

Sept. 27, 1932.

E. J. ABBE

1,878,994

INDUSTRIAL TRUCK

Filed June 3, 1931

3 Sheets-Sheet 1

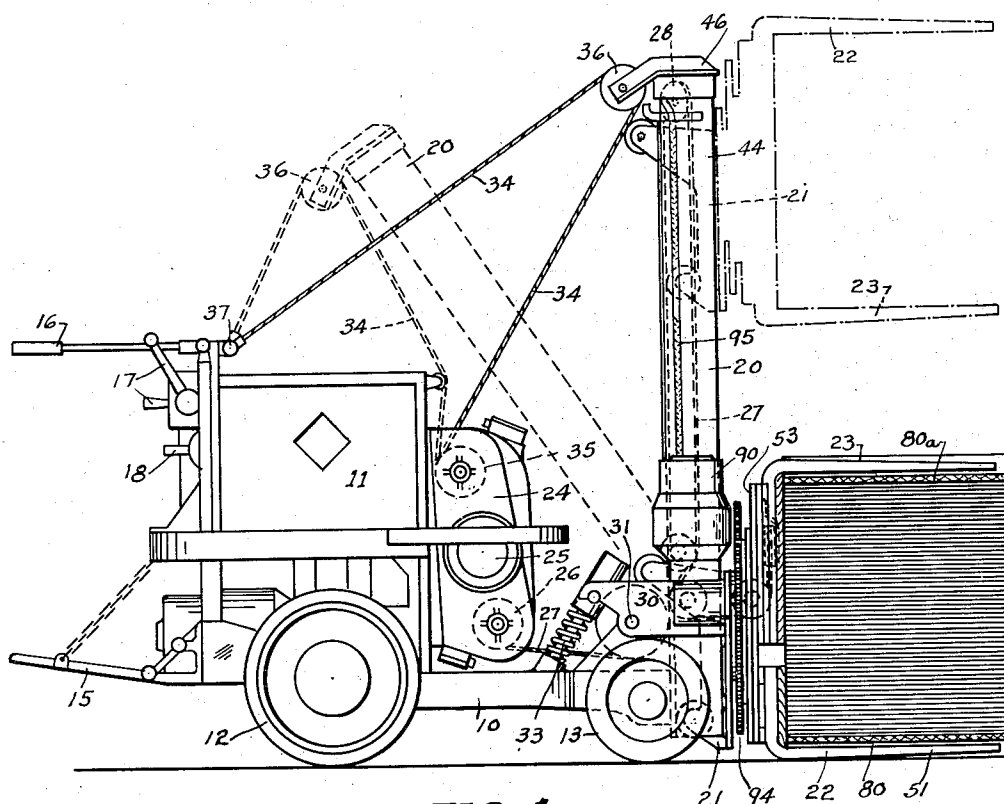


FIG-1

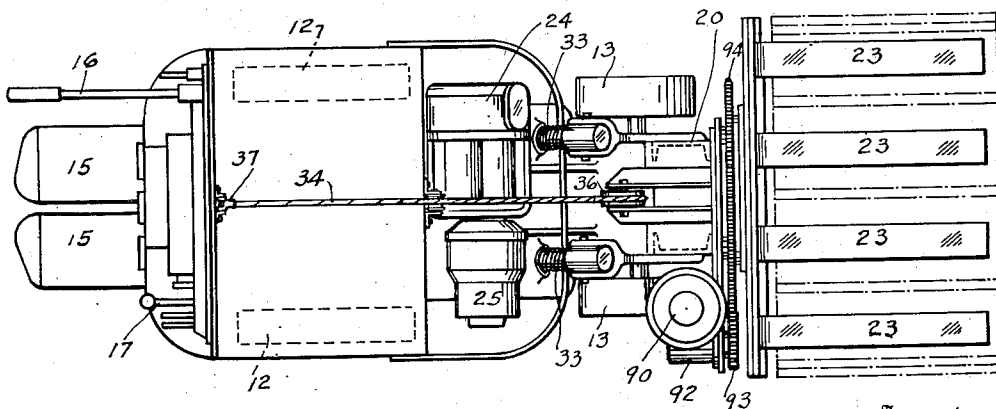


FIG-2

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3 Sheets-Sheet 2

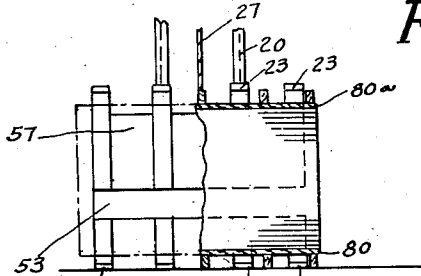
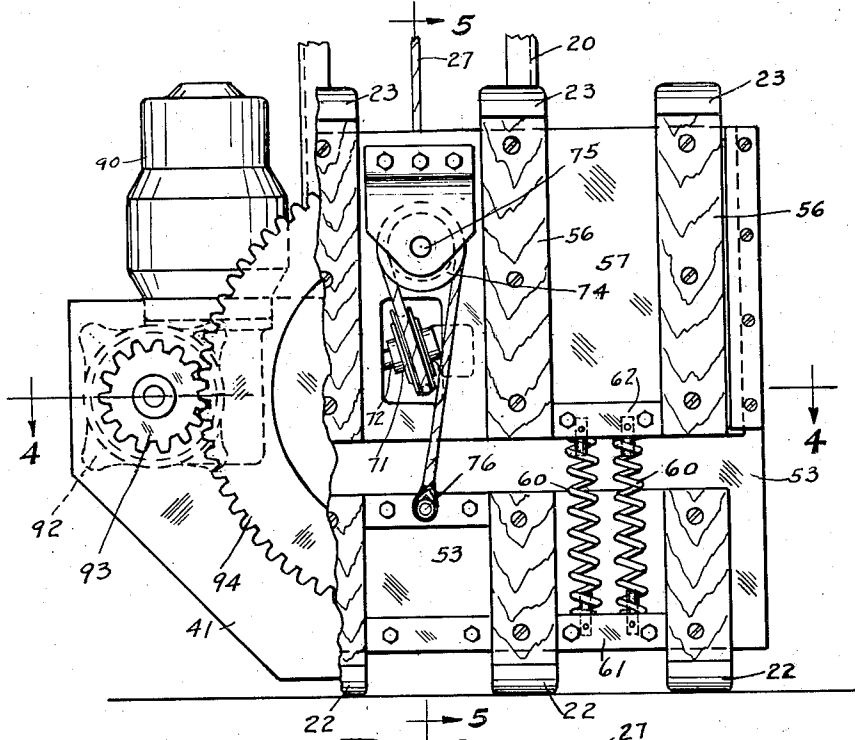


FIG. 6

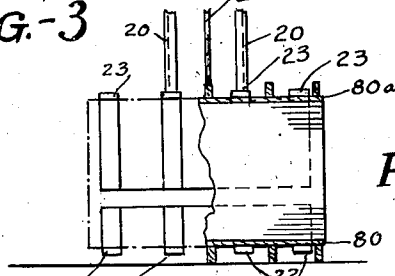


FIG. 7

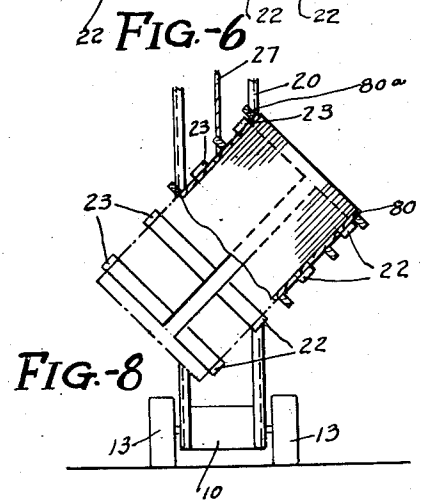


FIG. 8

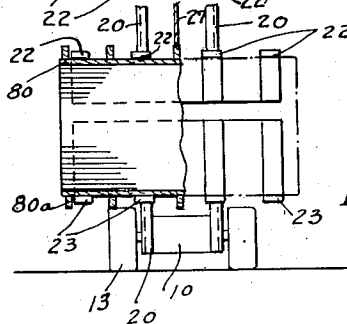


FIG. 9

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3 Sheets-Sheet 3

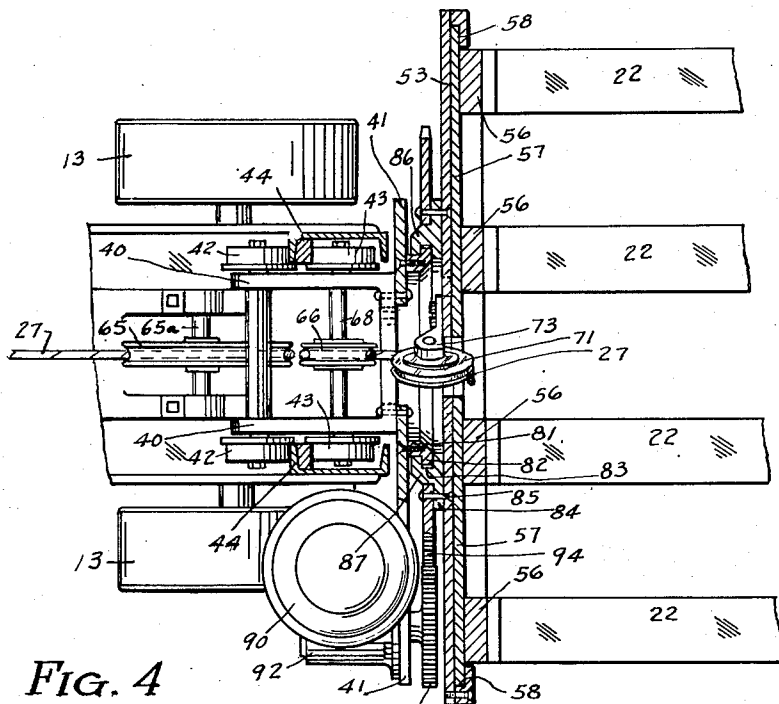


FIG. 4

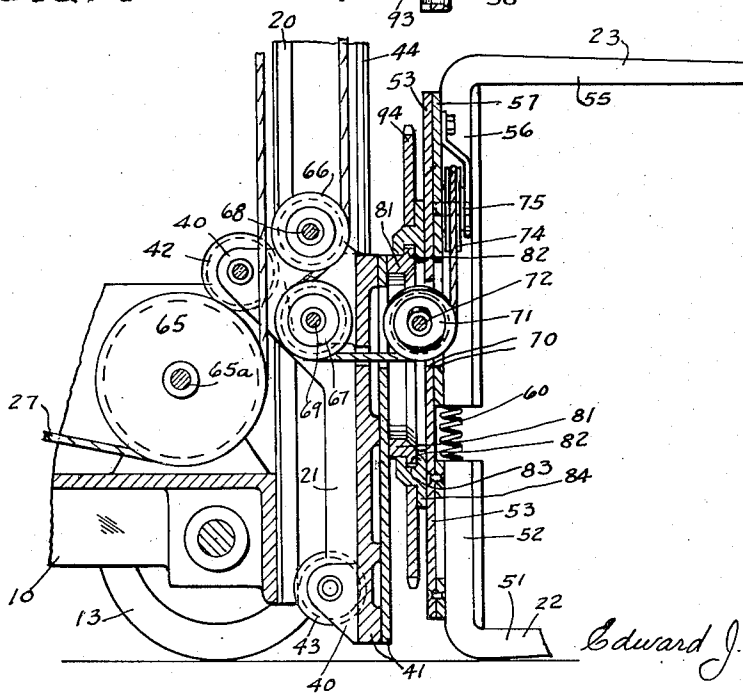


FIG. 5

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UNITED STATES PATENT OFFICE

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INDUSTRIAL TRUCK

Application filed June 3, 1931. Serial No. 541,814.

This invention relates to an industrial truck, capable of lifting or elevating a load, transporting it from place to place, and finally depositing such load in an inverted position. In industrial establishments it is often desirable to transport a load, such as a stack of sheets, from one part of the establishment to another, or from one machine to another. In some instances, one machine has performed an operation on one face of the stock, while a second machine, located some distance from the first, performs an operation on the opposite face of the stock. For example, in printing magazines, the sheets are often printed on one side by one press, which discharges them in a stack with the printed surfaces uppermost. The stack is then transported to a second press, which prints on the opposite side of the sheet. As a general rule, the presses are not equipped with feeding mechanisms adapted to turn the sheets. Hence, to utilize such presses and feeding mechanisms, the sheets are turned before they are placed in the feeding mechanism of the second press. In the past, this turning of the sheets has been manually performed, and as the number of sheets which the operator could turn at one time was limited, the operation was slow, and therefore the sheets were usually carried from one press to the other by the operator, it being unnecessary to provide a transportation means to convey the sheets faster than the operator could turn them over.

Hence, the general object of this invention is to provide an industrial truck which is capable of transporting material from one place to another, and depositing said material in an inverted position.

A further object is to provide an industrial truck, capable of elevating or raising a stack of sheet material, clamping the material to the truck and conveying it from one place to another while simultaneously rotating the load on the truck so that it may be deposited in an inverted position.

Other objects of this invention will become apparent from the following description, referring to a preferred embodiment illustrated in the drawings, and the essential fea-

tures of the invention will be set forth in the claims.

In the drawings, Fig. 1 is a side elevation of an industrial truck, embodying a preferred form of my invention; Fig. 2 is a plan of the truck shown in Fig. 1; Fig. 3 is a fragmental front elevation of the truck, partially broken away, to more clearly illustrate the construction thereof; Fig. 4 is a fragmentary, longitudinal, cross-sectional view, as indicated by the lines 4—4 in Fig. 3; Fig. 5 is a fragmentary, horizontal, cross-sectional view, as indicated by the lines 5—5 on Fig. 3; Figs. 6 to 9, inclusive, are diagrams, illustrating various positions of the load-engaging parts relative to a load.

As illustrated in the drawings, the invention is embodied in an industrial truck of the type shown and claimed in the prior patent to C. E. Cochran, No. 1,399,543, issued December 6th, 1921. In general, this truck embodies a four-wheeled traction-driven vehicle, having a power unit, including a battery housing and an operator's platform at the rear end, and an upright boom or trackway at the other. A tier-lift load engaging member is mounted to vertically traverse the trackway.

The specific embodiment of the invention comprises, as shown, a plurality of load-engaging fork members, intended to be slid beneath a load, and a second set of fork members adapted to be slid over the top of the load. The load elevating means, (shown as a cable and suitable supporting sheaves) is arranged to act directly on one pair of forks, so as to move such forks toward the load, gripping the latter between the two sets of forks and thereafter, because the two sets of forks are mounted on a common carriage, the continued movement of the cable lifts the load. The forks are rotatably supported upon a horizontal axis, and a power means is supplied to rotate both sets of forks as a unit, thereby turning the load end for end, or upside down.

As shown in the drawings, the truck in general comprises a main frame 10, a battery housing 11, rear traction wheels 12, and front wheels 13. A suitable operator's platform is

secured to the rear end of the truck and the various control levers, including the steering arm 16, and hoist control levers 17 and fork rotating control lever 18, are positioned on the battery housing, where they are readily accessible to the operator.

The means for engaging and elevating the load is mounted forwardly on the truck, and is so constructed that the engaging members may pick up a load from the ground or truck supporting surface. An upright frame 20 serves as a trackway for a vertically movable carriage 21, upon which suitable load-engaging forks 22 and 23 are mounted, as will hereinafter be described. Suitable hoisting mechanism, which may comprise a motor housing unit 24, consisting of a motor 25, adapted to receive power from the battery (not shown) located in the battery housing 11. The motor 25 is controlled by the controller levers 17, which are within the reach of the operator as he stands on the platform 15. This mechanism further comprises a hoisting drum 26, and a cable 27, attached to the drum and running over a sheave 28, near the top of the trackway, and thence downwardly to the carriage 21, to which it is attached, as will be presently shown.

The boom or trackway 20 is preferably tiltably mounted on the truck, so that the load may be inclined to a position over the truck chassis. The guideway 20 is provided with a pair of rearwardly extending arms 30, which are pivotally supported on a transversely extending shaft 31, carried by the chassis 10. Suitable compression springs 33, one end of which engage the truck chassis and the other end of which engage the arms 30, serve to maintain the guideway 20 in a vertical position. When the guideway 20 is in its vertical position, its lowermost ends abut the foremost end of the chassis frame 10, preventing the guideway from tilting forwardly. The guideway 20 is tilted by a cable 34, one end of which is secured to a winding drum 35, and thence passes upwardly around a sheave 36, carried by the guideway 20 adjacent the upper end, and thence rearwardly to the rearmost portion of the frame or battery housing 11, where it is secured to a pivot 37. The winding drum 35 is so arranged that it may be selectively clutched to the motor 25, to cause the upright guideway 20 to be inclined over the truck, from the position shown in full line in Fig. 1 to that shown in dotted lines.

The mounting for the carriage 21, comprises as shown in Figs. 4 and 5, brackets 40 suitably mounted on a carriage apron 41, the brackets carrying shafts for upper and lower sets of rollers 42 and 43 respectively, which bear against flanges of upright channel members 44, which, together with suitable cross-frame members 46, comprise the boom or trackway 20.

The load engaging forks 22 and 23 are arranged to enable one set of forks to be slid beneath a load, while the other set passes above the load. The two sets of forks are then brought together, clamping the load between them. As shown in the drawings, the forks 22 comprise L-shaped members having outwardly extending arms 51, adapted to extend beneath a load, as shown in Fig. 1. The forks 22 are provided with upwardly extending arms 52, adapted to be secured to a plate 53, which, as will be hereinafter described, is rotatably mounted on the carriage 21. The forks 23 are slidably mounted on the plate 52, to enable them to be moved towards and away from the forks 22, thereby clamping the load between the two sets of forks. As shown in Figs. 3 to 5, the forks 23 have outwardly extending arms 55, which are similar to the arms 51 of the forks 22, and which, when the plate 50 is rotated 180 degrees, are adapted to engage a load in the same manner as the forks 22, but which normally lie above the load, as shown in Fig. 1. The forks 23 are provided with downwardly extending arms 56, rigidly secured to a plate 57, which is slidably mounted in ways 58 formed on the plate 53. The forks 22 are normally held spaced apart from the forks 23 by suitable compression springs 60 carried by blocks 61 and 62, which are secured to the plates 52 and 57, respectively.

The clamping and raising of the load is accomplished by the winding of the cable 27. As shown in Figs. 1, 3 and 5, one end of the cable 27 is secured to the winding drum 26, from which the cable passes forwardly around a sheave 65, rotatably mounted on a shaft 65a, carried by the frame or chassis 10. From the sheave 65 the cable passes upwardly to the sheave 28, mounted adjacent the top of the guideway, and thence downwardly to sheaves 66 and 67, mounted on shafts 68 and 69, respectively, which shafts are carried by the arms 40 of the carriage 21. From the sheave 67 the cable passes forwardly through openings 70 in the plates 53 and 57 and apron 41, to a sheave 71, carried by a shaft 72, rotatably mounted in bearings 73, which are secured to the plates 53. From the sleeve 71 the cable passes upwardly to a sheave 74, mounted on a shaft 75, carried by the plate 57 to which the forks 23 are secured, and thence downwardly and is secured to the plate 53, as at 76 (Fig. 3). The construction is such that the initial movement of the cable 27 raises the carriage 21 until the upper faces of the forks 22 engage the pallet 80, on which the load rests. During this time, the springs 60 retain the forks 23 in their normal or uppermost position relative to the forks 22 and carriage 21. The reaction of the engagement of the forks 22 with

the load then causes the continued movement of the cable 27, to draw the forks 23 and plate 57 downwardly, as a unit, until the lower face of these forks engages a second pallet 80a, which has previously been laid in an inverted position on the top of the load. The pallets 80 and 80a serve to prevent the marring of the sheets, due to the clamping action, as well as to space the sheets from the supporting surface, thereby permitting the forks to be slid beneath the load. Further movement of the cable 27 then causes the load and the load engaging forks 22 and 23, and the carriage 21 to travel upwardly in a guideway 20, as a unit. It will be noted that the construction is such that the load is clamped by a pressure equivalent to twice the weight of the load. This is due to the fact that the load is elevated by a single-part line, which runs from the hoisting drum to the sheave 74, but is clamped as a two-part line, the cable 27 passing from the drum to the sheave 74 on the slide plate 57 and thence to the stationary plate 53.

The forks 22 and 23, together with the plates 53 and 57, are rotatable as a unit on the carriage apron 41, enabling the load to be rotated 180 degrees and deposited in an up-ended position. Rigidly secured to the outer or forward face of the apron 41 is a bearing ring 81, having an annular lip 82 adapted to enter an annular groove 83 in a bearing ring 84, which is rigidly secured to the plate 53 by means of suitable bolts or rivets 85. To enable the assembly of the ring 84, it comprises two semi-circular segments 86 and 87. This construction is such that the plate 53, together with the forks 22 and 23, are freely rotatable, as a unit, about the horizontal axis of the bearing ring 81.

It is desirable that the rotation of the plate 50 and load-lifting forks be accomplished during the transporting of the load from place to place. I therefore rigidly mount a motor 90 on the apron 41, connect the motor by suitable gearing to the plate 53 in a manner to permit the rotation of the load lifting mechanism to be at all times, under direct control of the operator of the vehicle. Suitable reduction gearing contained within the housing 92 connects the motor 90 to a spur-gear 93, which meshes with a gear ring 94, rigidly secured to the plate 53 by the bolts 85. A suitable flexible conduit 95 (Fig. 1) connects the motor 90 with a controller 91, located at the rear end of the truck, and provided with an operating handle or lever 18, conveniently located relative to the operator's position on the truck platform members 15.

The operation of the truck is as follows: The truck is brought into position approaching the load with the load engaging fork 22 adjacent the ground. The truck is then ad-

vanced, carrying the fork 22 into a position beneath the pallet 80, upon which the load rests. The operator then starts the winding mechanism. The first movement thereof will cause the forks 22 to engage the underside of the load. Further winding of the cable will cause the upper forks 23 to clamp against the top of the load, with a pressure equal to twice the weight of the load and carriage. As soon as this point of equilibrium is reached, the carriage 21 and load as a unit will travel upward in the guideway 20. After the load has been raised an amount to sufficiently clear the floor, the rotating mechanism is started and the load rotated through an angle of 180 degrees. The winding mechanism is then reversed and the load deposited upon the floor, or deposited on top of another load, in an upside down position. By reversing the winding mechanism, the forks will release the load, due to the pressure of the springs 60 and the forks can then be withdrawn. The truck may then proceed to pick up a second load with the forks in their rotated position, or the forks may be rotated back to their normal positions.

I find it a decided advantage to operate the truck by picking up the first load and depositing it on the floor or supporting surface, as just described, and then pick up the second load with the forks in their rotated position. In other words, causing the forks 23 to engage the bottom of the load and the forks 22 to engage the top of the second load. In this instance, the initial reeving of the cable 27 will raise the forks 22 and 23 as a unit, until the upper face of the forks 23 engages the bottom of the load, the spring 60 retaining the forks 22 and 23 in their separated positions, as before. However, when the forks 23 engage the bottom of the load, the added weight of the load will overcome the resistance of the spring 60, and as the cable 27 is reeved twice as fast as the clamping movement, the further reeving of the cable will bring the forks 22 and carriage 21 downward, until the forks 22 contact with the upper face of the load, with a pressure equal to twice the weight of the load, at which time, the carriage, together with the forks 22 and 23, will move upwardly as a unit, raising the load. Thereafter the load is rotated and deposited as heretofore described. The fact that it is not necessary to rotate the forks after depositing the first load, greatly increases the speed at which the truck may be operated, as well as conserves power, the latter being a decided advantage in trucks which utilize a storage battery as a sole source of power.

From the foregoing description, it will be seen that I have provided an industrial truck, capable of lifting or elevating a load of sheet material, transporting it from place to place, and simultaneously turning the load end for

end, so that it may be deposited in an inverted position, and wherein a second load may be thereafter lifted without previously rotating the forks to their normal position.

I claim:

1. In an industrial truck, a frame, an electric power supply mounted on said frame, a vertically extending guideway at one end of the frame, a carriage mounted in the guideway, a means to cause said carriage to traverse the guideway, a pair of oppositely disposed load engaging members carried by the carriage, one of said members being movable to and from the other of said members, means adapted to cause relative movement between the said members and clamp and load therebetween, said load engaging members being rotatably mounted as a unit on the carriage, and an electric motor carried by said carriage to rotate said load engaging members.

2. In combination with an industrial truck of the class described, an upright guideway disposed at the front end of the truck forwardly of the front wheels, a carriage movably supported in the guideway, a support carried by the carriage and arranged for rotary movement on a horizontal axis relative to said carriage, a depending L-shaped load engaging member carried by the support, the foot of the L being adapted to pass beneath the load to lift it, a second L-shaped member movably carried by said support in an inverted position relative to said first-named member, resilient means adapted to space said members, means acting on said first-named member to cause it to clamp a load between the two members and thereafter raise the members and carriage as a unit on the guideway, power means mounted on the carriage and adapted to rotate said members and load as a unit relative to said carriage.

3. In an industrial truck, an upright guideway carried by the truck, a carriage mounted for vertical movement in the guideway, means to raise the carriage in the guideway, a support mounted for rotary movement about a horizontal axis on said carriage, a pair of oppositely disposed load engaging arms carried by said support and extending outwardly therefrom, either of said arms adapted to engage the bottom of a load and support it while the carriage is being elevated, one of said arms being slidably mounted in the support and adapted to be slid towards the other arm to clamp a load therebetween, said raising means including a power operated winding drum, a cable having one end secure to the drum and passing from the drum to a sheave at the upper end of the guideway, thence downwardly to the carriage and outwardly along the axis of rotation of the support and upwardly to a sheave carried by the movable arm and downwardly to the support where it is secured wherein the carriage and load is lifted by a single part line and wherein the

load engaging arms are drawn together to clamp the load by a two part line.

4. An industrial truck comprising a frame, an upright guideway carried by the frame, a carriage mounted to traverse said guideway, flexible means to cause the carriage to traverse said guideway, a support carried by the carriage and arranged to rotate about a horizontal axis relative to said carriage, a pair of outwardly extending load engaging members adapted to engage opposite faces of the load, means supported by the carriage and including a motor adapted to rotate said support and load engaging members as a unit to bring either load engaging member adjacent the truck supporting surface to engage the bottom surface of a load, wherein either of said load engaging members will support the load during the elevation or lowering operation and wherein the load may be raised, rotated simultaneously.

5. An industrial truck comprising a frame, an upright guideway tiltably carried by the frame, power operative means to tilt the guideway, a carriage mounted to traverse said guideway, flexible means to cause the carriage to traverse said guideway, power means operable on said flexible means, a support carried by the carriage and arranged to rotate about a horizontal axis relative to said carriage, a pair of outwardly extending load engaging members adapted to engage opposite faces of the load, means supported by the carriage and including a motor adapted to rotate said support and load engaging members as a unit, wherein the load may be raised, inclined and rotated simultaneously, and independent means to control each of said operations.

6. In an industrial truck, an upright guideway mounted on the truck, a carriage mounted for vertical movement on said guideway, an annular supporting member rigidly mounted on said carriage in a substantially vertical plane, a load-engaging member mounted for rotation on said annular support, a gear ring secured to said member, a motor mounted on said carriage, gearing operatively connecting said motor to said gear ring to rotate the load-engaging member on said carriage, a source of electrical energy mounted on the truck, a controller carried by said truck and an electrical connection between said controller and said motor whereby the operator may cause said load engaging member to be rotated while said truck is in motion.

In testimony whereof, I hereunto affix my signature.

EDWARD J. ABBE.

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