

Aug. 15, 1939.

S. WEISS
INDUSTRIAL TRUCK

2,169,440

Filed June 17, 1938

4 Sheets—Sheet 1

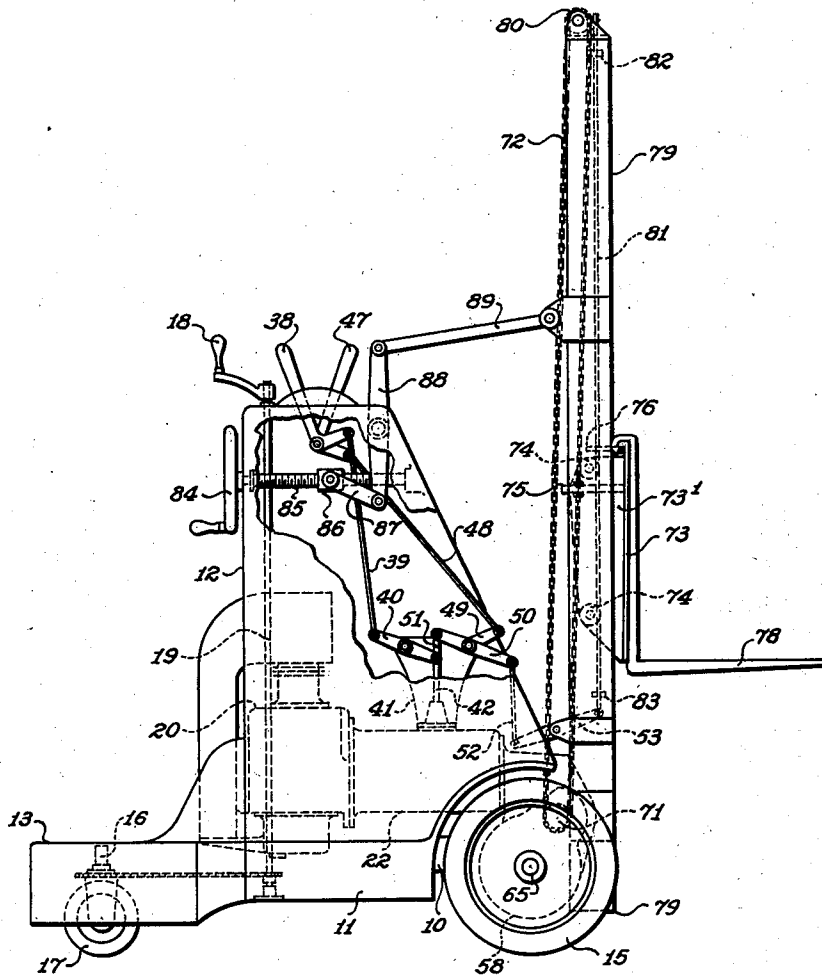


Fig. 1

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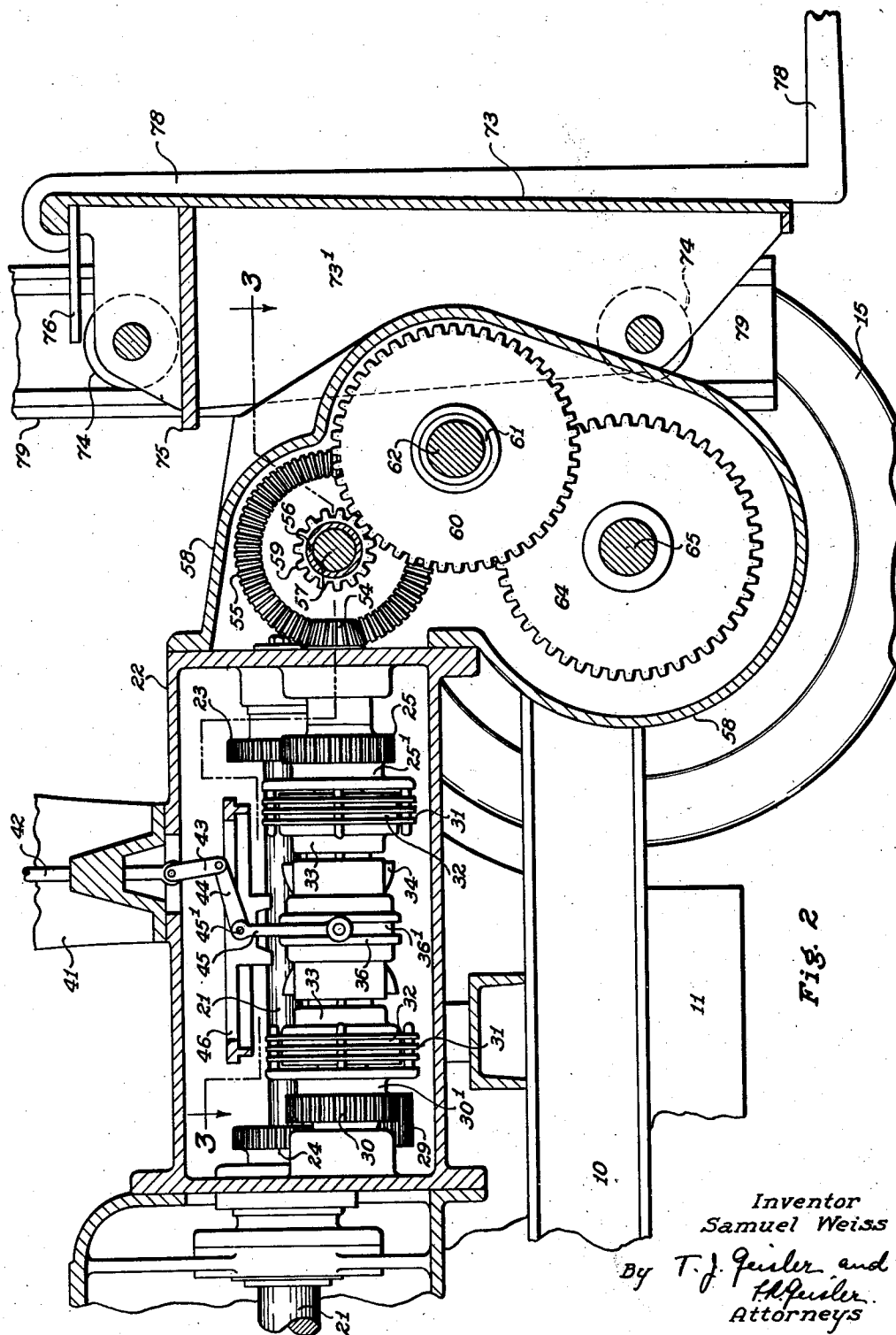


Fig. 2

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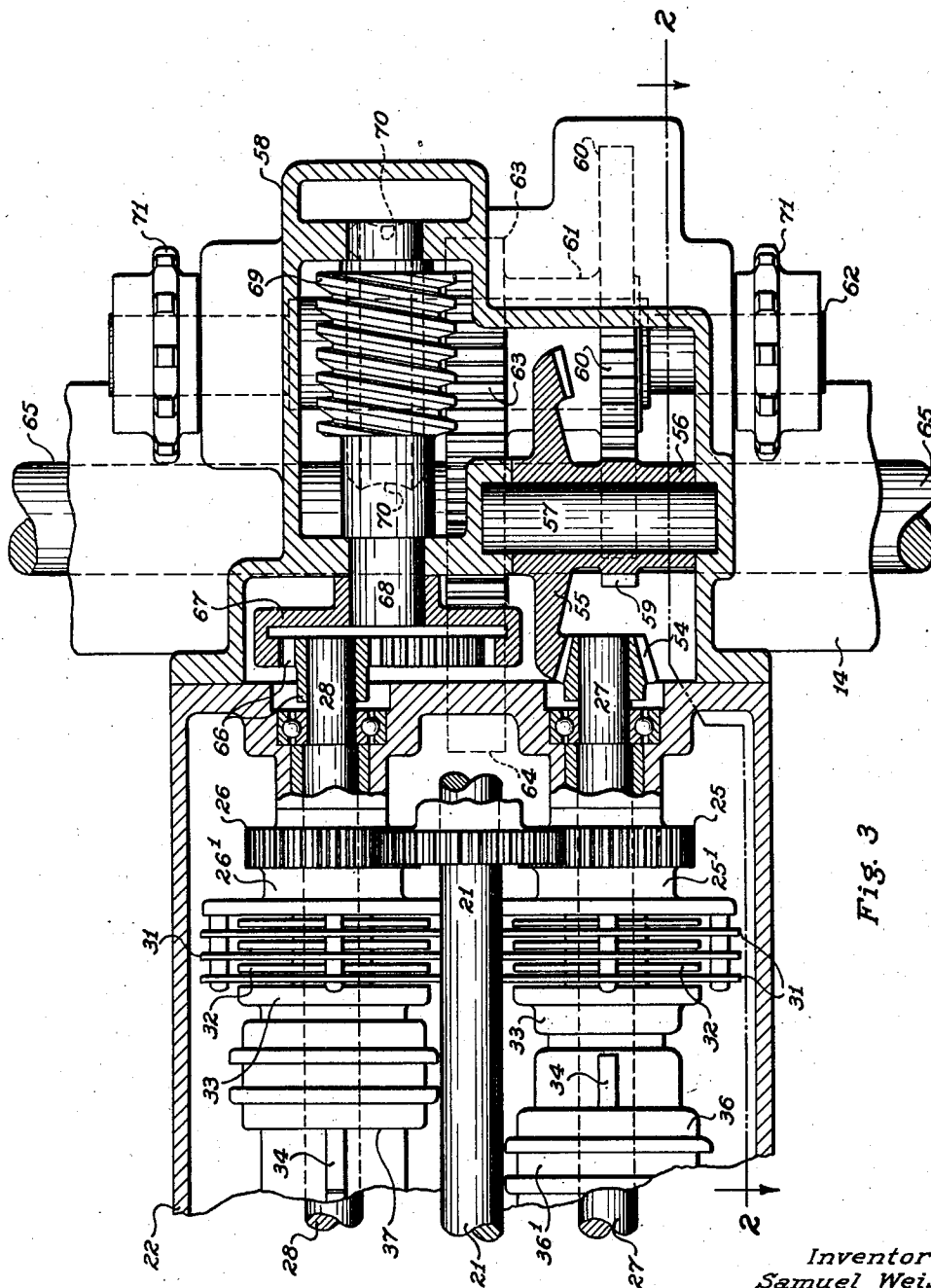


Fig. 3

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4 Sheets-Sheet 4

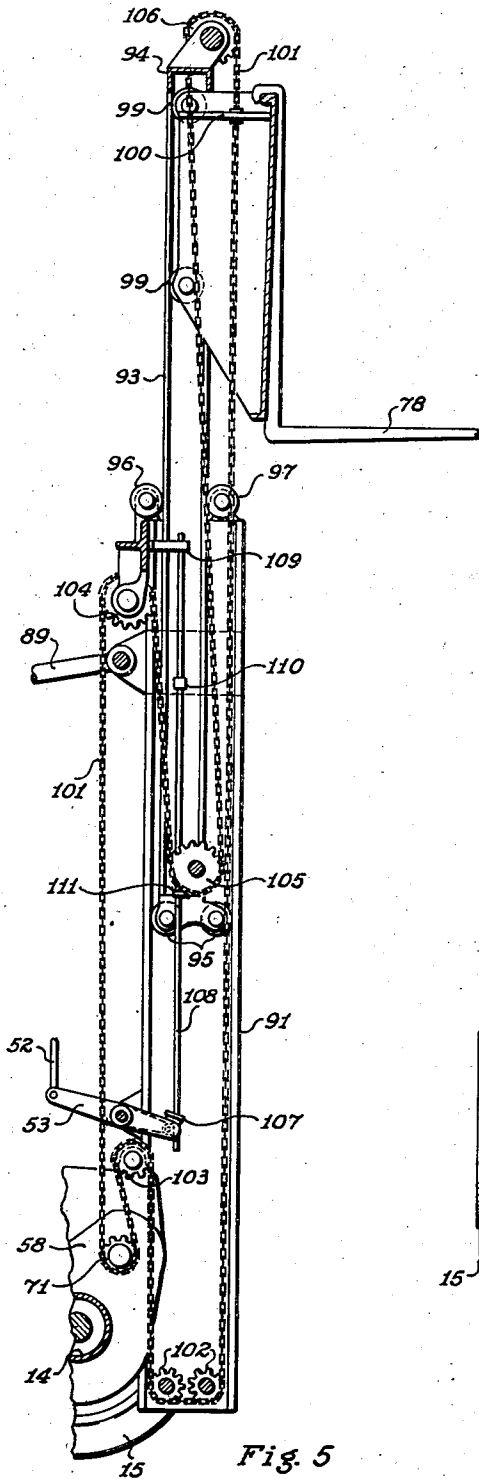


Fig. 5

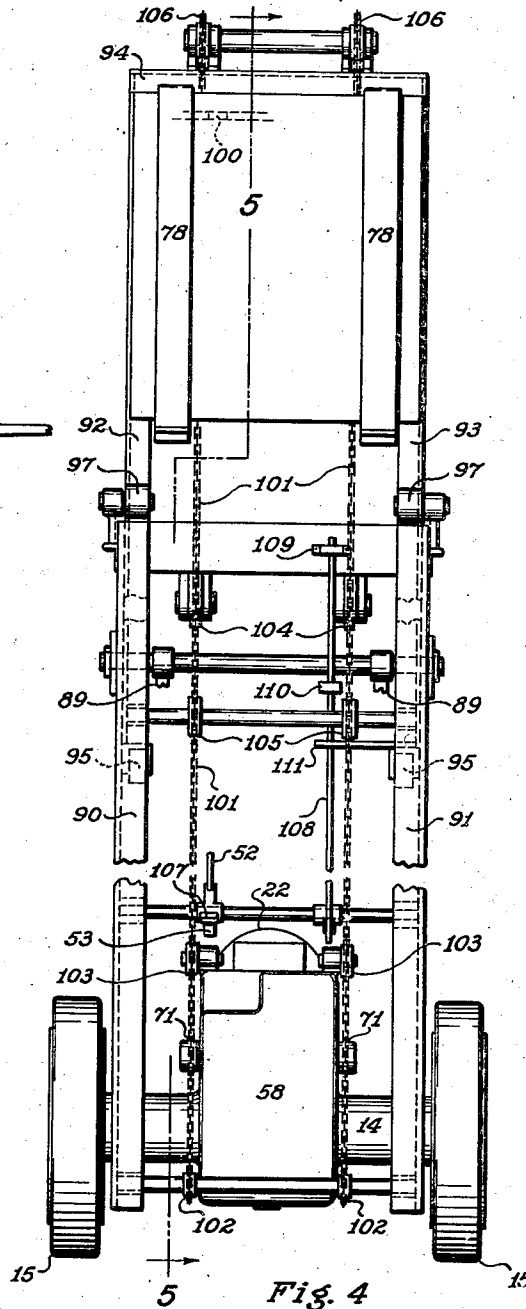


Fig. 4

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UNITED STATES PATENT OFFICE

2,169,440

INDUSTRIAL TRUCK

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Application June 17, 1938, Serial No. 214,255

9 Claims. (Cl. 214-75)

This invention relates to industrial trucks and particularly to that type of trucks used in warehouses, on docks, etc., for raising, transporting, and depositing loads. More specifically, this invention relates to end lift trucks or trucks of the elevating platform type.

An object of my invention is to provide a truck of the type above mentioned which will take up little space, will be strong, sturdy and capable of lifting and transporting relatively heavy loads, and which will be simple of operation.

Another object of my invention is to provide simple and practical mechanism driven from a single power shaft for moving the truck about and also for raising and lowering the load lifting means.

These objects and other features I attain by providing a load lifting truck with a motor and a motor driven shaft, and with a pair of clutch shafts parallel to said motor driven shaft; by connecting one of said parallel clutch shafts to the load lifting means, and the other to the driving wheels of the truck, whereby power from the motor shaft can be applied both for driving the truck and for operating the load lifting means independently and either separately or simultaneously; by providing duplicate clutch mechanism on each shaft and having each set of duplicate clutch mechanism controlled by a single hand lever; and by otherwise constructing my truck and the load lifting means in the manner hereinafter to be described with reference to the accompanying drawings.

In the drawings:

Fig. 1 is a side elevation of a preferred form of my elevator truck, a portion of the side sheathing being broken away to show the interior control mechanism;

Fig. 2 is a sectional elevation corresponding to the line 2-2 of Fig. 3, the parts of the clutch mechanism and transmission which are illustrated in this view being those relating to the means for driving the truck, and certain parts relating to the elevator and automatic stop mechanism being omitted for the sake of simplicity;

Fig. 3 is a sectional plan of a portion of the twin clutch mechanism and of the transmission taken on the line 3-3 of Fig. 2 and drawn to a slightly larger scale, with certain parts omitted;

Fig. 4 is a foreshortened front elevation of a modified form of the guide frame and associated load lifting means of my truck, with certain parts of the truck omitted for clarity; and

Fig. 5 is a sectional elevation of the guide frame

and load lifting means shown in Fig. 4 taken on the line 5-5 of Fig. 4.

Referring first to Fig. 1, the body portion of the truck comprises a rigid chassis 10, fender members 11, superimposed housing or sheathing 12, and a stand or deck 13 for the operator. The truck is supported on three wheels, the forward end of the chassis 10 being mounted on the axle housing 14 (see Fig. 4) of the two driving wheels 15-15, and the rear of the chassis being secured to the deck 13 (Fig. 1) which in turn is supported on the shank 16 of the caster wheel 17. The pivotal movement of the caster wheel 17 directs the travel of the truck. The shank 16 is journaled in suitable bearings (not shown) provided in the deck 13, and the lower end of the shank is bifurcated to receive the caster wheel 17. A vertical shaft 19 has a sprocket and chain connection with the shank 16 and a handle 18 is secured to the top of the shaft 19, above the top of the housing, for steering the truck.

An air-cooled internal combustion engine 20 (shown in dotted outline in Fig. 1) is mounted on the chassis 10 within the housing 12, and this single engine supplies the power for propelling the truck and for raising and lowering the load lifting means. The power shaft 21 (see Figs. 2 and 3) of the engine extends into and is journaled within the clutch housing 22, which is mounted on the chassis 10 adjacent the engine 20. A pair of clutch shafts 27 and 28 are journaled in suitable bearings in the housing 22 parallel with the power shaft 21 and on opposite sides of it. Two spur driving gears 23 and 24 are keyed to the power shaft 21. The spur gear 23 meshes with spur gears 25 and 26 which are integral with sleeves 25' and 26' freely mounted on the clutch shafts 27 and 28, respectively. The other spur gear 24 meshes with an intermediate gear 29 (Fig. 2) which in turn meshes with the spur gear 30 of a sleeve 30', freely mounted on the clutch shaft 27, and with a similar spur gear (not shown) of a sleeve (not shown) likewise freely mounted on the clutch shaft 28. This gear arrangement, therefore, is such that the rotation of the power shaft 21 causes the sleeves 25' and 26' to be driven in the opposite direction to that of the power shaft, while the other sleeves on the clutch shafts will be rotated in the same direction as the power shaft. The arrangement of the clutch shafts and driving shaft and the entire construction of the clutch mechanism is the same as that described in detail in my United States Letters Patent No. 2,105,680, issued January 18, 1938, to which reference is made.

A series of friction clutch disks 31 are slidably but non-rotatably mounted on each sleeve of the clutch shafts and are adapted to engage the interposed disks 32 which are slidably but non-rotatably mounted on the clutch shafts 27, 28 in the manner described in my United States Patent No. 2,105,680. Adjacent each group of these sets of friction disks is a pressure head 33 carried on a pressure sleeve slidably mounted on the clutch shaft, and on each clutch shaft, between the pair of pressure sleeves, are Y-shaped pressure levers 34 (portions of which are shown in Fig. 2). Shifting collars 36 and 37, one on each clutch shaft, operate these levers. Shifting of a collar will cause a group of friction disks to be pressed into frictional engagement and result in that clutch shaft being turned in one direction or the other, depending upon the group of friction disks affected. When the collar is in the center or neutral position, as shown with collar 36 in Fig. 2, neither group of friction disks on that clutch will be affected and no rotation will be imparted to such clutch shaft. The power shaft 21 of the engine can thus be made to rotate either or both of the clutch shafts 27 and 28 in either direction, depending upon the positioning of the respective collars 36 and 37.

In the illustrated embodiment of my invention, clutch shaft 27 controls the forward and backward movement of the truck and clutch shaft 28 controls the upward and downward movement of the load lifting means. The rotation of clutch shaft 27 (and consequently the starting, forward, or backward movement, and stopping of the truck), is controlled by a single hand lever 38 (Fig. 1) which is in the form of a bell-crank pivotally mounted near the top of the housing 12. The short arm of this bell-crank lever is connected by a rod 39 to one end of a rocker 40 pivotally mounted on a bracket 41 secured to the clutch housing 22; and the other end of rocker 40 is connected to a rod 42 which is coupled by a link 43 to an arm 44 rigidly connected to a forked yoke 45. The forked yoke 45 is pivotally mounted at 45' on the stationary framework 46. Pins carried by the extremities of the forked yoke 45 bear in the groove 36' of the shifting collar 36 as shown in Fig. 2. The linkage is so arranged that when the hand lever 38 is moved forwardly the collar 36 will be so shifted as to cause the clutch shaft 27 to be rotated in the proper direction to drive the truck forwardly, and when the hand lever 38 is moved to the reverse or rear position the truck will be driven backwardly. Since partial reversal of the driving means for the clutch shaft forms an effective brake, none of the conventional brake mechanisms is required in this truck.

The raising and lowering of the load lifting means, that is, the rotation of clutch shaft 28, is controlled in a similar manner by a hand lever 47 which forms part of a bell-crank rockably mounted in the top of the housing 12 adjacent the hand lever 38. This bell-crank is connected by a rod 48 to an arm 49 keyed to a shaft carrying a rocker 50. One end of the rocker 50 is connected to a rod 51 and up and down movement of the rod 51 is converted into lateral movement of the shifting collar 37 thru the medium of a link, arm and forked yoke which are not shown but which are identical to the parts 43, 44 and 45. The other end of rocker 50 is connected by a rod 52 to a rocker 53, the function of which will be described later.

The manner in which the clutch shaft 27 is

connected to the driving wheels 15 will now be described with reference to Figs. 2 and 3. A bevel pinion 54 is keyed to the forward end of the clutch shaft 27 and meshes with a bevel gear 55. Gear 55 is formed integrally with a sleeve 56 which is rotatably mounted on a shaft 57 disposed in the transmission case 58. The sleeve 56 also has a spur gear 59 formed thereon which co-acts with a spur gear 60. The spur gear 60 is formed on a sleeve 61 rotatably mounted on a shaft 62. The sleeve 61 carries a spur gear 63 which meshes with a similar gear 64 keyed to the axle 65 of the driving wheels 15. The driving wheels 15 may also be mounted on separate axles driven thru the medium of a conventional differential mechanism (not shown) connected to the gear 64, but for ordinary purposes I have found the mounting of the wheels on a single axle as illustrated to be sufficient.

Clutch shaft 28 has a pinion 66 keyed to the forward end, and this pinion meshes with the teeth of an internal gear 67 keyed to a shaft 68 journaled in the housing 58 as shown in Fig. 3. The shaft 68 carries a worm 69 in engagement with a worm gear 70 (shown in dotted lines in Fig. 3), mounted on the shaft 62. At the ends of shaft 62 a pair of sprocket wheels 71 are mounted around which sprocket chains 72 (see Fig. 1) pass.

The frame 79 for the load lifting means or 30 elevator has brackets (not shown) secured near the bottom, which brackets are pivotally mounted on the housing of the wheel axle 65. The frame is held in upright position by the link rods 89 pivotally attached to the upper ends of a pair of levers 88, the other ends of which levers are attached by links 87 to a nut 86 mounted on the threaded shaft 85. Rotation of the shaft 85 by means of a hand wheel 84 will thus cause the frame to be tilted, whenever this is desired.

The load lifter or elevator comprises a front plate 73 and a pair of side plates 73' (one of them being shown in dotted line in Fig. 1), each of which side plates carries a pair of rollers 74. A bracket 75 is attached to the rear of plate 73 to which the ends of the sprocket chains 72 are anchored. A detachable pair of angular, load-engaging and carrying arms 78 are hooked over the top reinforced edge of the plate 73. The rollers 74 travel on the inside of the tracks provided by U-shaped side members of the frame 79. The sprocket chains 72 pass around the drive sprockets 71 and around the idling sprockets 80 at the top of the frame.

An upstanding rod 81 is pivotally attached to 55 the rocker 53 and supported for reciprocal motion in the top of the frame 79. Collars 82 and 83 are attached on this rod near the top and bottom ends, respectively, as shown in dotted lines in Fig. 1. These collars are adapted to be engaged by a stop arm 76 attached to the rear of plate 73 of the elevator. In Fig. 1 it is assumed that the elevator is descending. In other words, the handle 47 is in position to cause the clutch shaft 28 to be rotated in such direction that the elevator will be moved downwardly. When the angular arms 78 are about to touch the ground the stop arm 76 of the elevator engages the collar 83, thereby forcing the rod 81 downwardly, which in turn operates the rocker 53, pushing 70 rod 52 upwardly, actuating the rocker 50, and causing the clutch mechanism of clutch shaft 28 to be moved into central or neutral position, whereupon rotation of clutch shaft 28 will stop. When it is desired to raise the elevator, the han- 75

die 47 is pulled back, causing the clutch shaft 28 to be driven in the opposite direction and the movement of the handle 47 causes the rod 81 to be lowered to its lowest position. As the elevator 5
nears the top of the frame 79, the stop arm 76 will engage the upper collar 82 and move the rod 81 upwardly until the clutch mechanism of clutch shaft 28 is again thrown into neutral position and rotation of clutch shaft 28 will then be 10
stopped.

Figs. 4 and 5 illustrate a modified form of elevator guide frame which I have also found it practical to use with my invention under certain conditions. The elevator frame in Figs. 4 and 5 is an extensible frame, the main part of which is similar to the frame 79 shown in Fig. 1. The main portion of this frame includes a pair of vertical guide channels 90 and 91 which have brackets (not shown) secured near the bottom, 20
these brackets being pivotally mounted on the axle housing 14. Link rods 89 support the upper end of this portion of the frame in the same manner as already described with reference to Fig. 1. The guide channels 90 and 91 are open 25
at the top permitting a smaller frame to slide within them. The smaller frame includes smaller side channels 92 and 93 rigidly connected by suitable cross-members including top member 94. A pair of rollers 95 are mounted at each side of the smaller frame at the bottom, which rollers 30
bear on the inner surfaces of the flanges of the guide channels 90 and 91 of the main frame. At the top of the main frame, rollers 96 and 97 are mounted against which the smaller frame 35
bears.

The elevator itself in this modification is similar to that used in the frame illustrated in Fig. 1. The rollers 99 of the elevator bear in the side channels 92 and 93 of the smaller frame only. 40
The ends of the sprocket chains 101 are anchored in the bracket 100 attached to the elevator. Each sprocket chain extends downward from bracket 100 and passes around a pair of idling sprockets 102 mounted on transverse shafts journaled at the bottom of the main frame. Then 45
each chain extends over the idling sprocket 103, mounted on the end of the transmission housing and around the driving sprocket 71 to an idling sprocket 104, mounted near the top of the main frame. Each chain then passes downwardly 50
around a sprocket 105 mounted at the bottom of the smaller frame, thence upward over the sprocket 106 mounted at the top of the smaller frame, and finally to the anchoring bracket 100. 55
The arrangement of these parallel chain and sprocket mechanisms is such that starting with the smaller or telescoping frame in the lowest position, and with the elevator adjacent the ground, rotation of the sprockets 71 will first 60
cause the elevator to travel upwardly in the smaller frame and then cause the inner or smaller frame itself to be raised as shown in Figs. 4 and 5. When the direction of the rotation of the sprockets is reversed the smaller or telescoping frame first descends carrying the elevator 65
with it, the elevator remaining at the top of the smaller frame, and then, when the smaller frame has reached its lowest position, the elevator descends in the lowered smaller frame.

Automatic means for disengaging the clutch mechanism to stop the upward or downward travel of the elevator, as the case may be, is provided and such means is similar to that already described with reference to Fig. 1. A rod 108, 75
pivotally attached to the rocker 53, is supported

at its upper end by the bracket 109 on the main frame and is permitted reciprocal motion in said bracket. A collar 110 is secured to rod 108 and is adapted to be engaged by an arm 111 at the bottom of the smaller frame when the smaller frame is raised to its extreme upper position. 5
The bracket 100 at the rear of the elevator is similarly adapted to engage a lug 107 attached to the rocker 53 when the elevator reaches its extreme low position. Movement of the rocker 10
arm in either direction into intermediate position operates to move the clutch mechanism of clutch shaft 28 into neutral position in the manner previously described.

I claim:

1. In an end lift truck of the character described, a motor driven shaft, a pair of clutch shafts located near to and parallel with said motor driven shaft, gears on said power shaft, loose gears carried by the clutch shafts and driven 20
by said gears on said power shaft, clutch mechanisms for engaging said loose gears selectively with the clutch shafts and thus operatively connecting the clutch shafts to the power shaft, each of said clutch mechanisms comprising axially 25
slidable disks carried by said loose gears, cooperating clutch disks longitudinally slidable on said clutch shafts and interposed between the first mentioned disks, members longitudinally slidable 30
on each clutch shaft adapted, by imposing pressure, to cause the engagement of said cooperating disks with the disks carried by said loose gears, two-arm, Y-shaped rockable levers pivoted on said clutch shafts, and a control collar on 35
each clutch shaft slidable over said levers for operating the same, one of said clutch shafts connected to the driving wheels of said truck, the other of said clutch shafts connected to the end lift of said truck, manually operable means 40
for positioning the control collar on each clutch shaft, whereby selectively to connect the clutch shafts with said motor driven shaft and thus control travel of said truck and movement of said lift.

2. The combination described by claim 1 with the addition of means associated with said end lift for automatically moving said control collar 45
on the clutch shaft connected with said end lift into neutral position whenever said lift has reached predetermined high or low positions. 50

3. In an end lift truck of the character described, a motor-driven shaft, a pair of clutch shafts located near to said motor driven shaft, one of said clutch shafts connected to a driving wheel of said truck, the other of said clutch shafts 55
connected to the end lift of said truck, loose gears on said clutch shafts rotated by said motor driven shaft, longitudinally-slidable friction clutch disks on each of said clutch shafts and cooperating slidable friction disks carried by 60
said loose gears, manually operable lever means associated with each clutch shaft for bringing said clutch disks into frictional engagement, means connected with said end lift for automatically releasing the lever means associated with 65
said lift clutch shaft, whenever said lift has reached a predetermined high or low position.

4. In an end lift truck of the character described, a motor-driven shaft, a pair of clutch shafts located near to and parallel with said 70
motor driven shaft, one of said clutch shafts connected to a driving wheel of said truck, the other of said clutch shafts connected to the end lift of said truck, clutch mechanism connected with each of said clutch shafts whereby each 75

clutch shaft may be rotated by said motor-driven shaft independently of the other clutch shaft, said clutch mechanism including axially-slidable friction clutch disks, manually operable lever means associated with each clutch shaft for bringing said clutch disks into frictional engagement, means on said end lift for automatically releasing the lever means associated with said lift clutch shaft whenever said lift has reached a predetermined high or low position.

5: In an end lift truck of the character described, a motor-driven shaft, a pair of clutch shafts located near to said motor driven shaft, one of said clutch shafts connected to a driving wheel of said truck, the other of said clutch shafts connected to the end lift of said truck, loose gears on said clutch shafts rotated by said motor driven shaft, longitudinally-slidable friction clutch disks on each of said clutch shafts and cooperating slidable friction disks carried by said loose gears, means, including control collars, for bringing said clutch disks into frictional engagement, and manually operable lever means for positioning said control collars, means connected with said end lift for automatically permitting the clutch disks on the clutch shaft connected to said end lift to move out of frictional engagement whenever said lift has reached a predetermined high or low position.

6. In an end lift truck of the character described, a motor-driven shaft, a pair of clutch shafts located near to said motor driven shaft, one of said clutch shafts connected to a driving wheel of said truck, the other of said clutch shafts connected to the end lift of said truck, clutch mechanism connected with each of said clutch shafts whereby each clutch shaft may be rotated by said motor-driven shaft independently of the other clutch shaft, said clutch mechanism including axially-slidable friction clutch disks, means, including a control collar, for bringing said clutch disks into frictional engagement, manually operable lever means for positioning said control collar, and means associated with said end lift for automatically moving said

control collar on the clutch shaft connected with said end lift into neutral position whenever said lift has reached predetermined high or low positions.

7. In an end lift truck of the character described, a motor-driven shaft, a pair of clutch shafts located near to said motor driven shaft, one of said clutch shafts connected to a driving wheel of said truck, the other of said clutch shafts connected to the end lift of said truck, loose gears on said clutch shafts rotated by said motor driven shaft, longitudinally-slidable friction clutch disks on each of said clutch shafts and cooperating slidable friction disks carried by said loose gears, means on each clutch shaft for bringing said clutch disks into frictional engagement, a pair of identical, manually operable lever controls, each of said lever controls connected to said means on one of said clutch shafts.

8. In an end lift truck of the character described, a motor-driven shaft, a pair of clutch shafts located near to said motor driven shaft, one of said clutch shafts connected to a driving wheel of said truck, the other of said clutch shafts connected to the end lift of said truck, loose gears on said clutch shafts rotated by said motor driven shaft, longitudinally-slidable friction clutch disks on each of said clutch shafts and cooperating slidable friction disks carried by said loose gears, means including a control collar on each clutch shaft for bringing said clutch disks into frictional engagement, a pair of identical, manually operable lever controls located adjacent each other, each of said lever controls adapted to position the control collar on one of said clutch shafts.

9. The combination set forth in claim 8 with the addition of means associated with the end lift for automatically moving the lever control for said end lift clutch shaft into neutral position whenever said lift reaches predetermined high or low positions.

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