Aug. 30, 1932. J. H. MOSEL 1,875,103

TRUCK

Filed May 14, 1930 3 Sheets-Sheet 1

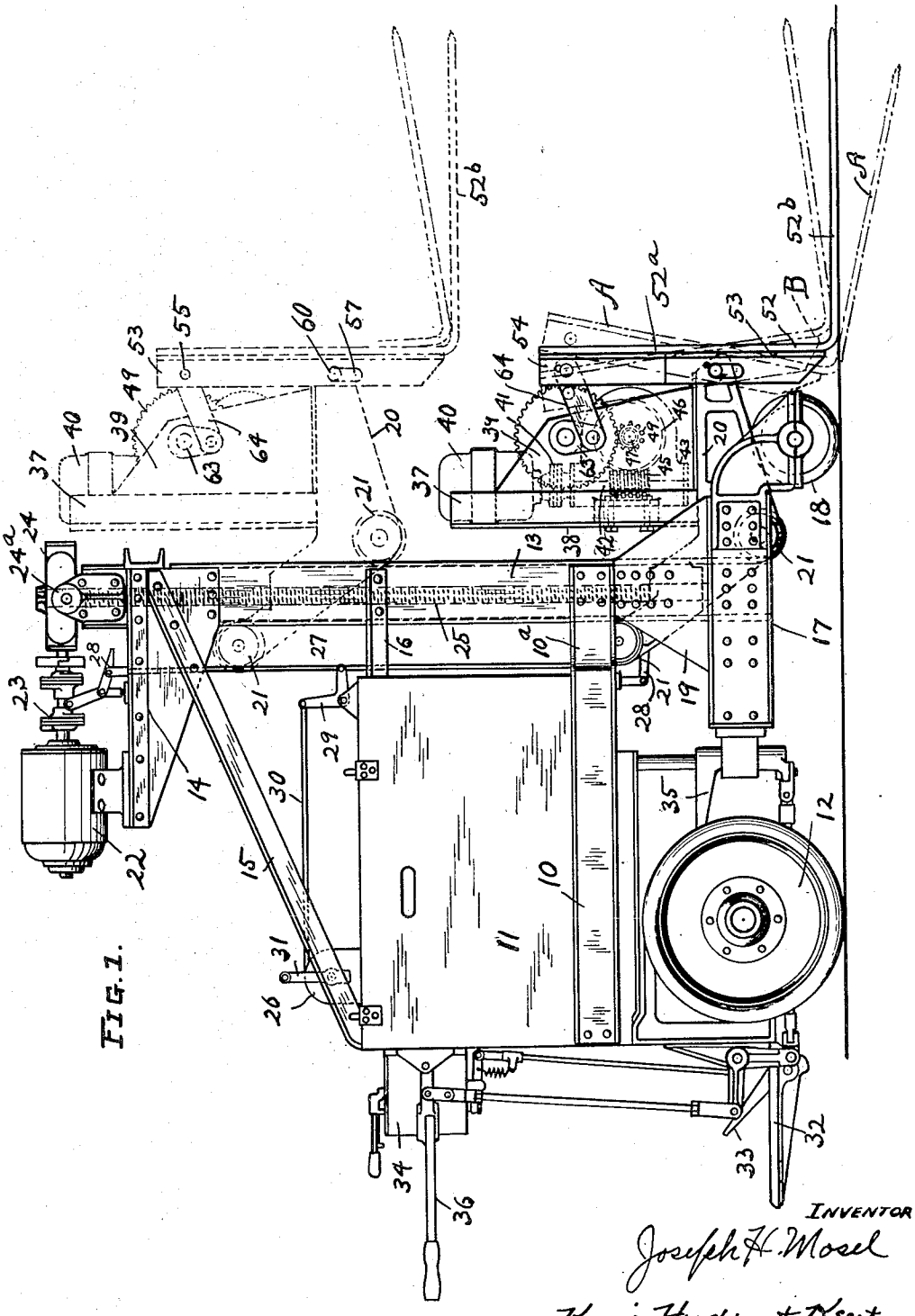

FIG. 1.

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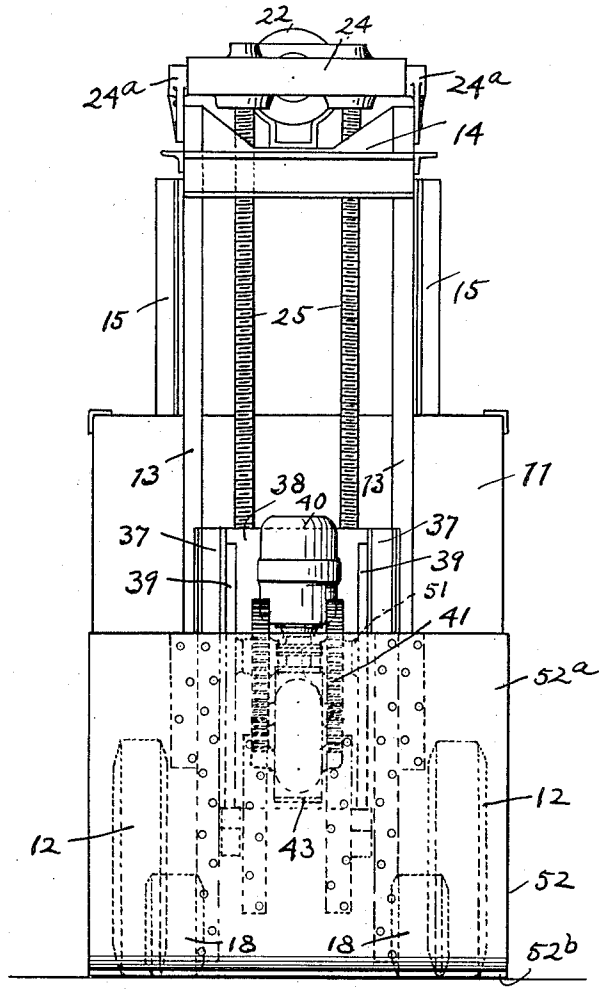
FIG. 2.



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TRUCK

Filed May 14, 1930 3 Sheets-Sheet 3

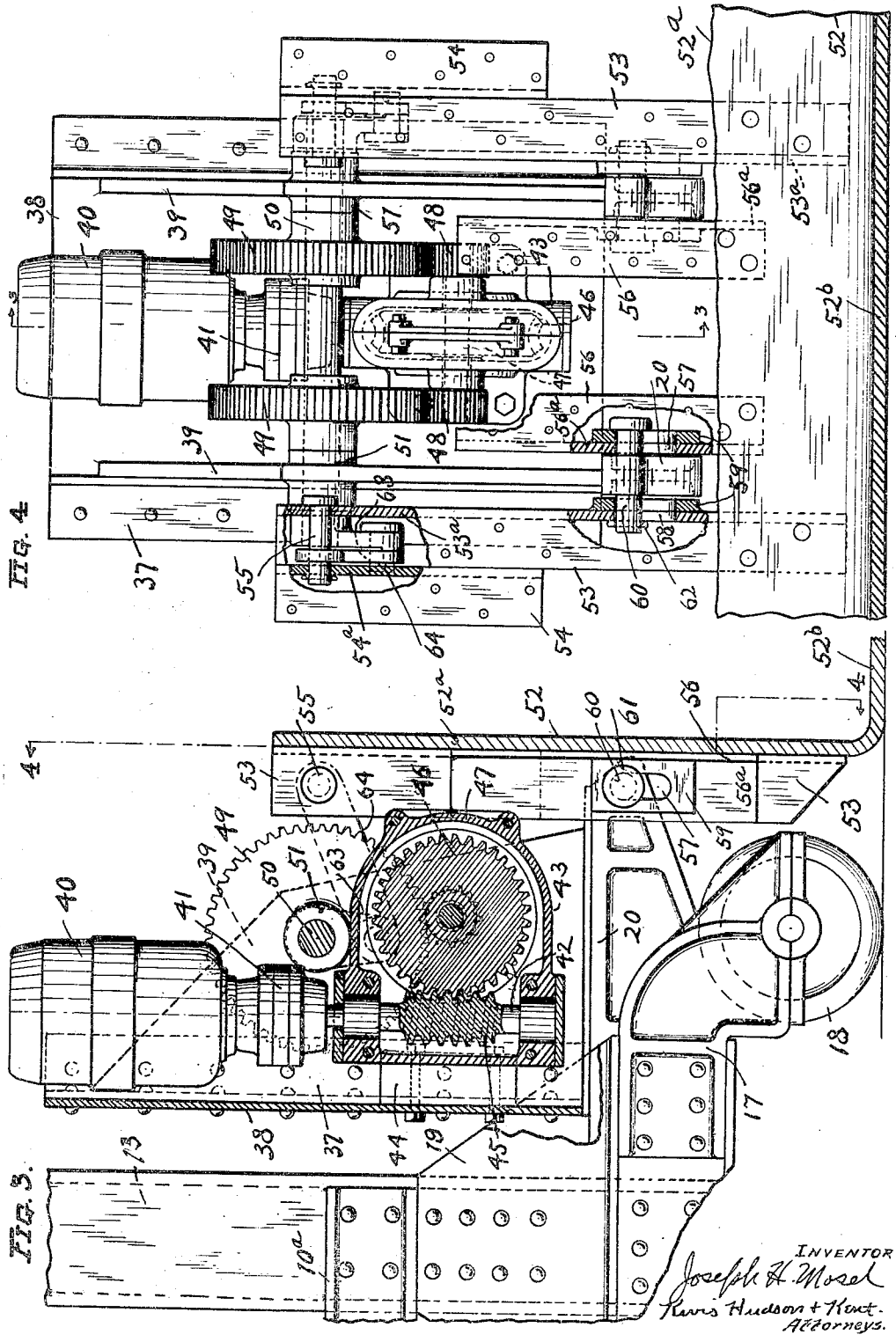

FIG. 4

FIG. 3.

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1,875,103

UNITED STATES PATENT OFFICE

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TRUCK

Application filed May 14, 1930. Serial No. 452,395.

This invention relates to a truck and more particularly to an industrial truck of the tier lift type.

An object of the invention is to provide an industrial truck capable of improved operation, since the work or material being handled by the truck may be more expeditiously placed upon the platform, apron or fork of the truck, while the likelihood of such work or material being displaced therefrom during transit is reduced to a minimum.

Another object is to provide an industrial truck wherein the platform, apron or fork may be inclined with respect to the horizontal in a number of different positions.

A further object is to provide an industrial truck wherein the platform, apron or fork may be moved vertically and may also be tilted about a substantially horizontal axis.

A further object is to provide an industrial truck wherein the platform, apron or fork may be moved vertically and may also be tilted with respect to the horizontal by movements effected independently of each other.

An additional object is to provide an industrial truck of the tier lift type wherein the platform, apron or fork may be relatively moved with respect to its supporting arms so as to position said platform, apron or fork at an inclination to the horizontal.

A further object is to provide an industrial truck of the tier lift type wherein the platform, apron or fork may be independently tilted relative to its supporting arms.

Another object is to provide an industrial truck wherein the above enumerated objects may be obtained in a simple manner, and by means of a simple and efficient arrangement of mechanical details.

Additional objects and advantages will become apparent hereinafter as the detailed description of an embodiment of the invention is proceeded with.

An embodiment of the invention is illustrated in the accompanying drawings, wherein

Figure 1 is a side elevational view of an industrial truck of the tier lift type, different positions of the platform or apron of the truck being indicated in dotted lines.

Figure 2 is an end elevational view of the truck shown in Fig. 1, viewed from the right-hand side of Fig. 1.

Figure 3 is a fragmentary view partly in side elevation and partly in section, the section being taken substantially on line 3—3 of Fig. 4, looking in the direction of the arrows, and

Figure 4 is an end view partly in section and partly in elevation, the section being taken substantially on line 4—4 of Fig. 3 looking in the direction of the arrows.

In industrial trucks of the type shown in the drawing it has been customary to provide means for raising and lowering the apron, platform or fork of the truck, but it has not been customary to provide means for tilting or inclining the platform, apron or fork, and particularly to effect such tilting or inclination of these members by means entirely independent of the raising and lowering means. It will be appreciated that the provision of means for tilting or inclining the platform, apron or fork of the truck increases the facility with which the truck may be operated, since it enables the work or material to be placed upon the apron or platform in a more expeditious manner and at the same time lessens the likelihood of the work or material being displaced therefrom while the truck is in transit.

The present invention contemplates an industrial truck construction such that the platform, apron or fork of the truck may be tilted or inclined with respect to the horizontal independently of the position of the supporting arms for the platform, apron or fork, and also independently of the upright columns supporting the lifting mechanism of the truck.

In Fig. 1 is shown in side elevation an industrial truck of the tier lift type, and since a large part of the truck frame, lifting mechanism and driving mechanism is conventional a brief description of these portions of the truck will suffice for the present application.

The truck frame is preferably constructed of structural steel angles and channels, and comprises a pair of horizontally arranged

spaced parallel channels 10 forming the main frame members of the truck. The forward ends of the channel members 10 are inwardly off-set, as indicated at 10ª.

The channel members 10, rearwardly of the offset portions 10ª, support a battery compartment 11, within which the batteries may be assembled in trays and in groups of convenient size for handling. The battery compartment 11 is situated over the drive wheels 12, these wheels, of course, being the rear wheels of the truck.

The driving motor for the rear wheels 12 (not shown in any of the views) is located over the rear axle beneath the battery compartment 11 and preferably drives the horizontal rear axle through a worm and differential; the axle being connected with the two drive wheels 12 through a train of bevel gears or by any other suitable means, so that the wheels 12 may be turned in order to steer the truck.

Secured to the inwardly offset portions 10ª of the channel members 10 are vertically extending columns 13 in the form of inwardly facing channels, these columns supporting at their upper end a platform construction designated generally by the numeral 14 for supporting the elevating mechanism. This platform 14 may be interbraced by angle members 15 secured thereto and extending rearwardly and downwardly and secured to the angles 16 extending from the columns 13 through the battery compartment 11 where they are secured to upright frame members (not shown).

The columns 13 extend below the frame members 10 and are secured to horizontally arranged outwardly facing channels 17 forming the frame portion of the truck which carries the front truck wheels 18.

It should be noted that in this particular disclosure the front truck wheels are rotatably mounted on a fixed axle, but that the present invention is equally as applicable to a truck construction wherein the front wheels are carried by an axle capable of being turned about a vertical axis for the purpose of steering the truck. Suitable gusset plates 19 may be arranged between the frame members 10 and the channels 17 as is well understood in the art.

A pair of cantilever arms 20 are arranged to support the platform or apron of the truck, with the weight of the platform or apron and the material thereon transmitted to the columns 13 through four rollers 21, two of which are arranged at the inner ends of the arms 20 and roll along the rear flanges of the channels 13, while the other two rollers are arranged at the junction of the branches of the cantilever arms and roll along the front flanges of the channels 13.

The hoisting or elevating mechanism carried by the platform 14 includes a motor 22, directly connected through a flexible disc universal joint 23 to a worm meshing with two horizontally disposed worm gears arranged in a housing 24. The worm and the two worm gears are not shown in the drawings, since this arrangement is well understood in the art.

Each of the two horizontally disposed worm gears is keyed to the top of vertically extending elevating screws 25, one of the screws having a right-hand thread and the other having a left-hand thread, since these screws are rotated in opposite directions. The screws 25 are rotatably journaled at their lower ends in a member of the frame and pass through trunnion nuts associated with the cantilever arms 20, as is common in constructions of this character.

The housing for the worm gears at the top of the vertical screws and the elevating nuts associated with the cantilever arms 20 are all trunnion mounted, so that there is no possibility of the elevating mechanism binding during operation, the trunnion mounting for the housing 24 being indicated at 24ª.

The elevating mechanism is preferably controlled by a separate single speed reversible controller 26 usually arranged on top of the battery compartment within easy reach of the operator. The elevating mechanism controller is also provided with automatic cut-out means arranged to be tripped by the cantilever arms 20 at their maximum and minimum elevations, so as to prevent overrunning should the operator forget to stop the elevating mechanism.

This automatic cut-out arrangement includes the vertically extending rod 27 connected at its opposite ends to trip levers 28, one of such levers being arranged on the platform 14 and the other being arranged on the lower portion of the truck frame, as clearly shown in Fig. 1. The rod 27 is connected intermediate its ends to a bell crank lever 29 pivoted on the battery compartment 11, such lever also being connected to a rearwardly extending rod 30 operatively associated with the controller 26. The controller 26 may be manually operated by a lever 31, as clearly shown.

An operator's platform 32 is carried by the truck frame at the rear of the truck, and has a foot pedal 33 pivoted thereon, such pedal controlling the brake and the electric circuit of the driving mechanism.

When the operator pushes down this pedal with his foot the brakes are released, the electric circuit closed and the truck is then ready to operate by means of the controller 34. When the operator raises his foot or leaves the platform the pedal 33 springs up, opening the circuit and applying the brake. The truck ordinarily cannot be started again until the controller has been brought back to the neutral position.

The brake mechanism preferably comprises a brake drum mounted on the main drive shaft for the wheels 12, together with an external brake band contracting on the drum. The steering of the truck is obtained through steering mechanism associated with the drive wheels 12 and indicated generally in Fig. 1 by the numeral 35, such mechanism being operatively associated and controlled by a horizontal lever 36 operating up and down and so situated that the operator may conveniently steer the truck when running in either direction.

The foregoing briefly outlined structural arrangement of the truck is more or less conventional, and does not by itself form a part of the present invention, but has been set forth herein in order that the invention may be better understood.

The forwardly extending branch of the cantilever arms 20 provides a supporting platform for an operating mechanism for tilting or inclining the apron, platform or fork of the truck.

A vertically arranged outwardly facing angle 37 is secured to each cantilever arm 20 adjacent the junction of the branches of the cantilever arm, and are interconnected by means of a plate 38 extending therebetween and connected to the rear flanges of the angles 37. A forwardly extending plate 39 is connected adjacent its rear edge to the forwardly extending flanges of the angles 37, while its bottom edge is outwardly flanged and secured to the top of the forwardly extending branch of the cantilever arm 20.

A motor 40 is supported centrally on the plate 38 adjacent the upper end thereof, the shaft of the motor 40 being connected by means of a flexible disc universal coupling 41 to a shaft 42 arranged in a gear housing 43, supported upon the plate 38 by means of a supporting block 44.

The shaft 42 is provided with a worm 45 which meshes with a worm gear 46 fixed on a shaft 47 extending transversely of the gear housing 43 and carrying on its opposite ends pinions 48.

The pinions 48 are arranged externally of the gear housing 43 and mesh with large gears 49 fixed on a shaft 50 rotatably mounted in bearing bosses 51 formed in the forwardly extending plates 39.

The work or material supporting apron 52 is preferably of heavy sheet metal and is substantially L shaped, as it has a vertically extending part 52^a and a horizontally extending part 52^b. The apron is substantially of the same transverse width as the truck and has its vertically extending part secured by rivets, welding, or other suitable means to a pair of vertically extending angle bars 53 arranged in parallel spaced relation with respect to each other and located inwardly of the vertical edges of the part 52^a of the apron.

The angle bars 53 extend substantially the full length of the part 52 and are located outwardly of the plates 39 and the cantilever arms 20.

A second pair of angle bars 54 are secured to the part 52^a of the apron, these bars being arranged in parallel relation outwardly of the bars 53 but being shorter than the bars 53. It will be noted by reference to Figure 4 that the rearwardly extending flanges 53^a and 54^b of the bars 53 and 54, respectively, are spaced apart and form a support for a pin 55 later to be referred to.

A third pair of angle bars 56 are secured to the rear side of the part 52^a of the apron in parallel spaced relation below the bars 54 and inwardly of the cantilever arms 20. The rearwardly extending flange 56^a of the bar 56 is provided with an elongated vertical slot 57 aligning with a similar slot 58 formed in the flange 53^a of the bar 53, slotted reinforcing and strengthening plates 59 being secured to the flanges 53^a and 56^a, respectively adjacent the slots 57 and 58.

Each cantilever arm 20 fixedly carries at its forward end a substantially horizontally extending pin 60, the opposite end of whch passes through the slotted reinforcing and strengthening plate 59 and through the slots 57 and 58. The pins 60 are provided at one end with a head 61 while their opposite ends may be provided with cotter pins 52, nuts or other suitable means to prevent the parts from becoming disengaged by lateral shifting movements thereof.

A crank arm 63 is fixedly mounted on each end of the rotatable shaft 50 outwardly of the plates 39, each crank arm 63 having pivotally connected to its outer end a link 64, the free end of which extends between the flanges 53^a and 54^a of the angle bars 53 and 54, respectively, and is pivotally connected to the pin 55 carried by such flanges.

It will be understood that when the motor 40 is operated the worm 45 will rotate the worm gear 46, the shaft 47, and the pinions 48 carried by the opposite end of the shaft 47. The pinions 48 meshing with the large gears 49 effect the rotation of the shaft 50 carrying the crank arms 63 fixed on the opposite ends thereof.

This movement of the crank arms 63 is transmitted to the apron 52 through the links 64 connected to the pins 55 carried by the flanges 53^a and 54^a of the bars 53 and 54, respectively, secured upon the rear side of the part 52^a of the apron 52.

When the movement of the crank arms 63 is such as to move the links 64 forwardly, the apron 52 will be tilted about the horizontal pin 60 fixedly mounted to the forward end of the cantilever arms 20 with the part 52^b of the apron inclined downwardly and

forwardly with respect to the horizontal, the position of the apron being substantially the position shown by dotted lines in Figure 1 and indicated by the letter A.

When the links 64 are moved rearwardly by the crank arms 63 the apron will be tilted to the reverse direction with the part 52^b thereof inclined downwardly and rearwardly as shown in Figure 1 by dotted lines and indicated by the letter B. It is understood that intermediate positions may be obtained by suitably controlling the motor 40, one of such positions being the full line position of the apron as shown in Fig. 1.

It will also be appreciated that since the drive from the motor 40 is through worm 45, worm gear 46, pinion 48, gears 49, and the gear arm 63 that the apron will be held in the different positions to which it is swung when the motor 40 is stopped.

A suitable controller for starting, stopping and reversing the motor 40 will be provided and preferably will be so arranged to be conveniently located for the operator standing on the platform 32.

It will be understood, of course, that the operation of the truck as far as the vertical movements of the apron are concerned, is substantially the same as in other trucks of the tier lift type.

The work or material is placed on the platform or apron at the loading point and the truck is then driven to the discharge point where the platform or apron is raised or lowered, as conditions require, by the elevating mechanism to the proper discharge height.

The elevating mechanism is controlled by the operator through the controller 26 and by the automatic cutouts 28 to start, stop and reverse the rotation of the right and left hand screws 25, it being remembered that these screws rotate in unison but in opposite directions.

The operation of the motor 22 in one direction will cause the trunnion nut carried by the cantilever arms 20 to travel up the screws 25 while the operation of the motor 22 in the opposite direction will cause the nuts to travel down the screws; in both of these movements the roller 21 will travel on the flanges of the columns 13. When the motor 22 is stopped, the cantilever arms 20 are held in whatever position they are in at the time because of their connection through the nuts with the screws 25.

Often it would be advantageous in loading the platform or apron with the work or material, if the platform or apron could be tilted so that the normally horizontal part thereof could be inclined downwardly and forwardly. When this occasion arises the operator simply starts the operation of the motor 40 until the crank arms 63 have pushed the links 64 forwardly and have tilted the apron to the position shown in Figure 1 in dotted lines and designated by the letter A.

It will be appreciated that when the apron of the truck is in this position the truck may be moved forwardly to contact with the work and the work more readily slid upon the apron, than is the case when the apron is in a substantially horizontal position, as shown in full lines in Figure 1.

The work having been placed on the apron when it is tilted in the position shown by letter A, the operator merely reverses the operation of the motor 40, and moves the apron either to the full line position or to the dotted line position indicated by the letter B, or possibly to an intermediate position.

The truck may then be driven to the point of discharge with its apron in position B, and it will be appreciated that the rearward tilting of the apron will lessen the likelihood of the work or material arranged thereon being displaced during transit or accidentally sliding off the apron.

When the point of discharge has been reached, the operator may move the apron vertically to the desired position, and, in fact, preferably arrange it slightly above the level at which the work is to be discharged, after which the apron may be tilted to the position A or some intermediate position, whereby it will readily be seen that the work may be easily slid off the apron and discharged onto the platform or other surface.

The tilting movements of the apron or platform being obtained entirely independently of any movement of the columns or cantilever arms, the construction is simple and of such character that the strength of the truck frame is not lessened.

Although a preferred embodiment of the invention has been disclosed herein, it should be understood that the invention is susceptible of various modifications and adaptations within the scope of the appended claims.

Having thus described my invention what I claim is:

1. In an industrial truck of the character described, means for raising and lowering the load carrying member, and means for positively swinging said member about a substantially horizontal axis to an upwardly or downwardly inclined position or to a horizontal position, said last named means being independent of said first named means.

2. In an industrial truck of the character described, a load carrying member, means for supporting the load carrying member, means for raising and lowering said first named means, and means for positively swinging said load carrying member about a substantially horizontal axis to an upwardly or downwardly inclined position or to a horizontal position and relative to said first named means, said last named means holding

said load carrying member in such different positions.

3. In an industrial truck of the character described, a load carrying member, means for supporting the load carrying member, means for raising and lowering said first named means, and means carried by said first named means for positively swinging said load carrying member about a horizontal axis to an upwardly or downwardly inclined position or to a horizontal position and relative to said first named means.

4. In an industrial truck of the character described, vertically movable means, a load carrying member pivotally associated with said means, and independent means for positively moving said load carrying member about its pivot to an upwardly or downwardly inclined position or to a horizontal position and for holding the same in such positions.

5. In an industrial truck of the character described, vertically movable means, a load carrying member pivotally associated with said means, and means carried by said vertically movable means for positively moving said load carrying member about its pivot to an upwardly or downwardly inclined position or to a horizontal position and for holding the same in such positions.

6. In an industrial truck of the character described, a vertically movable member, means for moving said member, a load carrying member pivotally supported by said first named member on a substantially horizontal pivot, and means independent of said first named means for positively moving said load carrying member about its pivot to an upwardly or downwardly inclined position or to a horizontal position.

7. In an industrial truck of the character described, a vertically movable member, means for moving the same, a load carrying member pivotally supported by said first named member means on a substantially horizontal pivot, and means independent of said first named means carried by said vertically movable member for positively moving said load carrying member about its pivot to an upwardly or downwardly inclined position or to a horizontal position.

8. In an industrial truck of the character described, a truck frame including vertically extending columns, a member associated with said columns and adapted to move longitudinally thereof, means for moving said member, a load carrying member pivotally associated with said first named member so as to be capable of tilting movements relative to the columns and to said member, and independent means for positively tilting said load carrying member to an upwardly or downwardly inclined position or to a horizontal position.

9. In an industrial truck of the character described, a truck frame including vertically extending columns, cantilever arms associated with said columns for longitudinal movement therealong, means for moving said arms, a load carrying member pivotally associated with said arms adjacent the forward ends thereof, and means independent of said first named means for positively moving said load carrying member about its pivot to an upwardly or downwardly inclined position or to a horizontal position.

10. In an industrial truck of the character described, a truck frame including vertically extending columns, cantilever arms associated with said columns for longitudinal movement therealong, means for moving said arms, a load carrying member pivotally associated with said arms adjacent the forward ends thereof, and means independent of said first named means and supported by said arms for positively moving said load carrying member about its pivot to an upwardly or downwardly inclined position or to a horizontal position.

11. In an industrial truck of the character described, a truck frame including vertically extending columns, cantilever arms associated with said columns for longitudinal movement therealong, means for moving said arms, a load carrying member pivotally associated with said arms adjacent the forward ends thereof, and independent means for moving said load carrying member about its pivot, said means comprising a motor, crank arms operatively associated with said motor and links connecting said crank arms to said load carrying member.

12. In an industrial truck of the character described, a truck frame including vertically extending columns, cantilever arms associated with said columns to move longitudinally therealong, horizontally disposed pins carried by said arms adjacent the forward ends thereof, a load carrying member having slotted portions through which said pins extend to pivotally connect said member with said arms, and means for moving said load carrying member about its pivot and supported by said arms, said means comprising a motor, crank arms operatively associated with said motor, and links connecting said crank arms with said load carrying member.

13. In an industrial truck of the character described, a truck frame including vertically extending columns, a member associated with said columns and adapted to move longitudinally thereof, means for moving said member, a load carrying member pivotally associated with said first named member, and means for moving said load carrying member to a plurality of different tilted positions with respect to and on the opposite sides of a horizontal plane.

14. In an industrial truck of the character described, a truck frame including vertically

extending columns, a member associated with said columns and adapted to move longitudinally thereof, means for moving said member, a load carrying member associated with said first named member and pivotally connected thereto at the outer end of said first named member and on opposite sides thereof whereby said load carrying member may be tilted to an upwardly or downwardly inclined position or to a horizontal position, and means for moving said load carrying member to said positions.

15. In an industrial truck of the character described, a truck frame including vertically extending columns, a member associated with said columns and adapted to move longitudinally thereof, means for moving said member, a load carrying member located forwardly of said first named member, means pivotally connecting said load carrying member to said first named member whereby said load carrying member may be moved to an upwardly or downwardly inclined position or to a horizontal position, and means for moving said load carrying member to said positions.

In testimony whereof, I hereunto affix my signature.

JOSEPH H. MOSEL.