

May 10, 1960

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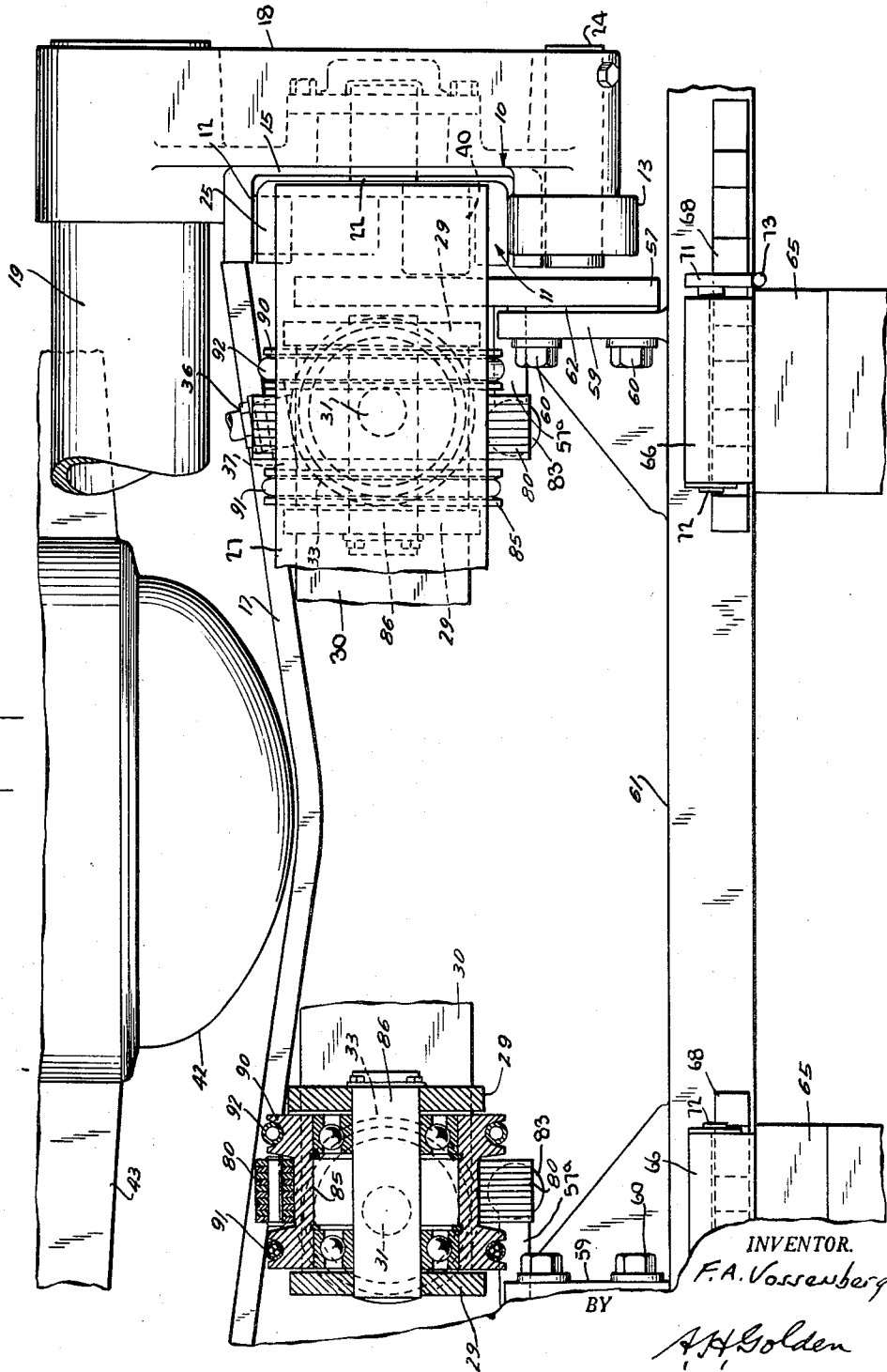
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CHANNEL CONSTRUCTION FOR INDUSTRIAL TRUCK

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5 Sheets-Sheet 1

Fig. 1-



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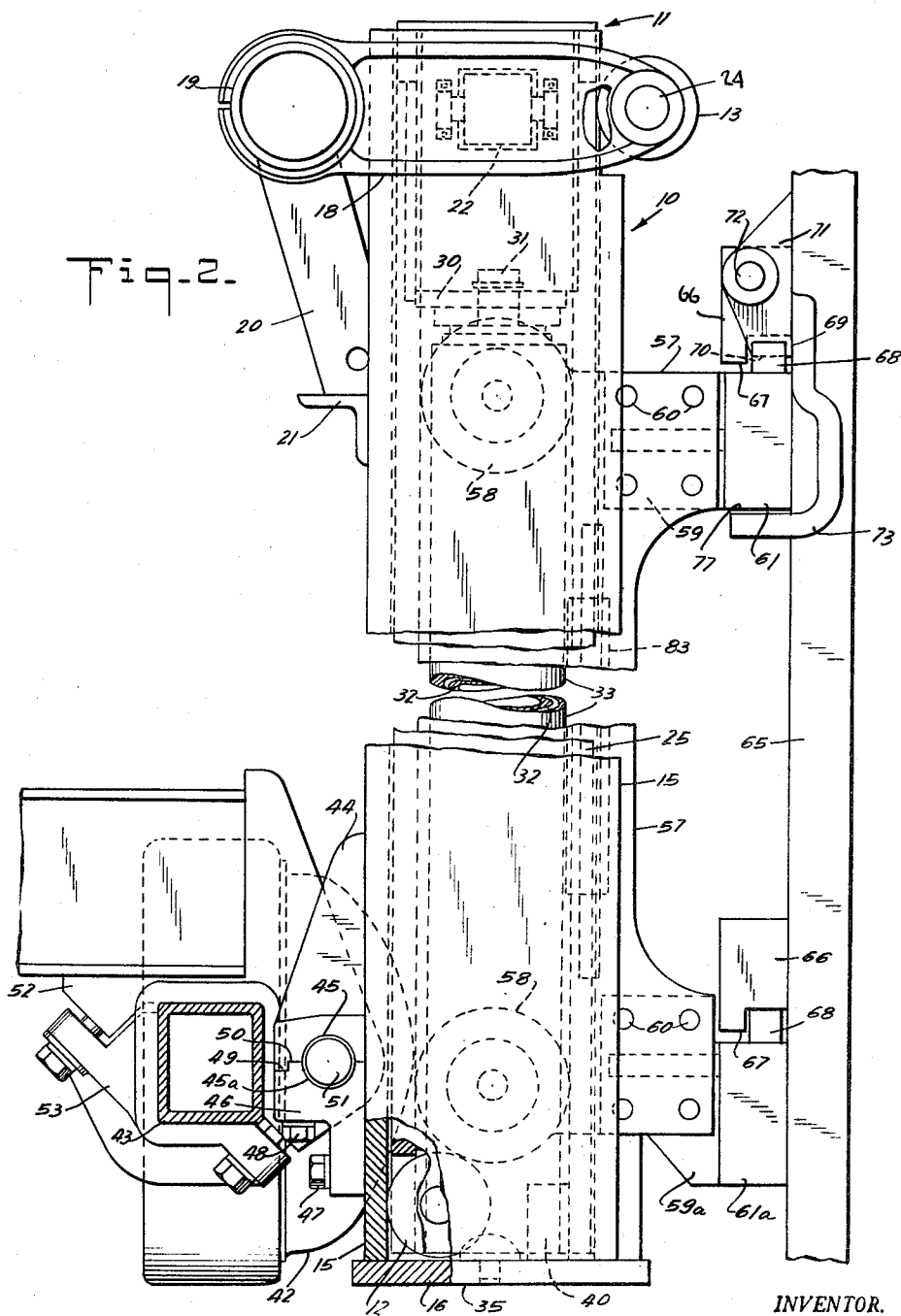
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CHANNEL CONSTRUCTION FOR INDUSTRIAL TRUCK

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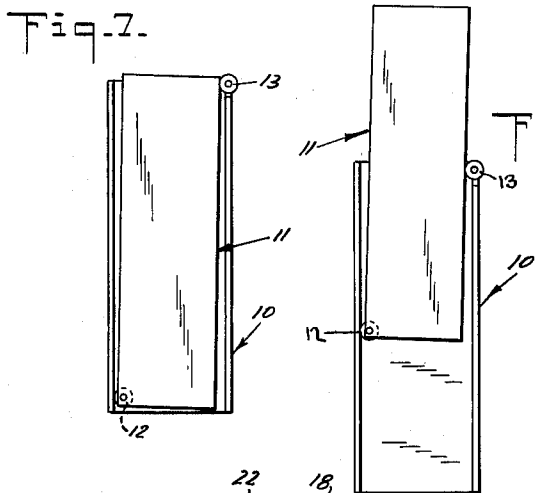
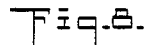
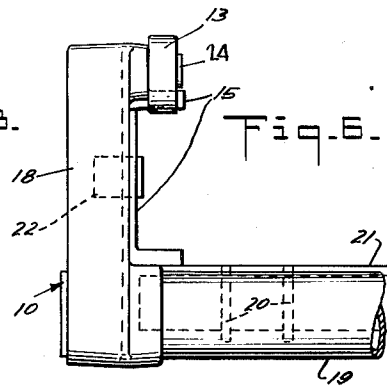
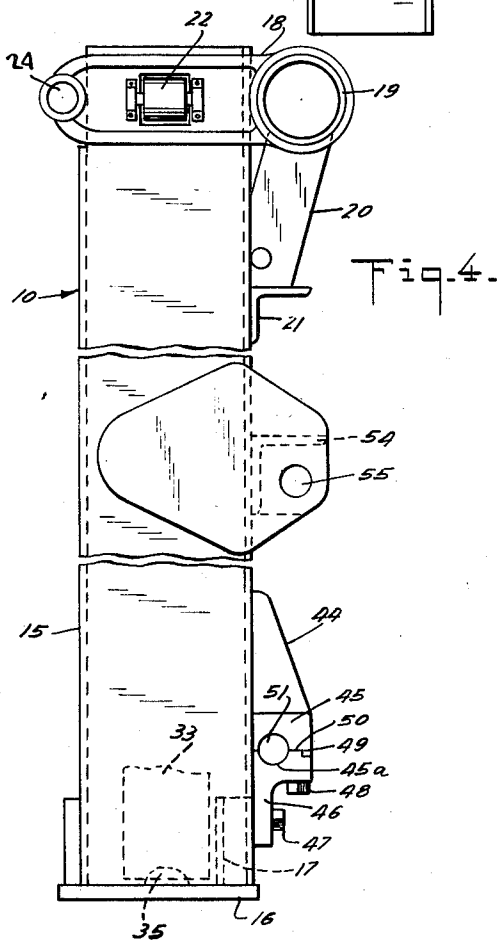
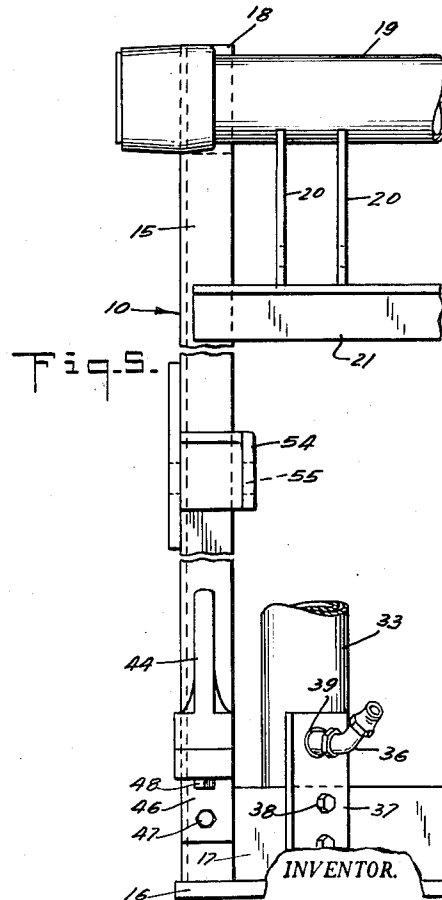
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CHANNEL CONSTRUCTION FOR INDUSTRIAL TRUCK

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CHANNEL CONSTRUCTION FOR INDUSTRIAL TRUCK

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Fig. 9.

Fig. 10.

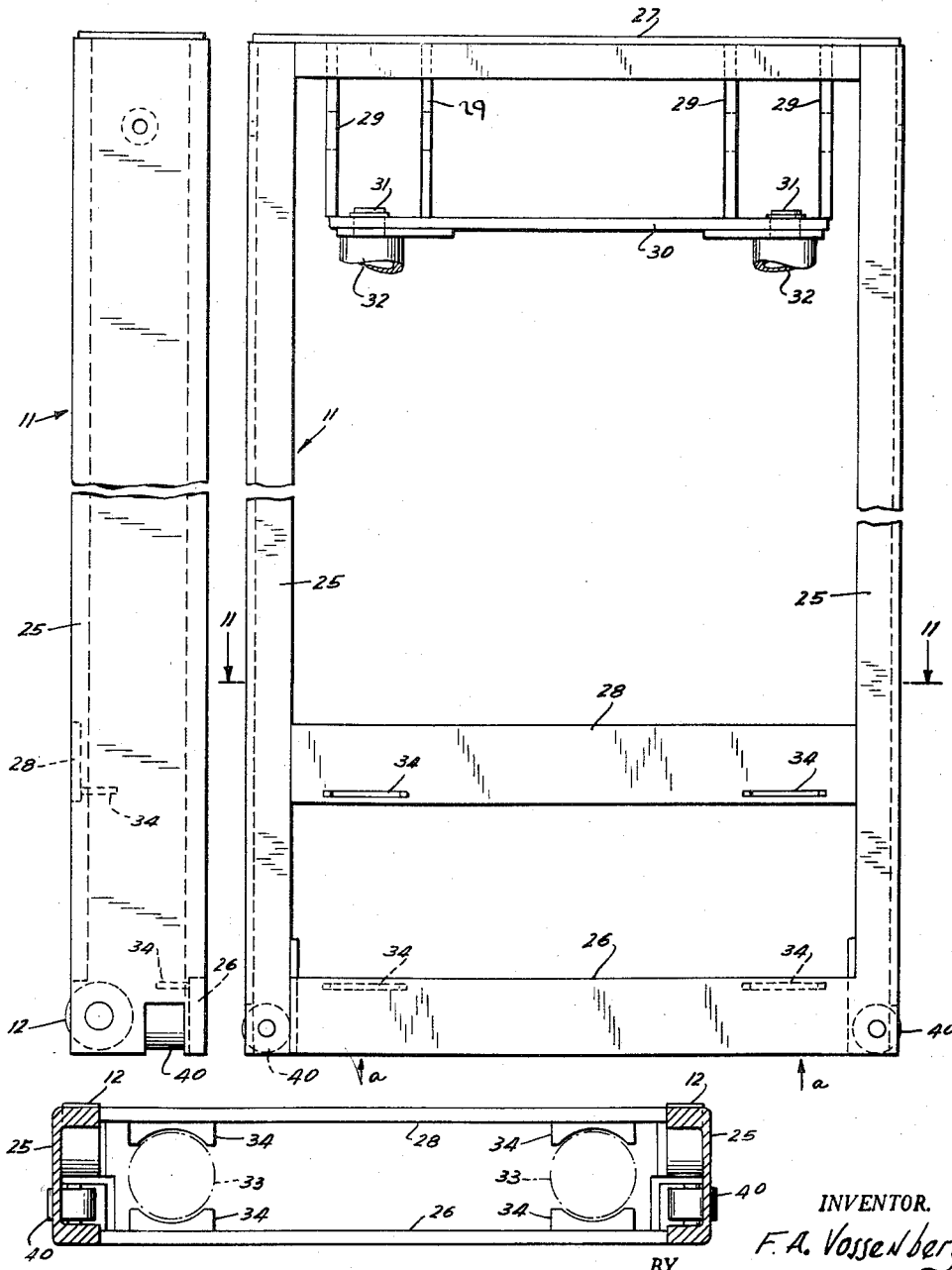


Fig. 11.

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CHANNEL CONSTRUCTION FOR INDUSTRIAL TRUCK

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Application February 19, 1957, Serial No. 641,087

5 Claims. (Cl. 187—9)

This invention relates to an industrial truck of the type adapted to handle extremely large and heavy loads and to lift those loads to considerable heights. There are numerous trucks on the market designed for this purpose, these trucks generally involving fixed or primary uprights on which are movably mounted secondary uprights, the secondary uprights in turn having mounted thereon a carriage. The load is handled by the carriage through forks or a platform, the carriage moving on the secondary uprights, and the secondary uprights in turn moving on the primary or fixed uprights. For imparting lifting movement to the carriage there is utilized a ram, the ram operating generally through chains to impart lifting movement to the carriage.

Because the loads are extremely heavy and are handled at one end of the truck, the stresses carried by the uprights and carriage and various other parts are extremely large. Therefore, the channels forming the primary and secondary uprights are quite large in section. Since the hydraulic ram is also large, and since there may be required two rams, the result is that the alignment of the rams and uprights effectively blocks the vision of the operator in handling the load.

Much effort and thought has been applied to the problem of providing good vision to the operator in a truck of the particular class, but so far as I know, no one has been successful in meeting the problem.

In the handling of lighter loads, it is possible to use a primary or fixed upright that is formed as a channel, being U-shaped with the bottom of the U parallel to the longitudinal axis of the truck. The secondary upright can be similarly shaped and can effectively nest within the primary upright for movement relatively thereto. However, when heavy loads are applied, the friction developed between the primary upright and the secondary upright is so great that the construction cannot be utilized. Those skilled in the art have long known that a construction of the particular class might very well be used if rollers could be applied between the primary and secondary uprights for accepting the thrust between the two in an effective manner. So far as I know, no one has yet been able to solve the problem of the application of rollers or other anti-friction means.

Because those skilled in the art have been unable to solve this problem, it has been the custom in the art to mount the secondary uprights and the primary uprights in juxtaposed relation to one another with rollers on the secondary uprights moving in the channels of the primary uprights. Obviously, this means that the flanges of the uprights extend transversely of the truck and most effectively block the vision of the operator.

An attempt has been made during the last few years to mount the uprights with the flanges of the secondary uprights moving within the channel of the primary uprights, rollers being carried between the two uprights for the purpose of accepting the stresses therebetween. However, this construction still presents the flanges of both uprights in a somewhat offset relationship, but neverthe-

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less transversely of the truck, so as to block a great deal of the vision of the operator, while also lengthening the truck somewhat. Further, the stresses are so disposed that there is a tendency to twist the uprights, particularly were extremely heavy loads to be handled. It is obvious that the construction is not nearly so effective as a construction in which the uprights are in nested relation.

Various other constructions have been proposed, including an offset juxtaposed positioning of the uprights, but all of these constructions fail for one reason or another and have never been deemed successful.

The concept that I contribute to the art through this application involves the use of nested uprights, but with the secondary uprights moving relatively to the primary uprights on rollers that function effectively because of the positioning of the secondary uprights relatively to the primary uprights, and because of the effect of the load carried by the secondary uprights. Thus, the secondary uprights are adapted to cock or tilt relatively to the primary uprights within the channel of the primary uprights in which they slide, sufficient space being provided for this purpose. By providing rollers that will accept the forces introduced by this tendency to tilt or cock, I am able to mount the secondary uprights in nested relation to the primary uprights. Further, the channels of the secondary uprights remain free to house rollers for the mounting of a load carriage thereon.

As a particular feature of my invention, the secondary uprights carry rollers at their lower ends and the primary uprights carry rollers at their upper ends. In this way, the rollers at the lower ends of the secondary uprights are always in a position to accept forces between the primary and secondary uprights at one end of the secondary uprights. The primary uprights carry their rollers at their upper ends, and thereby are adapted to accept the stresses between the primary and secondary uprights at one end of those portions of the secondary uprights within the primary uprights. Of course, the cocking of the secondary uprights relatively to the primary uprights maintains the rollers always in effective position to accept the thrusts or forces between the uprights.

As a further particular feature of the invention, the secondary uprights have some play within the channel of the primary uprights so that actually the secondary uprights will cock within the channels of the primary uprights, the rollers then being positioned in what might be considered an angular relationship to one another so as to accept the thrusts between the two uprights.

An actual operating truck has been constructed in accordance with my concept and is extremely effective in operation, being adapted to handle extremely heavy loads and to move those loads into an extremely high position. Because I am able through my construction to nest the uprights within one another, I am able to obtain extremely good vision for the operator. The importance of the construction may be well appreciated if it is understood that even if the flanges of the secondary uprights are only 3 inches in width and the primary uprights 3½ inches, the four flanges will present to the operator approximately 13 inches. This, together with the rams, will effectively block the vision of the operator. By nesting the secondary uprights within the primary uprights, I am able to free to the operator at least 6 inches of vision, which, in the center of the truck is of great significance.

As a further feature of my invention, I am able to provide rollers for accepting also the side or transverse thrust of the secondary uprights relatively to the primary uprights.

A still further feature of the invention resides in the

mounting of the two rams, each ram being carried at its lower end through resting on a small protuberance carried by the primary uprights, the pistons of the rams being secured to the upper ends of the secondary uprights.

As a still further feature of the invention, the secondary uprights carry the load sheaves operating against the chains that in turn move the carriage. Since the thrust of the rams is accepted by the secondary uprights directly, I am able to mount the load sheaves in offset relation to the rams while still effectively balancing the loads carried by the rams without subjecting the rams and secondary uprights to offset stresses.

A further feature of the invention resides in the forming of guides or supports on the secondary uprights for mounting the rams on the secondary uprights prior to the assembly of the secondary uprights to the primary uprights.

As a further feature of the invention, each ram is held against rotation and movement off its seat through the utilization of a part that allows free movement of each ram on its seat while holding the ram against rotation, the particular parts being carried by the fixed uprights.

As a further feature of the invention, the primary uprights are mounted for rotation on a fixed axis through novel bearing means that are interlocked relatively to the shaft forming the tilt axis.

A still further feature of the invention resides in the manner in which the main frame of the truck is secured to the traction axle, the feature of this construction being the relation of the parts so as to allow the placing of the tilt axis of the uprights, in as close relation to the axis of the traction wheels as is possible. This means that the uprights are mounted as closely to the fulcrum axis about which they tend to tip the truck as it is possible to place them.

A still further feature of the invention resides in the mounting of the carriage relatively to the secondary uprights. This construction utilizes a pair of plates each carrying rollers moving in the channel of the secondary uprights. The load forks fit between the two plates and are then secured to the plates through spacers, the number of spacers used and their thickness being adapted to determine the spacing of the plates and their adjustment relatively to the secondary uprights. This allows for very accurate mounting of the carriage while yet making possible the manufacture of the parts with commercial standards.

I have thus outlined rather broadly the more important features of my invention in order that the detailed description thereof that follows may be better understood, and in order that my contribution to the art may be better appreciated. There are, of course, additional features of my invention that will be described hereinafter and which will form the subject of the claims appended hereto. Those skilled in the art will appreciate that the conception on which my disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of my invention. It is important, therefore, that the claims be regarded as including such equivalent constructions as do not depart from the spirit and scope of my invention, in order to prevent the appropriation of my invention by those skilled in the art.

Referring now to the drawings, Fig. 1 is a plan view and partial section of one end of an industrial truck, showing the upright and load lifting assembly of my invention with relation thereto.

Fig. 2 is a side view of the parts of Fig. 1, and illustrates the arrangement of the uprights, their mounting on the transmission of the truck, together with the application of the forks to the load lifting carriage.

Fig. 3 is a vertical end view and partial section of the upright assembly as applied to the truck.

Fig. 4 is a side view of the primary upright assembly of my invention broken away at its center to shorten the drawing.

Fig. 5 is a front elevation of one-half of the primary upright assembly of Fig. 4.

Fig. 6 is a plan view of that half of the upright assembly shown in Fig. 5.

Figs. 7 and 8 are diagrammatic views illustrating the relationship of the primary and secondary uprights in two positions of the secondary uprights relative to the primary uprights.

Fig. 9 is a side view of the secondary upright assembly, while Fig. 10 is an elevation of that assembly.

Fig. 11 is a section taken along the lines 11—11 of Fig. 10.

Referring now more particularly to the drawings, and especially the diagrammatic views of Figs. 7 and 8, the primary upright assembly is designated by reference numeral 10, while the secondary upright assembly is designated by reference numeral 11. The primary upright assembly 10 is best shown in Figs. 4, 5 and 6, while the secondary upright assembly 11 is best shown in Figs. 9, 10 and 11. In Fig. 7 the secondary uprights are in their lowermost position within the primary uprights and as there shown, the secondary uprights have assumed a slight angular position within the primary uprights. Of course, this angular position is extremely exaggerated since in my actual construction the play between the primary and secondary uprights is one-quarter of an inch. In other words, the secondary uprights may move transversely within the channel of the primary uprights for a distance of one-quarter of an inch. A suitable roller 12, to be referred to more specifically hereinafter, is carried at each side of the lower end of the secondary upright. A roller 13 is carried at the upper end of each side of the primary upright. The load that is imposed on the secondary upright assembly will bias the secondary uprights to the angular position illustrated in Fig. 7 so that the lower end of the secondary uprights will carry each roller 12 against a flange surface of the channels of the primary uprights 10 as there shown. As the secondary uprights move in the primary uprights, as to the position shown in Fig. 8, the roller 12 will accept the stresses between the two uprights and will prevent the development of friction. Of course, the rollers 13 at the upper ends of each primary upright will accept the thrust between the secondary uprights and the primary uprights in the opposite direction, as is well shown in Fig. 8 as well as Fig. 7, thereby effectively mounting the secondary uprights within the primary uprights for free sliding movement.

I thought it well to refer first to the diagrammatic views of Figs. 7 and 8 because a full understanding of those views will facilitate the understanding of the actual construction that will be described fully. It is well to indicate also that each roller 12 is so positioned that it will effectively accept about one-eighth of an inch or one-half of the play between the secondary and primary uprights, while the roller 13 is also adapted to accept about one-eighth of an inch or one-half the play. In view of this, it is possible under certain circumstances for the secondary uprights to move relatively to the primary uprights for a distance of approximately one-eighth of an inch, and such movement may conceivably occur when the truck is stopped suddenly or accelerated suddenly with the load in a particular position. Conceivably, it might be desirable to have pressure rollers carried on the primary uprights for preventing violent shifting of the secondary uprights even through this small distance of one-eighth of an inch. In the actual truck that I have constructed I have not found this necessary as yet.

Referring now to Figs. 4, 5 and 6, I shall describe the primary upright assembly of my invention. It will be noted from Figs. 5 and 6 that I show, for convenience, only one-half of the upright assembly, since the assembly

is symmetrical. The upright assembly 10 will comprise a pair of U-shaped channels 15 that are connected at their lower ends by a suitable bottom cross-plate 16 and other reinforcing structure, including a vertical plate 17. The upper ends of the channels 15 will be braced by a structural member 18 welded to a cylindrical bracing pipe 19 that is in turn braced by gussets 20 welded to a cross-angular member 21. The manner of bracing and holding the channels 15 assembled is not of importance to my invention, and is here merely described in order that there may be an understanding of the specific structure I have devised. It is only required to understand that I use a pair of channels suitably connected for accepting the heavy stresses applied thereto. At one end of the structural member 18 on each side of the truck there is a suitable bearing 24 for a roller 13, this being the roller that was earlier referred to in connection with Figs. 7 and 8. One roller 13 is also well illustrated in Fig. 2 where it is shown in position to accept the thrust of the secondary uprights 11. The members 18 are also adapted to support side thrust rollers 22 to bear at the sides of the secondary uprights 11, as will be understood after reading the specification that follows.

Referring now to Figs. 9, 10 and 11, I show the secondary upright assembly. This assembly comprises a pair of channels 25 suitably connected at their lower ends by a vertical cross-bar 26, and at their upper ends by a compound cross-bar 27. An intermediate vertical cross-bar 28 is also utilized. In addition, a box-like structure is carried at the upper end of the upright assembly and comprises four vertical members 29 and a cross-plate 30. The cross-plate 30 is formed with openings through which may extend lugs 31 at the ends of pistons 32 of a pair of hydraulic rams 33, the rams being best illustrated in Figs. 2 and 3. The cross-plates 26 and 28 carry suitable brackets 34 best shown in Fig. 11, these brackets being adapted to hold in place the rams 33, those rams being moved upwardly into position between brackets 34 as depicted by arrows *a* in Fig. 10. This permits the secondary upright assembly 11 to be moved with facility into nested relation to the primary upright assembly 10 by the placing of the channels 25 into nested relation to the channels 15, as best shown in Fig. 1. In Fig. 1, I show the nested relation of the upright assemblies at one side of the truck, but since the truck is symmetrical, as was earlier emphasized, this will suffice to show clearly the construction.

When the secondary upright assembly 11 is nested within the primary upright assembly 10, the lower ends of the rams 33 are adapted to rest on buttons 35 carried by the plate 16 of the primary upright assembly. Naturally, dwells are formed in the lower ends of the rams 33 so that they may rest on the dome-shaped buttons 35, permitting some free movement of the rams, as will be understood and appreciated by those skilled in the art. Each ram is equipped with a nozzle construction 36 best illustrated in Figs. 3 and 5, and I utilize this nozzle both for the purpose of leading hydraulic fluid to the ram 33, and also to position each ram within the truck assembly. Thus, a securing plate 37 is bolted at 38 to cross-member 17, as well shown in Fig. 5. The plate has a relatively large opening 39 that fits freely about the nozzle 36, thereby allowing some free movement of the nozzle and its ram relatively to the plate 37. The opening 39 is sufficiently small with relation to the nozzle 36 so that the ram will not be permitted, however, to move off its seat on dome-shaped button 35. Of course, each of the two rams of my truck assembly is mounted in this manner.

Referring now once again to Figs. 9, 10 and 11, it will be noted that at the lower end of the upright assembly, provision is made for the mounting of bearing rollers 12 referred to earlier in connection with Figs. 7 and 8. These are, of course, the rollers that accept the thrust between the lower end of the secondary upright assembly

and the primary uprights due to the biasing of the uprights by the application of a load, all as has been described earlier. Opposed rollers 40 are mounted on the secondary upright assembly 11 so as to bear on the sides of the channels 15 forming the primary upright assembly, it being obvious that the rollers 40 accept transverse stresses, coating for this purpose with the rollers 22 mounted at the upper ends of the primary uprights. It will be well at this time also to refer to Fig. 2 where in the relationship of the rollers 12 and 13 is further well illustrated and set forth. Fig. 2 is also helpful in showing the secondary uprights nested within the primary uprights, as well as the relation of the rams to the secondary and primary uprights.

Fig. 2 is now referred to again in order to describe the manner in which the entire upright assembly is mounted on the truck. For the purposes of my invention, the truck is shown formed with a banjo housing 42, the housing having at each end a square extension 43 in which is mounted a drive axle, this axle being of the usual type required in vehicles of this class. I have arranged to attach my upright assembly to the truck through a pair of bracket constructions, there being one bracket construction for each square portion at each side of the banjo housing. More in detail, a bracket 44 is securely welded to each side of the primary upright assembly and is formed with a partial bearing 45. This construction is also well illustrated in Fig. 4. Coacting with the bracket 44 is a second bracket 46 that is adapted to be secured by a bolt 47 to the primary uprights, and by a second bolt 48 to the bracket 44. Further, the bracket 46 has a lug portion 49 interlocking with a lug 50 of the bracket 44, as well as a bearing surface 45a complementary to surface 45. The purpose of this construction is to cause the bracket portions 46, 44 to accept between them a shaft 51. When this shaft is embraced, any tendency to separate the two brackets 44, 46 will be resisted not only by the bolts 47, 48 but also by the interlocking lugs 49, 50, as will be well appreciated.

Naturally, because of this construction, the entire upright assembly is adapted through the brackets 44, 46 to rotate or pivot on the shaft 51. The shaft 51 is in turn carried by a pair of interlocking brackets 52, 53 that are adapted to embrace each of the square axle housing extensions 43 earlier set forth. In other words, the shaft 51 is supported by the brackets 52, 53 and shaft 51 in turn carries the primary upright assembly so that assembly may pivot. A suitable bracket 54, best shown in Figs. 4 and 5, is secured at each side of the primary upright assembly 10, and is formed with an opening 55. It is the purpose of the openings 55 of the bracket 54 to mount a pair of rams for tilting the uprights. Since the particular tilting construction is conventional, it is not described further.

I shall now refer to Figs. 1, 2 and 3 to describe the load carriage of my truck. The carriage has on each side thereof a vertical plate 57 which carries upper and lower rollers 58, as best seen in Fig. 2, the rollers on these plates 57 moving in the channeled uprights 25 of the secondary upright assembly 11. This mounting of the plates 57 on the secondary uprights is substantially conventional as those skilled in the art will appreciate. The two vertical plates 57 are then assembled to the remainder of the carriage in novel fashion. Thus, referring to Figs. 1 and 2, I have upper and lower brackets 59 and 59a welded to form an integral part of upper and lower carriage members 61 and 61a. These brackets 59, 59a are bolted to the plates 57 through bolts 60, Fig. 1, with shims 62 being utilized. The purpose of the shims is to space the plates 57 so that the rollers 58 will be properly and effectively mounted within the channels 25 of the secondary upright assembly 11. Thus, by increasing the thickness of the shims 62 between plates 57 and the brackets 59, 59a and carriage members 61, 61a, the plates 57 can be moved toward the secondary

upright channels 25, and by decreasing the thickness of the shims the plates are moved away from the secondary upright channels. In this most simple manner, I am able to adjust the position of the rollers 58 without difficulty.

As is required in the art, the upper and lower carriage members 61, 61a support forks designated by reference numeral 65 in Fig. 2. Each fork is equipped with upper and lower brackets 66 having lug portions 67 adapted to coact with a vertically extending longitudinal rib 68 on each of the members 61, 61a. It is the purpose of this construction to position the forks on the carriage. In addition, the forks have means whereby they may be secured in any one of a series of transversely spaced positions. This is accomplished through the utilization of dogs 70, shown in Fig. 2, adapted to fit into slots 69 formed in the upper longitudinally extending rib 68 of the upper carriage member 61. Each dog 70 is formed as part of lever 71 pivoted at 72 to a fork 65. The levers 71 are equipped with handles 73 whereby they may be pivoted on axis 72. Thus, in order to release the forks for sliding movement relative to the upper and lower carriage plates 61, 61a, the handles 73 rotate the levers counter-clockwise, moving the dogs 70 out of the slots 69. Thereupon, it is possible to slide the forks on the longitudinal ribs 68.

The levers 71, in addition to controlling the sliding movement of the fork assembly relatively to members 61, 61a are further adapted to prevent upward movement of the forks in a manner to release the forks from ribs 68. Thus, it is the function of each of the handles 73 of the two levers 71 to coact with surfaces 77 to prevent upward movement of the fork assembly in a manner to separate lugs 67 from ribs 68. Those skilled in the art will appreciate that the retention of the fork assembly and the sliding movement thereof is conventional. However, so far as I know, it has never been proposed to adjust the sliding of the fork assembly through means that are also effective to prevent the movement of the fork assembly away from the carriage.

In order to effect lifting movement of the carriage of my truck, I utilize the vertical movement of the secondary uprights relatively to the primary uprights. Through the arrangement I shall describe presently, I am able to mount the hydraulic rams that do the lifting so that those rams will be extremely close to the upright assemblies while at the same time making possible a balanced lifting of the carriage of my truck. Thus, I utilize the rams for lifting directly the secondary uprights as I have already indicated, the pistons of the rams bearing against the plate 30 of the secondary upright assembly as described in connection with Fig. 10 and as is well shown in Figs. 2 and 3. For accomplishing the actual lifting of the load carriage I employ a pair of chains, one on each side of the carriage. Each chain is designated in the drawings by reference numeral 80, one end of each chain being secured to a coupling member 81 that is formed at the end of a rod 82 fitting in the opening of a sleeve 83, as best seen in Fig. 3, there being a sleeve 83 formed integrally with a portion 57a on each of the side carriage plates 57.

The opposed end of each of the chains 80 may be suitably secured to the primary uprights at any desired point, each of the chains being reaved over a sheave 85, Figs. 1 and 3. There are two of these sheaves 85, one at each side of the secondary upright assembly 11. The sheaves are supported on the secondary upright assembly by shafts 86, the said shafts being carried by vertical plates 29 already referred to in connection with Fig. 10. It will be noted, particularly from Figs. 3 and 10, that the sheaves are mounted in offset relation to the pistons 32 of the rams 33. This is necessary because, while it is desirable to get the rams over to each side of the truck as far as possible, the chains 80 must be mounted where they may lie in line with sleeves 83 of the plates 57 of

the carriage. Of course, with the construction so set forth, the transmission of the lift to the secondary upright assembly 11 will be fully balanced, while at the same time the transmission of lift to the carriage through the chain 80 will also be fully balanced since the sheaves 85 are properly spaced on the secondary upright assembly. In this way, I obtain a balanced lifting of the load carriage while at the same time utilizing rams that are offset relative to the axis of operation of the chains. This is an exceedingly important feature of my invention as those skilled in the art will appreciate.

It will further be noted that each of the sheaves 85 is equipped with flanges 90 that are grooved for the mounting of hydraulic hose and electric wires. Thus, the electric wires are designated by reference numeral 91 and the hydraulic hose by numeral 92. The purpose of this construction is to be able to carry hydraulic hose and electric wires from the truck proper to the carriage. In this way, attachments carried by the carriage may be controlled electrically and operated hydraulically by fluid in the hose 92.

Those skilled in the art will now appreciate that I have a secondary upright assembly fully nested in a primary upright assembly, but that I am still able to utilize rollers for accepting the thrusts developed between the upright assemblies. This makes it possible for me to handle exceedingly heavy loads while at the same time obtaining that visibility that is only possible through the use of nested uprights. It will also be apparent to those skilled in the art that I have developed an extremely efficient and effective means for assembling a load lifting carriage for movement on secondary uprights and for adjusting the carriage relatively to the secondary uprights.

Further, it will be readily appreciated that I may lift my load through the use of two rams that may be mounted in extremely close relation to the upright assemblies, while yet obtaining a balanced lifting of the carriage through chains. This mounting of the rams naturally contributes extremely good vision so that I am able to take advantage fully of the nested relation of the uprights. It is thought that the additional further features including the mounting of the forks on the carriage, the pivotal mounting of the uprights, the positioning of the hydraulic rams and their retention, will all be fully and clearly understood by those skilled in the art.

I now claim:

1. In a truck of the class described, a pair of spaced primary uprights having a base plate, a pair of spaced secondary uprights between said primary uprights, means engaging upon movement of said secondary uprights downwardly relatively to said primary upright for mounting said secondary uprights for vertical movement on said primary uprights, a hydraulic ram comprising a cylinder and a piston, brackets on said secondary uprights adapted to embrace the cylinder of said hydraulic ram therebetween in a position parallel to said uprights upon the insertion of said cylinder upwardly between said brackets, a cross plate at the upper end of said secondary uprights, means securing the upper end of said hydraulic ram piston to said cross plate, there being an opening in the space between the lower ends of said secondary uprights through which said ram may be inserted upwardly between the embracing brackets to bring the piston against said cross plate, and means on the base plate of said primary uprights engaged by the lower end of the cylinder of said ram to support the ram in operating position when said secondary uprights and cylinder are moved downwardly relatively to said primary uprights to assemble said secondary uprights relatively to said primary uprights.

2. In a truck of the class described, a pair of opposed spaced channeled uprights, a pair of opposed spaced plates, each of said plates having a roller fitting in one of said channels, a central carriage member secured at its opposed ends to said pair of plates whereby to form a load carriage, said rollers supporting said carriage for

vertical movement on said channeled uprights, and means for adjusting the securing of said plates to said central carriage member whereby to adjust the rollers relatively to said channeled uprights.

3. In a truck of the class described, a pair of opposed spaced channeled uprights, a pair of opposed spaced plates, each of said plates having a roller fitting in one of said channels, a central carriage member, a portion on each end of said central carriage member secured relatively to one plate whereby to form a load carriage, said rollers supporting said carriage for vertical movement on said channeled uprights, and means for adjusting one portion of the carriage member relatively to the corresponding plate whereby to adjust relatively to said channeled uprights the rollers that support the carriage.

4. In a truck of the class described, a pair of spaced primary uprights having a base plate, a pair of spaced secondary uprights between said primary uprights, means engaging upon movement of said secondary uprights downwardly relatively to said primary uprights for mounting said secondary uprights for vertical movement on said primary uprights, a hydraulic ram comprising a cylinder and a piston, brackets on said secondary uprights adapted to embrace the cylinder of said hydraulic ram therebetween as said cylinder is moved vertically into a position between said brackets, means securing the upper end of the piston of said hydraulic ram to said secondary uprights when said ram cylinder is moved upwardly between said brackets, and support means on the base plate of said primary uprights against which the lower end of the cylinder of said ram moves to support the ram in operating position when said secondary uprights and cylinder move downwardly relatively to said uprights to assemble said secondary uprights to said primary uprights, said support means and the bottom of said ram cylinder being formed for relative pivotal movement therebetween.

5. In a truck of the class described, a pair of opposed substantially vertical channeled primary uprights having their flanges in parallel alignment, channeled secondary

uprights nested to slide within the channels of the primary uprights, the flanges of said secondary uprights being each dimensioned for predetermined looseness relatively to the space between the inside surfaces of the flanges of the primary channeled uprights, a load platform, means extending into the channels of said secondary uprights for slidably supporting said load platform for movement on said secondary uprights, said load platform adapted by its weight to bias the secondary uprights toward an angular position in the channels of said primary uprights with the degree of angularity determined by the dimensioning of said secondary uprights and their looseness relatively to said primary uprights, a roller at the lower end of each secondary upright adapted to roll against the inside surface of one flange of its primary upright to accept the thrust between the lower ends of said secondary uprights and the primary uprights as said secondary uprights move upwardly and downwardly in said primary uprights while biased towards said angular position, a roller at the upper end of each primary upright engaging the outer surface of the flange of its secondary upright on the opposite side of its secondary upright from said one flange of the primary upright to accept the thrust between the upper ends of the primary uprights and the secondary uprights as said secondary uprights move upwardly and downwardly in said primary uprights while urged to said biased position, and power means for effecting movement of said load platform relative to said primary uprights.

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2,279,832	LeTourneau	Apr. 14, 1942
2,456,320	Repke	Dec. 14, 1948
2,595,120	Barnes	Apr. 29, 1952
2,678,746	Gibson	May 18, 1954
2,679,437	Pusztay	May 25, 1954
2,701,031	Brumbaugh	Feb. 1, 1955
2,746,612	Wirz	July 12, 1952