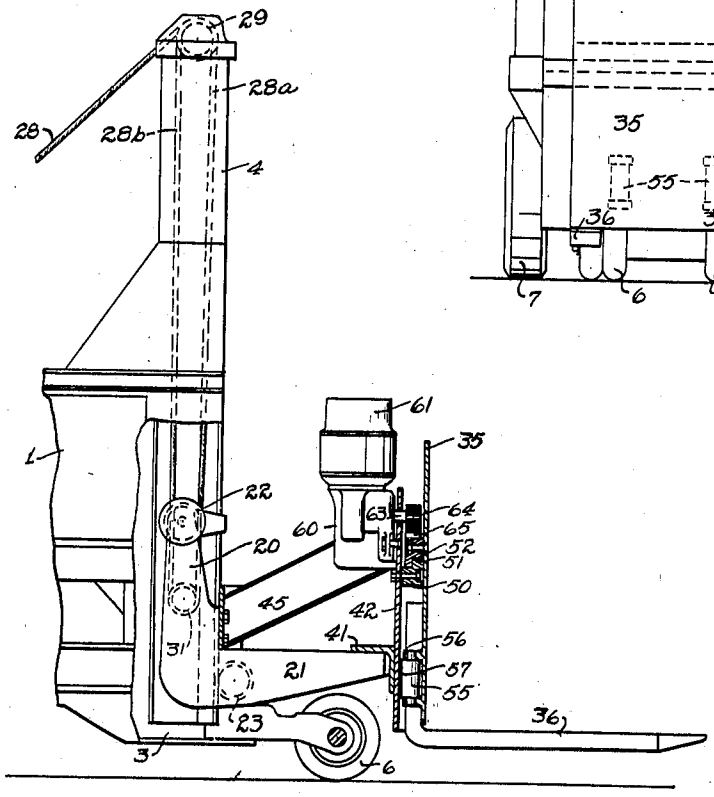


FIG_4

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LOAD HANDLING METHOD AND APPARATUS

Original Filed Aug. 27, 1928 3 Sheets-Sheet 3

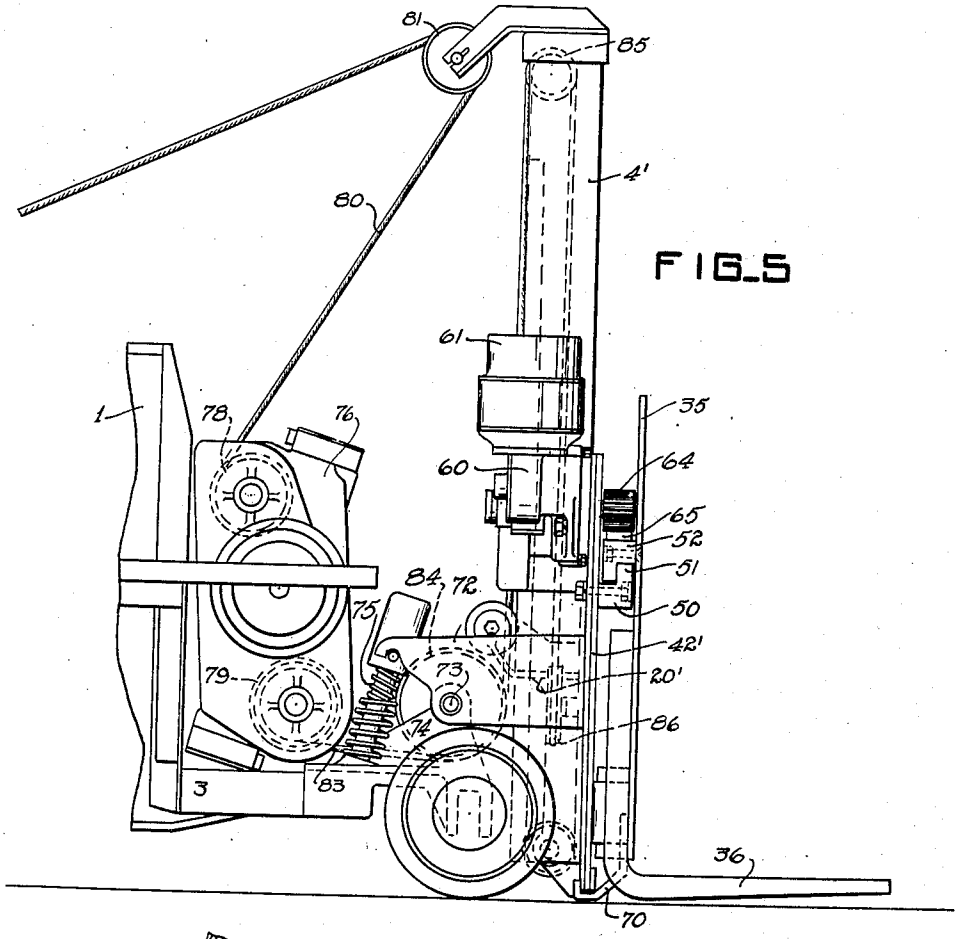


FIG_5

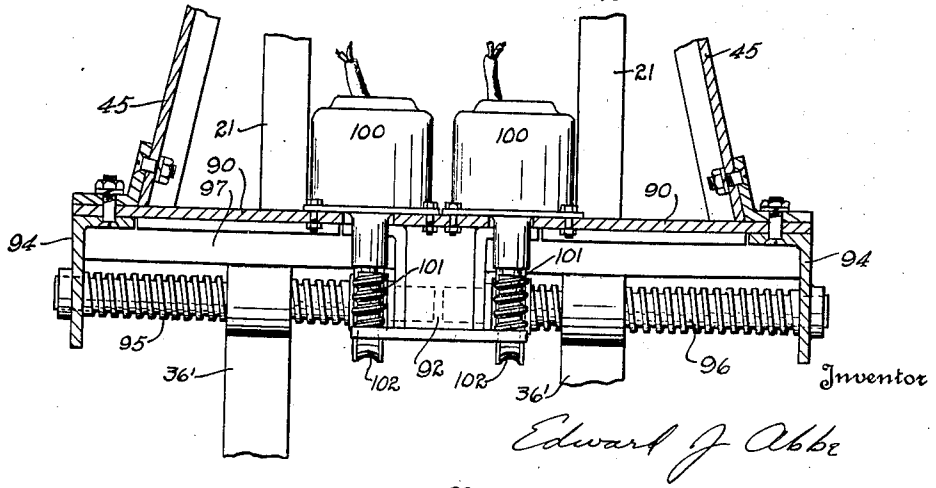


FIG_6

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Patented July 7, 1931 1,813,597

UNITED STATES PATENT OFFICE

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LOAD HANDLING METHOD AND APPARATUS

Original application filed August 27, 1928, Serial No. 302,203. Divided and this application filed June 3, 1929. Serial No. 367,880.

The primary object of this invention is to provide a novel and effective method of handling loads by means of an industrial truck. The invention relates in part to a load handling device in connection with industrial trucks, and the present application is a division and continuation of my prior application, Serial No. 302,203, filed August 27, 1928. In my prior application, I have shown mechanism for operating load supporting arm or fork members positioned on an industrial truck, by the use of which one is enabled to adjust the position of the load engaging members to effectively handle loads varying in character, and is also enabled to pick up and deposit such loads in various positions transversely of the longitudinal truck center.

A great deal of difficulty has been experienced, and time wasted, in the manipulation of industrial trucks, particularly of the tier lift type, when a load conveyed by the truck must be accurately aligned with an set down on top of a previously deposited load. A similar difficulty, by way of example, is encountered where the load to be picked up is placed off center in a narrow alley or runway. Here the ordinary truck very often cannot be maneuvered to pick up the load until the latter is properly placed. If it may be picked up, without such accurate placement, then it usually overhangs one side of the truck with the result that the load is unbalanced and side clearance decreased. A specific object of the present invention is to provide simple and efficient method and apparatus by which the above and similar difficulties may be overcome.

Further objects and features of the invention will become apparent from the following description relating to the accompanying drawings. The essential characteristics are summarized in the claims.

In the drawings, Fig. 1 is a side elevation showing one form of load handling mechanism incorporated with an industrial truck of the tier lift type; Fig. 2 is a fragmentary plan view of the mechanism shown in Fig. 1; Fig. 3 is an end elevation of the load handling mechanism in accordance with Figs. 1 and 2; Fig. 4 is a fragmentary longitudinal cross sectional view in a vertical plane, as indicated by the line 4—4 on Fig. 2; Fig. 5 is a fragmentary side elevation of a modification of the invention, and Fig. 6 is a sectional plan view of still another modification.

In general, the arrangement shown comprises a plurality of load carrying arm members mounted for lateral movement on a substantially vertically movable carriage, the carriage being raisable on the truck to pick up and deposit a load at various heights. The mechanism for positioning the arms is shown herein as of two general forms. In one general form shown, the load carrying members, shown as arms adapted to engage beneath the load, are positioned by means of a rack and pinion, the pinion being driven by a suitable reduction gearing and motor, operable by the driver in truck driving position, to shift the arms laterally preparatory to picking up a load, or to shift the arms with a load mounted thereon to accurately spot the load in setting it down. In the other form, which is also shown in the parent application, the arm members are moved by screws having worm and gear connections with suitable power mechanism, operable by the driver in truck driving position to either variably space the fork members equal or dissimilar distances from the truck center; or the arm members may be moved unitarily to the right or left, maintaining a fixed relation to each other.

Referring in detail to the drawings, and first to Figs. 1 to 4 inclusive, the truck shown comprises a battery housing portion 1 mounted on a general frame 2, the latter having a forwardly extending low slung por-

tion 3 providing a support for dirigible wheels 6. The main driving wheels 7 are supported beneath the battery housing and are suitably driven by a motor and gearing, not shown, disposed beneath the battery housing and on the frame 2. The operator's position on the truck is rearwardly from the battery housing. He stands on the pivoted platform 10, forming a part of the control mechanism of the truck, and in this position is in reach of certain other controls, designated generally 11, including a steering arm for controlling the dirigible wheels 6. Positioned intermediately of the driving and dirigible wheels is an upright frame forming a trackway for a load lifting carriage. The frame is designated 4, and as shown, this rises from the low slung frame extension 3, and is anchored to the battery housing portion of the truck.

The load lifting carriage comprises a vertically movable separate frame 20 having a forwardly projecting pair of arms 21. The carriage is guided for vertical movement by suitable rollers, such as 22 and 23 suitably mounted on the frame 20 and arranged to engage, either directly or through suitable rider strips, the flanges of channel members which, as shown, comprise the upright frame or trackway 4.

The carriage may be raised and lowered on the trackway by a suitable power hoist, which as shown, is mounted above the battery housing portion of the truck and comprises a main hoist frame 25 equipped with a motor 26 and winding drum 27. Suitable cables, diagrammatically indicated at 28, are wound on the drum and pass upwardly over sheaves 29 on a suitable bracket formation 30 surmounting and connecting the trackway forming members 4. The cables then extend, as at 28*a*, to sheaves 31 on the carriage frame 20, and then upwardly, as at 28*b*, to a suitable equalizing anchor (not shown) suspended from the bracket 30. Obviously, the operator may, by suitable controls, not shown, either raise or lower the carriage 20 to lift or deposit a load. The arrangement permitting the operator to pick up and deposit a load from and in various positions without moving the truck, will now be described.

The load carrier comprises, as shown, a vertically disposed plate or apron 35 to which are rigidly attached a suitable number of load engaging fork members 36, shown as generally L-shaped in side elevation. The vertically extending portions of the members 36 may be bolted or otherwise secured rearwardly of the plate 35. The free ends of the fork members are adapted to be thrust beneath the load to be lifted, which may be supported on suitable stringers for fork clearance, by driving the truck toward the load. The load carrier, including the plate 35 and fork members 36, is guided and supported for lateral movement relative to the truck. The form of guide and support illustrated will now be described.

Directly adjacent the main body of the carriage 20, the arms 21 support a vertically disposed plate 40. At the ends of the arms is suitably attached an angle section 41. Adjacent the vertical flange of the angle section 41 and anchored thereto is an upright vertically disposed plate 42. The plate is braced and held in vertical position by diagonally extending channel-shaped braces or ties 45 suitably connected to the member 40 and to the plate 42. The arrangement comprises a very rigidly braced overhanging support for the plate 42 on the carriage 20.

To form a transverse guide and support for the load carrier 35—36, I preferably provide a guide bar 50 having an upwardly extending rib or flange 51, the bar being fastened directly to the plate 42 in any suitable manner. On the back side of the plate 35 is a similar bar indicated at 52, fixed to the plate 35 and having a rib or flange 54 lying between the spaced surfaces between the rib 51 and plate 42. The bar 52 carrying the plate 35 may slide crosswise of the truck, as will be obvious. The lower end of the carrier is anti-frictionally supported to bear rearwardly against the plate 42 by reason of a suitable number of rollers, two being shown at 55. The rollers are preferably carried on suitable brackets 56 on the plate 35 and bear rearwardly against a horizontally extending bearing strip or plate 57 rigidly attached to the plate 42.

For driving the load carrier on its support, above described, I preferably provide a motor driven power unit which may be mounted in fixed position on the plate 42. Such power unit may comprise a frame 60 supporting suitable reduction gearing driven by a motor 61 surmounting the frame 60 and attached thereto. The gearing terminates in a shaft 63 which has rigid therewith an external pinion 64. The pinion, as shown, is in mesh with a short rack 65 which may be bolted or otherwise suitably secured to the top side of the bar 52 which forms part of the load carrier guide. The motor may have suitable connections to a control switch at the operator's position, as by reason of conductor strips and brushes (not shown) between the frame 4 and carriage 20, so that the operator, in driving position on the truck, may control the motor to drive it in either direction and thus, through the intermediacy of the rack and pinion, move the load carrier to the right or left a limited distance, as required.

The method of operation for loading is as follows: The driver first moves the truck up to a load with the fork members 36 substantially in position to engage beneath it,

and then if the forks are off center with respect to the load, the carrier is then moved laterally in the desired direction by manipulation of the controls for the power unit 60—64 until the forks are in proper position to go beneath the load. It will be noted that where the truck is operating in a narrow aisle and the load to be picked up is out of reach of the arms in their normal or central position, the arms may be moved laterally within the limits of the sliding support described, in order to pick up such load.

The method of unloading by means of the arrangement above described, in order to accurately locate one load on top of another, or in a predetermined position on a platform or another truck, is as follows: The truck carrying the load on the arms 36 is first driven into approximate load depositing position and then, after stopping the truck, the operator shifts the load laterally to position it in exactly the desired position.

The modification shown in side elevation in Fig. 5 is very similar to the mechanism shown in Figs. 1 to 4 inclusive, the primary difference residing in that the load engaging arm or fork members are located close to the end of the truck and directly adjacent a swingable boom or trackway for the tier lift carriage; whereas, in the previously described modification, the trackway is fixed and the load carrier elements overhang the low slung truck frame portion.

The parts shown in the modification of Fig. 5, which are essentially similar to parts shown in previously described figures, are similarly numbered. The hoisting unit in Fig. 5 is shown as adapted to tilt the boom as well as raise and lower the carriage 20′ and associated load engaging devices including the slide supporting plate 42′, a pair of L-shaped arms 36 and the connecting and supporting plate 35 therefor. The power drive for shifting the load engaging parts laterally of the path of movement of the truck, is mounted directly on a laterally overhanging portion of the plate 42′, so as to move therewith when the carriage 20′ and plate 42′ is raised and lowered.

The gearing in the casing 60 terminates as before in a pinion 64 which meshes with the rack 65 on the slide bar 52. The slide bar cooperates with the bar 50 attached to the outward side of the plate 42′ as before. The operation is substantially the same as with the previously described figures. The operator in driving position on the truck may by means of a suitable switch control the motor 61 to move the arms to the right or left with respect to the truck center. Fig. 5 shows a device which may, of course, be incorporated with the apparatus shown in the previously described figures, namely, guiding hook members 70 (one only being shown) depending from the plate 35 at the bottom thereof and engaging beyond the lower edge of the plate 42′, to prevent outward swinging of the load carrier and resulting breakage, as of the rack or pinion teeth for example.

In Fig. 5, the upright trackway 4′ is pivoted by means of a bracket 72 extending from the trackway and engaging a cross shaft 73 supported on a bracket 74 rising from the low slung portion 3 of the truck frame. Suitable yielding mechanism, designated generally at 75, tends to hold the frame 4′ in substantially upright position for normal operation. The hoisting unit for swinging the trackway and raising and lowering the carriage comprises a main frame or housing 76 supported on the low slung portion 3 directly adjacent the battery housing 1, and having two drums or sets of drums 78 and 79. Cable stretches 80 are attached to the drum or drums 78 and pass upwardly over sheaves 81, suitably supported on top of the trackway 4, and thence to a suitable anchor (not shown) on top of the truck. Winding in of this cable obviously tilts the trackway 4 to enable the load to be better secured for a long haul and to decrease the height of the truck.

The construction of the hoist may be substantially in accordance with my prior patent, No. 1,688,131, issued October 16, 1928, by reason of which the drums may be operated selectively. The drum 79 has a cable 83 attached thereto, which passes beneath a sheave 84 mounted on the cross shaft 73, then upwardly over a sheave 85 suspended from the top frame work of the trackway 4, thence downwardly to a sheave 86 and thence upwardly to an anchor (not shown). The drawing in of the cable 83 by rotation of the drum 79 will obviously raise the carriage 20′. The method of handling a load using the apparatus of Fig. 5 is essentially the same as with Figs. 1 to 4.

The modification shown in Fig. 6 is substantially identical with one form of the device shown in the parent application above referred to. In this form of device, a suitable supporting plate 90 may be secured to the carriage 20, partly by the arms thereof shown at 21, and partly by side struts 45, so that the whole device shown may be rigidly braced and arranged to be raised and lowered with the carriage. Intermediately of the ends of the plate 90 is an outwardly extending bracket 92 and at the ends of the plate 90 are similar brackets 94. The brackets support the ends of the screws, designated 95 and 96. Each of the screws have threaded thereon, the upper ends of L-shaped load carrying fork members 36′, shown as partly broken away. The lower ends of the L-shaped members which de-

pend from the screws may react rearwardly against the supporting plate 90 by means of interposed guiding strips, shown at 97.

There are two motor units shown with suitable geared connections with the respective screws. As shown, there are two motors 100, each provided with a worm 101, meshing with respective worm gears 102, each fast on its respective screw. The motors are adapted to be controlled similarly to the motor 61, but, of course, by individual switches at the operator's position, so that both motors may be driven synchronously in the same direction to move the load engaging fork members 36′ to the right or left relative to the truck center to carry out the load handling method above described. The device has an additional advantage over the arrangements shown in Figs. 1 to 5, in that the fork members 36′ may also be variously spaced equal distances from the truck center by driving the motors individually in opposite directions.

I claim:

1. In an industrial truck, a frame mounted on the truck, and arranged to be raised and lowered, a guideway extending transversely of the truck on said frame horizontally spaced and adjustable load lifting members carried on said guideway and adapted to extend beneath a load to lift the same, an electric motor and reduction gearing supported by the frame, and means operatively connecting the driven member of the gearing to said load lifting members for moving said members horizontally in unison, whereby the load lifting and depositing positions of said members may be simultaneously changed to accommodate the position of a load to be picked up, or to accurately spot a load already carried on said members to deposit the load in a definite position without moving the truck.

2. In an industrial power driven truck, substantially upright guiding means mounted on the truck, a frame mounted to traverse the guiding means, horizontal guiding means on the frame, a plurality of constantly spaced load engaging and lifting members guidingly supported by the horizontal guiding means, power mechanism supported by and movable with the frame, and a driving connection therefrom to said load engaging members arranged to position the same laterally of the path of movement of the truck.

3. In an industrial power driven truck, substantially upright guiding means on the truck, a carriage mounted to traverse the guiding means, means on the truck to raise and lower the carriage, load engaging means arranged to horizontally traverse the carriage, and power means supported entirely by the carriage and movable therewith, said power means including an electric motor and gearing, operatively connecting the motor with the load engaging means to adjust the same laterally in opposite directions relative to the carriage and truck.

4. In an industrial power driven truck, means forming a horizontal guideway at one end of the truck, a plurality of load lifting members mounted for substantially horizontal movement on said guideway, a rack rigidly carried by said load lifting members, a shaft and a pinion driven thereby in constant mesh with the rack, and power means for driving the shaft in either direction.

5. In an industrial truck, a horizontal guideway at one end thereof, load engaging means suspendingly supported for horizontal movement on said guideway, a guide extension on the truck below said guideway, an anti-friction roller interposed between the extension and load engaging means, means to support the roller connected to one of the last two mentioned elements, and means for adjusting the load engaging means on the guideway to change the position of a load thereon with reference to the longitudinal axis of the truck.

6. In an industrial truck, a main frame, dirigible and traction wheels supported beneath the frame adapted to carry the load on the truck, a load carrying member overhanging one end of the truck, beyond both the dirigible and traction wheels, a carriage on the truck, a lateral guideway carried by the carriage, the load engaging member being arranged to horizontally traverse and to be suspendingly supported by the guideway, power mechanism on the carriage with connections to move the load carrying member to adjust the same for picking up or depositing a load, and anti-friction means interposed between the load carrying member and carriage, including a set of rollers in fixed position on one of the two last mentioned elements, and a trackway for the rollers on the other of these elements.

7. An industrial truck, comprising a main frame, independently horizontally movable load engaging devices carried thereon, and means whereby the position of the said devices may be changed with relation to each other, for different loads, and with relation to the truck, for locating the devices with respect to the desired loading or unloading position thereof without moving the truck, said means comprising separate power devices adapted to be independently controlled by the operator of the truck, and independent means connecting each power device to its respective load engaging device.

8. An industrial truck, comprising a main frame, load handling mechanism mounted on the frame and including a tier lift carriage and a substantially upright guide therefor, load engaging devices mounted for lateral movement on said carriage, individual driv-

ing members connected with said devices respectively to move the same, and individual power means also mounted on the carriage and drivingly connected with their respective driving members, each of said power means being adapted to be independently controlled by the operator of the truck, whereby the load engaging devices may be relatively and individually spaced and moved into various load engaging positions with respect to the carriage.

In testimony whereof, I hereunto affix my signature.

EDWARD J. ABBE.