

May 2, 1933.

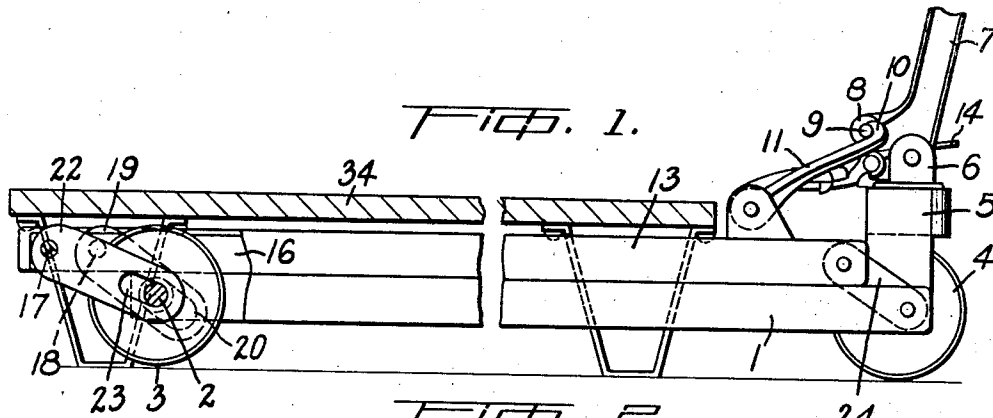
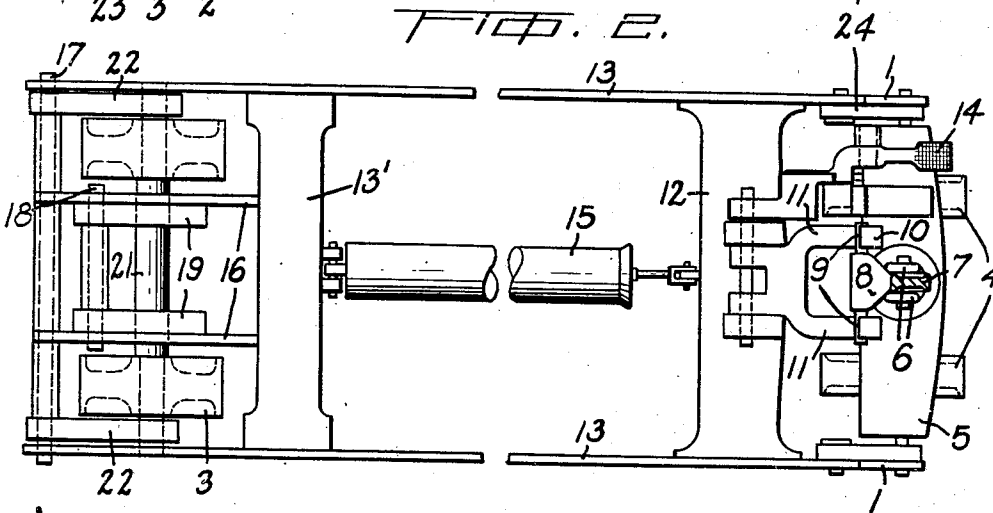
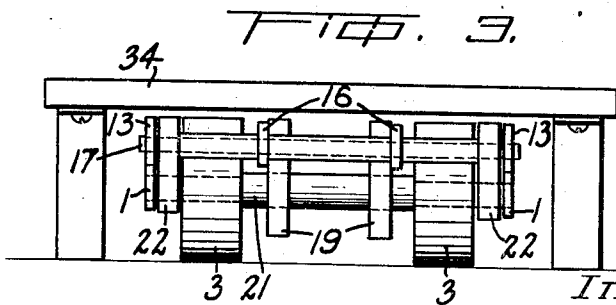
C. J. NOLAN

1,906,403

LIFT TRUCK

Filed April 30, 1932

2 Sheets-Sheet 1



Inventor
C. J. NOLAN

By *F. H. Stetson & Son*
Attorneys

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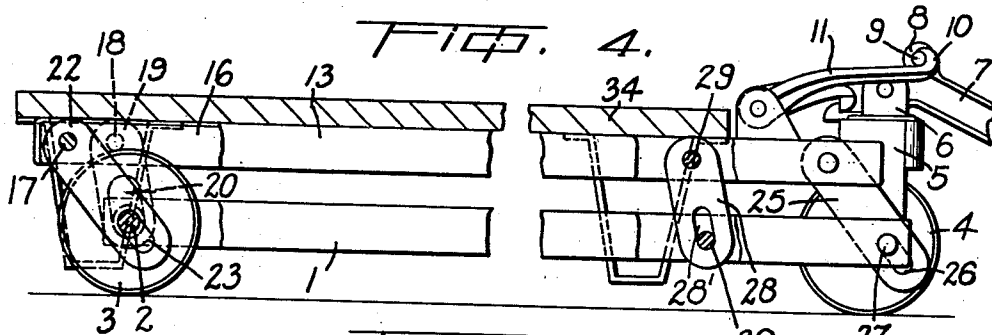
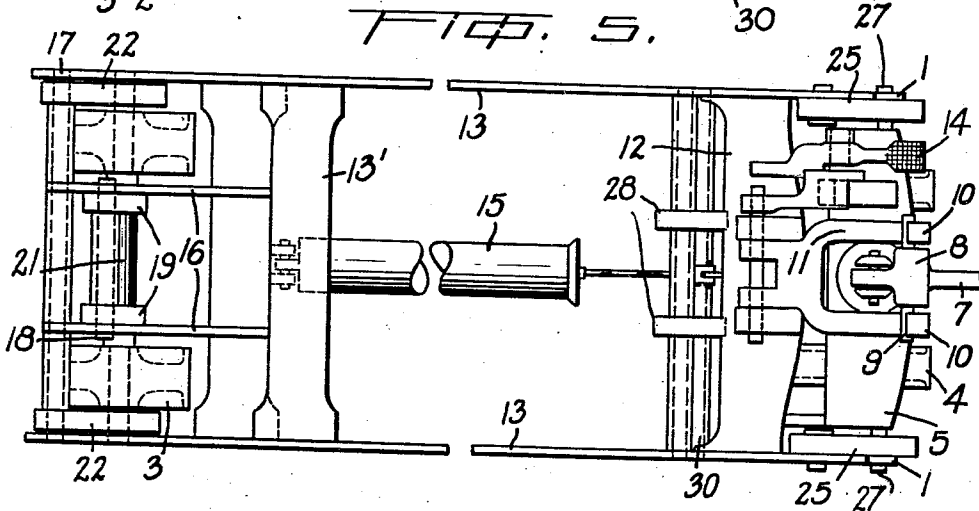
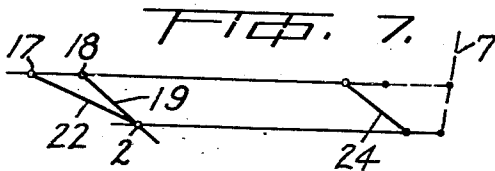
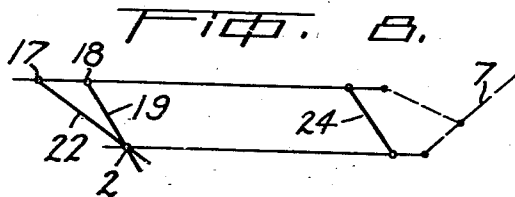
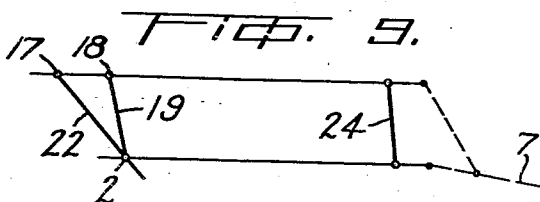
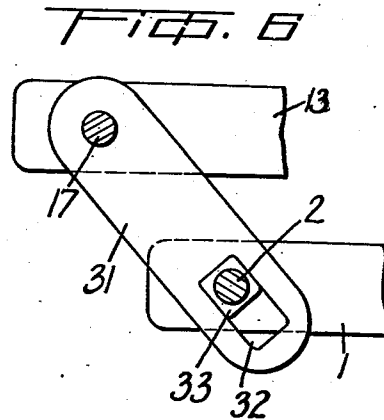
C. J. NOLAN

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LIFT TRUCK

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2 Sheets-Sheet 2



Inventor
C. J. NOLAN
By
Featherstonhaugh & Tinsley
Attorneys

UNITED STATES PATENT OFFICE

CECIL J. NOLAN, OF TORONTO, ONTARIO, CANADA, ASSIGNOR TO HERBERT J. REES,
OF TORONTO, ONTARIO, CANADA

LIFT TRUCK

Application filed April 30, 1932. Serial No. 608,495.

My invention relates to improvements in lift trucks and the object of the invention is to devise means whereby the load can be lifted more easily than is at present the case.

In other words a given load can be lifted with less effort or a greater load with the same effort.

Another object is to devise means whereby the effort required to lift the load will be substantially constant during the entire operation.

A still further object is to devise means in conjunction with the improved lifting means for locking the lifting frame when raised against a lateral upsetting.

Yet another object is to devise means for obviating wear upon the lifting link connection to the lift truck axle.

With the above and other objects in view which will hereinafter appear my invention consists in its preferred embodiment of the mechanism hereinafter described and illustrated in the drawings in which,

Fig. 1 is a side elevation of a lift truck constructed according to my invention showing the rear portions of the carrying and lifting frames broken away to expose the lifting links.

Fig. 2 is a plan view of my lift truck broken away intermediately.

Fig. 3 is an end view, viewed from the rear end.

Fig. 4 is a similar view to Fig. 1 showing a modified construction in which lifting links of my particular construction are employed at both front and rear of the truck.

Fig. 5 is a plan view of the modified form of construction in Fig. 4.

Fig. 6 is an enlarged detail of a modified form of one of the lifting links provided with means for preventing wear between the link and the axle to which it is connected.

Figures 7, 8 and 9 are diagrammatic views showing the disposition of the link construction illustrated in Figures 1 to 3 in the lowered, intermediate and raised positions respectively.

Like characters of reference indicate corresponding parts in the different views.

It is well known in the present type of lift

truck at present in use wherein a simple lifting link mechanism is employed that the greatest effort of the operator to raise the load occurs in starting the lift owing to the small amount of angularity between the longitudinal axis of the links and the line of pull on the lifting frame. In order to secure the required amount of lift it is necessary that the links shall be comparatively long and consequently their degree of angularity to the horizontal which is substantially the direction of the pull is very slight. This as above described makes it very difficult to start the lifting of the load, it being understood that the present invention relates to lift trucks in which the lifting frame is swung upwardly and forwardly to raise the load in contra-distinction to any special type of truck in which the lifting frame is raised vertically.

In carrying out my invention I employ two sets of links, preferably a pair of longer links initially set at a small degree of angularity to the horizontal and a shorter pair of links set at a greater degree of angularity to the horizontal or the direction of pull upon the lifting frame. When the lifting frame is pulled forwardly the shorter links take the load for a portion of the lift period when the longer links take up the load for the remainder of the period. Thus the difficulty of starting the raising of the load is overcome and yet the required amount of lift is attained.

In the drawings a lift truck of orthodox construction has been illustrated in which 1 is the carrying frame provided with a rear axle 2 journaled at its ends in the side members of the carrying frame, rear wheels 3 are rotatably carried on the rear axle 2 and a pair of front wheels 4 mounted on a bracket 5 connected to the forward end of the carrying frame 1, said wheels being turnable through the medium of the king bolt 6 to which is pivoted the operating handle 7 provided on its rear face with the offset portion 8 carrying the laterally projecting lugs 9 which are adapted to be engaged by the hooks 10 of the fork member 11 pivotally connected to the cross member 12 of the lifting frame 13.

The usual pedal operating dog mechanism 14 is provided for holding the lifting frame in the raised position or releasing it so that the load may be lowered against the check 15.

5 All the above construction is orthodox and has been illustrated and described merely to aid in the understanding of my invention which as above referred to relates solely to the lifting link mechanism.

10 Referring to Figures 1 to 3 in which my lifting link mechanism is only provided at the rear end of the lift truck a subsidiary frame 16 is carried between the cross member 17 of the lifting frame and the transverse rod 13'. This subsidiary frame 16 supports a cross rod 18 upon which the upper ends of my shorter lifting links 19 are pivoted the lower ends of the links 19 being provided with longitudinal slots 20 through which is inserted the axle 2. As illustrated the axle 2 between the two wheels 3 is provided with a sleeve 21.

25 Exteriorly of the wheels 3 and between them and the side members of the carrying frame 1 I provide the longer lifting links 22 which are pivotally connected at their upper ends to the cross rod 17, their lower ends being provided with longitudinal slots 23 through which extends the axle 2.

30 The shorter links 19 as will be seen upon referring to the respective figures of the drawings are set at a greater angle than the longer links 22 and when the lifting frame is in the lowered position as illustrated in Fig. 1, the upper end of the slots 20 in the shorter links 19 will be in engagement with the axle whereas in this position it is the lower ends of the slots 23 of the links 22 which are in engagement with the axle 2.

40 In Figures 1, 2 and 3, of the drawings the forward end of the truck is provided with the orthodox form of links 24 which are pivoted at their upper ends to the side members of the lifting frame 13 and at their lower ends to the side members of the carrying frame 1.

45 In the modified construction illustrated in Figures 4 and 5 the shorter links 24 are replaced by longer lifting links 25 having longitudinal slots 26 at their lower end through which extend pins 27 secured to the side members of the carrying frame 1, the upper ends of the links 25 being pivotally connected to the side members of the lifting frame 13. These links 25 are identical in construction to the links 22 and are obviously set at the same angle so that the device will function.

50 Shorter forward lifting links 28 are pivotally connected at their upper ends to the cross rod 29 provided on a lifting frame 13, the lower ends of the links having longitudinal slots 28' through which extends a cross rod 30 secured on the carrying frame 1. Such links 28 are identical with the shorter rear

links 19 and are obviously set at the same angle.

In the modified form of link illustrated in Fig. 6 such links 31 are intended where employed to replace the longer links 22, the only difference thereto being that the slots 32 therein are of such shape as to receive the squared boss 33 which is provided on the axle 2.

70 The axle 2 is rotatable in the said members of the carrying frame 1 and the wheels 3 are rotatable on such axle so that when the construction of link illustrated in Fig. 6 is swung upwardly or downwardly owing to the rectangular boss 33 the axle 2 will turn instead of remaining stationary and the link turning about it as occurs where the round section of axle extends through the slots in the links. This modified construction obviates a certain amount of wear between the links 31 and the axle 2.

75 I will now describe how my device is actuated. Assuming that the lift truck is in the position illustrated in Fig. 1 by engaging hooks 10 about the lugs 9 and swinging down the handle 7 the lifting frame 13 is pulled forwardly and through the medium of the shorter lifting links 19 the lifting frame 13 is raised until the links 19 reach the limit of their swing when the load is transferred to the longer links 22 as is illustrated in Fig. 4, the remaining portion of the lift being achieved by these latter links.

80 The load which is thus intended to be carried upon the platform 34 is lifted with a substantially equal amount of effort throughout the swinging of the handle 7 and the links are preferably so set that during the swinging of the handle downwardly from the vertical for about 45° the load will be taken by the shorter links and during the remaining downward swing of the handle the load will be taken by the longer links.

85 In Fig. 7 the disposition of the links at the beginning of the lifting operation is illustrated and in Fig. 8 the links 19 are shown just completing their lift and the links 22 taking the same. In Fig. 9 the lift is shown as being completed by the links 22.

90 In addition to providing an easier lift my link mechanism through the medium of the closed slots in the links acts as a positive lock for the lifting frame when raised, preventing it upsetting laterally, the load being under control at all times during the actuation of the lifting mechanism.

95 Ordinarily it will in all probability suffice to provide my link mechanism at the rear end of the truck but where the truck is designed to carry heavy loads the mechanism may be duplicated at the front end or constructed as illustrated in Figs. 4 and 5 of the drawings.

100 From the above description it will be apparent that I have devised a simple and effective means for a lifting mechanism for lift.

trucks which can be usefully employed without necessitating very great changes in the existing construction.

The embodiment as illustrated can be changed or amplified to a considerable degree without departing from the spirit of the invention or the scope of the claims and the form illustrated is therefore to be taken in an illustrative and not in a limiting sense.

What I claim as my invention is:—

1. In a lift truck, in combination, a lifting frame, a carriage, link mechanism between the lifting frame and carriage comprising a plurality of independent swingable devices, one of said devices elevating the lifting frame during the initial portion of the lift and the other device elevating the lifting frame during the remainder of the lift.

2. In a lift truck, in combination, a lifting frame, a carriage, link mechanism between the lifting frame and carriage comprising independent pairs of links operatively connected to the lifting frame and carriage, one pair of links elevating the lifting frame during the initial portion of the lift and the other pair elevating the lifting frame during the remainder of the lift.

3. In a lift truck in combination, a lifting frame, a carriage, link mechanism between the lifting frame and carriage comprising independent pairs of links each pivotally connected at its upper end to the lifting frame and each slidably and swingably connected at its lower end to the carriage, one pair of links elevating the lifting frame during the initial portion of the lift and the other pair elevating the lifting frame during the remainder of the lift.

4. In a lift truck in combination, a lifting frame, a carriage, link mechanism between the lifting frame and carriage comprising independent pairs of links, one pair of links being shorter in length than the other pair as set at a greater angle to the horizontal than the longer pair, each link pivotally connected at its upper end to the lifting frame and slidably and swingably connected at its lower end to the carriage, the shorter pair of links elevating the lifting frame during the initial portion of the lift, and the longer pair of links elevating the lifting frame during the remainder of the lift.

5. In a lift truck, in combination, a lifting frame, a carriage, link mechanism between the lifting frame and carriage comprising independent pairs of links, one pair of links being shorter in length than the other pair as set at a greater angle to the horizontal than the longer pair, each link pivotally connected at its upper end to the lifting frame and slidably and swingably connected at its lower end to the carriage, the shorter pair of links elevating the lifting frame during the initial portion of the lift, and the longer pair of links elevating the lifting frame during

the remainder of the lift, the longer pair of links being inoperative during the functioning of the shorter pair, and the shorter pair being inoperative during the functioning of the longer pair.

6. In a lift truck, in combination, a lifting frame, a carriage, link mechanism between the lifting frame and carriage comprising independent pairs of links, one pair of links being shorter in length than the other pair as set at a greater angle to the horizontal than the longer pair, each link pivotally connected at its upper end to the lifting frame and having a longitudinal slot in the vicinity of its lower end, a member on the carriage extending through the slot in each link, the shorter pair of links elevating the lifting frame during the initial portion of the lift, and the longer pair of links elevating the lifting frame during the remainder of the lift.

7. In a lift truck, in combination, a lifting frame, a carriage, a rear axle carried on the carriage, a pair of comparatively short links pivotally connected at their upper ends to the lifting frame and having longitudinally extending slots in the vicinity of their lower ends through which the rear axle freely extends, and a pair of comparatively long links pivotally connected at their upper ends to the lifting frame and having longitudinal slots in the vicinity of their lower ends through which the rear axle freely extends, the longer links being set at a lesser angle to the horizontal than the shorter links.

8. In a lift truck, in combination, a lifting frame, a carriage, a rear axle carried on the carriage, a pair of comparatively short links pivotally connected at their upper ends to the lifting frame and having longitudinally extending closed slots in the vicinity of their lower ends through which the rear axle freely extends, and a pair of comparatively long links pivotally connected at their upper ends to the lifting frame and having longitudinally closed slots in the vicinity of their lower ends through which the rear axle freely extends, the longer links being set at a lesser angle to the horizontal than the shorter links.

9. In a lift truck, in combination, a lifting frame, a carriage, a lifting link mechanism for elevating the carriage comprising independent shorter and longer pairs of links operatively connected to the lifting frame and to the carriage and means incorporated in the links for preventing lateral upsetting of the lifting frame when it is in the elevated position.

10. In a lift truck, in combination, a lifting frame, a carriage, a pair of comparatively short links operatively connected to the lifting frame and carriage in the vicinity of the rear end thereof, a pair of longer links set at a lesser angle to the horizontal than the short links operatively connected to the lift-

ing frame and carriage in the vicinity of the rear end thereof, a pair of comparatively short links operatively connected to the lifting frame and carriage in the vicinity of the forward end thereof, and a pair of longer links set at a lesser angle than the shorter links operatively connected to the lifting frame and carriage in the vicinity of the forward end thereof.

11. In a lift truck, in combination, a lifting frame, a carriage, a rear axle carried on the carriage, a pair of comparatively short links pivotally connected at their upper ends to the lifting frame in the vicinity of its rear end and having longitudinally extending slots in the vicinity of their lower ends through which the rear axle freely extends, a pair of comparatively long links set at a lesser angle to the horizontal than the shorter links and pivotally connected at their upper ends in the vicinity of the rear end of the lifting frame, said longer links having longitudinally extending slots in the vicinity of their lower ends through which the rear axle freely extends, a pair of comparatively short links pivotally connected at their upper ends in the vicinity of the forward end of the lifting frame and having longitudinally extending slots in the vicinity of their lower ends, a member freely extending through said slots for connecting the links to the carriage, and a pair of comparatively long links set at a lesser angle to the horizontal than the short links and pivotally connected to the lifting frame in the vicinity of its forward end, said longer links having longitudinally extending slots in the vicinity of their lower ends, and a member extending from the carriage freely through said slots.

12. In a lifting truck, the combination with the lifting frame, carriage and rear axle rotatably journaled on the carriage, of a lifting link pivotally connected at its upper end to the lifting frame and having a longitudinal slot in the vicinity of its lower end, and a substantially rectangular portion on said axle adapted to be disposed in said slot, said link being slidable in the direction of its longitudinal plane on the rectangular portion as such link is swung.

CECIL J. NOLAN.