

Oct. 20, 1942.

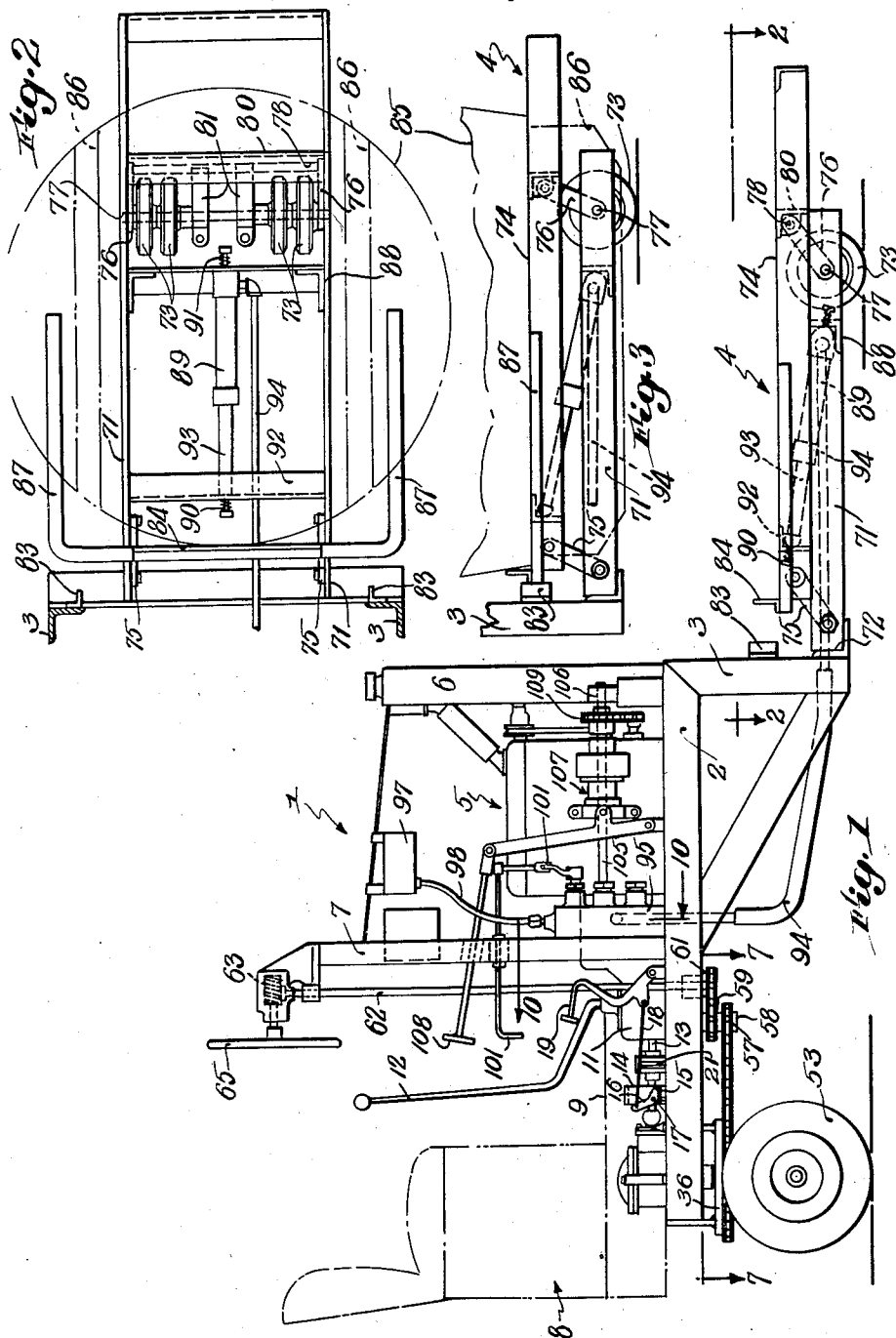
L. J. KENNEDY

2,299,150

TRANSPORTATION APPARATUS

Filed May 23, 1940

3 Sheets-Sheet 1



Oct. 20, 1942.

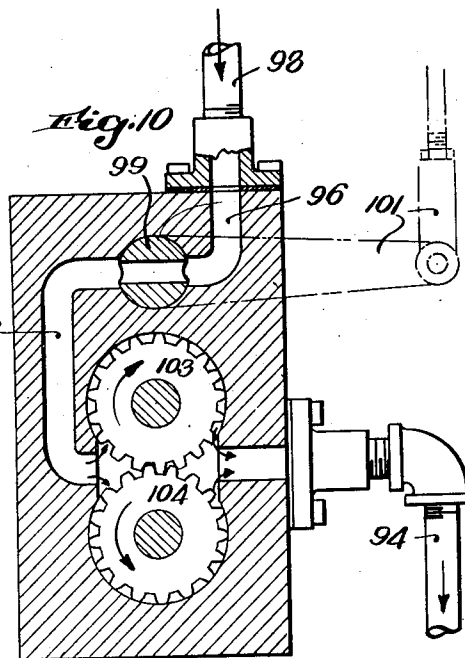
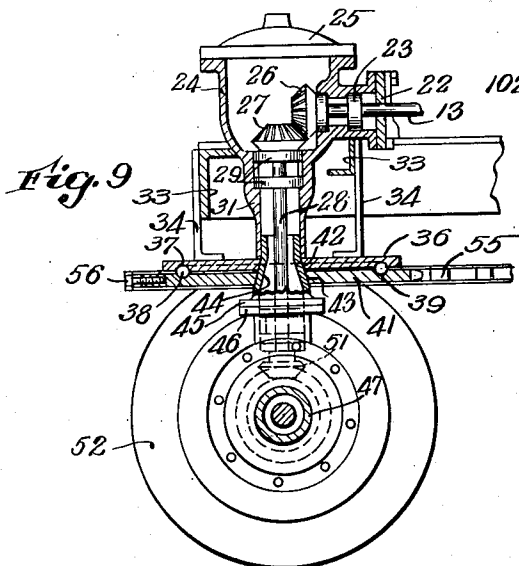
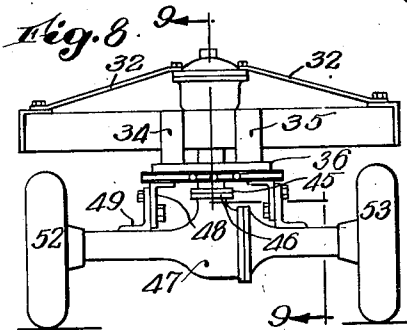
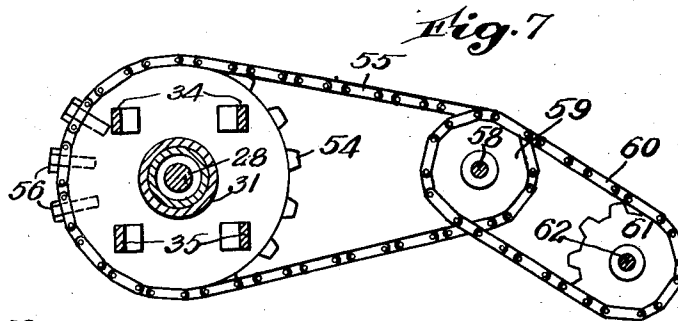
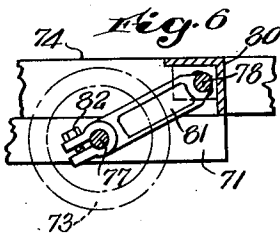
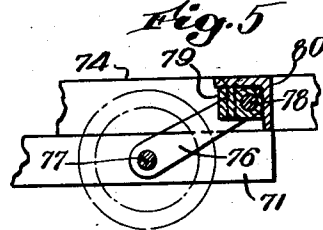
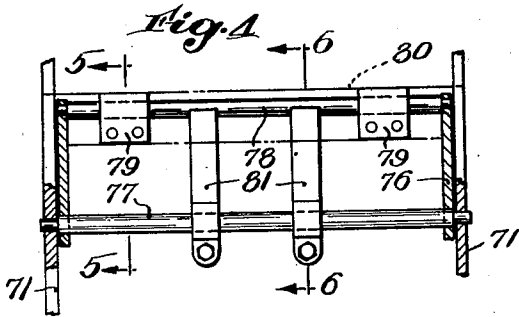
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TRANSPORTATION APPARATUS

Filed May 23, 1940

3 Sheets-Sheet 2



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TRANSPORTATION APPARATUS

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Fig. 11

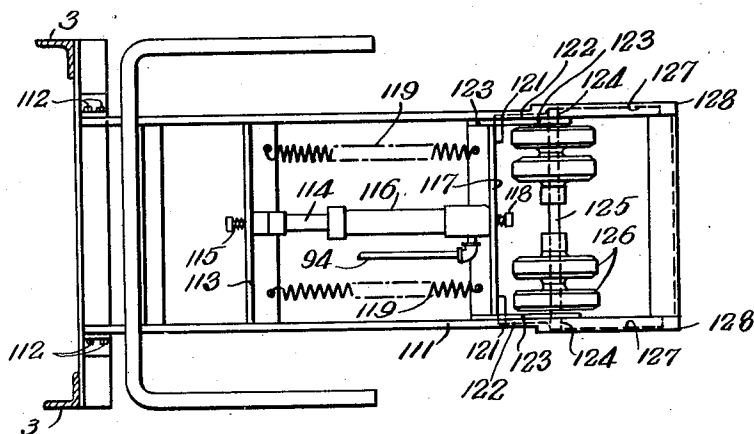


Fig. 12

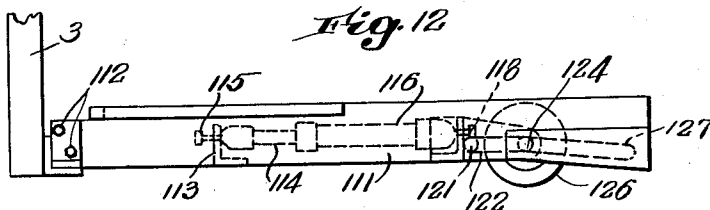
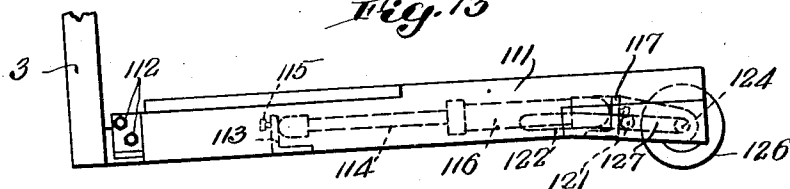


Fig. 13



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UNITED STATES PATENT OFFICE

2,299,150

TRANSPORTATION APPARATUS

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Application May 23, 1940, Serial No. 336,724

4 Claims. (Cl. 180—54)

The present invention relates to the construction of apparatus for transporting heavy loads for short distances.

In many industries it is important to handle heavy loads and yet to move them for only short distances at a time. Nevertheless, the route is not always the same so that rails, whether on the ground or overhead, are not suitable. Hand trucking is possible but too heavy and dangerous. And the path through which the goods are to be moved is usually tortuous and narrow.

It is therefore an object of this invention to provide a mechanical truck having a construction such as to permit of handling heavy loads, transporting them through narrow, sharply turning paths, without damaging other things or people, and to deliver the load safely where it is wanted. It is a further object to provide means for lifting and lowering the load from and to the floor. And it is also an object to provide means for guiding and controlling the operation of the truck, within a narrow compass, throughout its operation. Other objects will appear from the following disclosure.

A typical instance of the application of my invention is in the fish industry, where large buckets or tubs of fish are set in rows, upon the wharf or in the sheds, and which, from time to time are required to be moved, to receive or discharge their contents. When the tub is filled with fish or water, the load may amount to a ton or more. On the other hand, the tub may be empty. In either case it is important to be able to lift and move out any one of the tubs from the rows in which they are arranged without disturbing the others. It is also important, in carrying this tub between rows of other tubs, through doorways, alongside partitions, and especially around sharp turns and corners, that it shall not be in collision with any of them nor with workmen who are frequently working along the path which it is to travel.

The present invention provides an apparatus for accomplishing these purposes, which is characterized by having a single pair of wheels which are both mechanically driven and also capable of being steered and in which the load is carried by a device which is capable both of lifting and of supporting the load. It is found that such apparatus is capable both of driving and of directing the whole in any direction, and not only about curves of small radius but that the combination can be rotated even about its own center or about other points lying within the area upon which it stands. And throughout such opera-

tions the whole combination, together with its load, constitutes an apparatus which is stable and safe, either to move about or to leave standing as long as required. At its destination the load is lowered and released from the lifting device and the apparatus is then free to take up and deliver other loads, as before.

Accordingly, the invention will be described with reference to its adaptation to the fish industry, in which heavy duty and exacting requirements are to be met and which will exemplify its adaptation to various uses which it is qualified to serve.

In the description reference is made to the accompanying drawings in which:

Fig. 1 is a view in side elevation of the apparatus;

Fig. 2 is a plan view of the lifting device;

Fig. 3 is a side view of the lifting device in elevated position;

Fig. 4 is an enlarged plan view of a portion of the lifting device, with remaining parts broken away and omitting the wheels;

Fig. 5 is a cross-sectional view in the plane 5—5 of Fig. 4 showing a supporting wheel, in phantom outline;

Fig. 6 is a cross-sectional view in the plane 6—6 of Fig. 4 also showing a supporting wheel in phantom outline;

Fig. 7 is an enlarged plan view of the steering gear mechanism in the plane 7—7 of Fig. 1;

Fig. 8 is a rear view of the driving and steering mechanism as seen from the left in Fig. 1;

Fig. 9 is a cross-sectional view in the plane 9—9 in Fig. 8;

Fig. 10 is a detail cross-sectional view of the oil compression pump in the plane 10—10 of Fig. 1;

Fig. 11 is a plan view of a modified form of the lifting device;

Fig. 12 is a side view of a modified form of the lifting device in lowered position; and

Fig. 13 is a side view of the same in raised position.

Referring to the drawings, and more particularly to Fig. 1, it will be seen that the truck portion of the apparatus, which may be generally indicated by the numeral 1, is built upon a horizontal, substantially rectangular frame 2, having a depending portion 3 at the front end which is integral therewith and attached to the load-lifting portion of the apparatus, generally indicated by the numeral 4.

Mounted upon the forward part of the frame 2 is a small internal combustion engine 5 of con-

ventional type, with a radiator 6 and a dashboard or frame 7 to carry the several controls which are usual and necessary, as well as those which will be hereinafter described in particular. A seat 8 and floor boards 9 to provide a station for the operator are included, in phantom outline.

The main shaft (not shown) of the engine 5 is arranged to operate, through the (enclosed) clutch 11, controlled by the handle 12, the horizontal drive shaft 13. This may conveniently be provided with a brake drum 14 and a brake band 15 to engage it, under actuation of the cam 16 pivoted at 17 through the rod 18 and foot pedal 19. The drive shaft 13 may also have a universal joint or connection 21 from which it leads through plate 22 (Fig. 9) and bearing 23 into the inside of the enclosed transmission gear box 24, covered with a cap 25 at the top.

At the end of the drive shaft 13 is provided a beveled gear 26 meshing with a similar beveled gear 27 on the top end of the vertical shaft 28 mounted in bearings 29 in an extension 31 and passing through and from the bottom wall of the gear box 24.

The gear box or casing 24 is suitably mounted upon and supported by the frame 2 as by braces 32 (Fig. 8), and also by transverse angle irons 33 and downwardly projecting angle irons 34, which are welded at their top ends to the angle irons 33, and at their bottom ends to a heavy horizontal disc 36, upon which the lower end of the extension 31 is allowed to bear.

The lower surface of the disc 36 carries a ball race 37, the ball bearings 38 in which are received by a similar ball race 39 in a lower disc 41, and serve to hold the two discs apart and rotatable with respect to each other about the vertical shaft 28, as a center.

The vertical shaft 28 extends downwardly through central openings 42 and 43 in the discs 36 and 41, respectively, and through a cone-shaped housing 44 which fits snugly but rotatably into the extension 31. The upper portion of the housing 44 passes freely through the opening 42 in disc 36, and is capable of rotation therein. The lower end of the housing 44 is bolted by the flange 45 to a similar flange 46 on the top of the housing 47, containing the differential and axle. The lower disc 41 is also additionally secured to and supported by the housing 47 by means of depending flanges 48 welded to the disc 41 and upstanding flanges 49, welded to the housing 47, these flanges 48 and 49 being bolted together to adjust and secure the disc 41 in horizontal position and accurately spaced and adjusted (Fig. 8).

The lower end of the vertical shaft 28 carries a beveled gear 51 which enters into the housing 47 and is positioned so as to engage with the conventional differential gears therein and carried on the inner ends of the axles (not shown) of the rubber tired wheels 52 and 53, respectively, in the customary manner.

All, or at least 180°, of the periphery of the lower disc 41 is provided with teeth 54 adapted to receive a link-chain 55, the ends of which are drawn thereover and fastened by bolts or rivets 56 thereto. The intervening length of the chain 55 leads over a smaller toothed gear wheel 57 (Fig. 1) on a vertical shaft 58, which is mounted on the underside of the frame 2 and which also carries an upper gear wheel 59, and this in turn is connected by link-chain 60 to a similar gear wheel 61 mounted on the lower end of the shaft 62, the upper end of which has a gear (not shown)

adapted to be driven in either direction by a worm gear 63 on the steering wheel 65, mounted upon the upright dashboard or cowl 7.

The engine 5 and forward end of the truck portion is supported and stabilized through the frame 2 and the depending portion 3, by being positively joined to the frame 71 of the load-lifting portion of the apparatus 4, as by welding or bolting them together at 72. This frame 71 is substantially an open, rectangular frame of angle iron and is supported, close to the ground and horizontal, by a pair of small wheels 73 mounted thereon.

Substantially of the same size and shape, so as to rest thereon as shown in Fig. 1, is a lifting platform 74. This is pivoted to the lower frame by a pair of links 75 at one end, and at the other by a pair of links 76 (Fig. 4). The links 76 fit over and are pivoted to the axle 77 of the wheels 73 at their lower ends and at their upper ends receive the ends of a transverse shaft 78. The shaft 78 passes through bearings 79 which are welded to the underside of a strip of angle iron 80. The angle iron 80 is in turn welded at each end to the sides of the lifting platform 74.

The axle 77 of the wheels 73 may also carry two additional supporting links 81 clamped thereto by split sleeves and bolts 82, as shown in Fig. 6, either in fixed or rotatable relation to the axle 77, and welded at their other ends to the central portion of the transverse shaft 78.

As thus arranged it will be seen that the lifting platform 74 may be swung upwardly (and to the left) upon the pivoted links 75 and 76, as shown in Fig. 3. Preferably, however, it is prevented from coming to its full height so as to bring the links 75 and 76 to a vertical position (and hence to a dead center) by a stop 83 on the depending portion 3 of the truck. Hence, from this position, it will tend to fall and swing forwardly (to the right) under its own weight, if released, so as to rest again upon the frame 71.

The upper or lifting platform 74 is sufficiently low, when in lowered position, so that it may be run in beneath the tubs 85 (shown in phantom outline in Figs. 2 and 3) which are held above the floor by skids 86 on either side. On the rear end of lifting platform 74 is an upstanding vertical stop 84, to receive the end or side of the tub 85 and prevent it from striking against the depending front end of the truck 3 and radiator 6. To receive the skids and also to prevent slipping while on the truck, side arms 87 are provided extending from either side of the lifting platform 74, as best shown in Figs. 2 and 3.

Transversely of the platform or base 71 is provided an angle iron 88 adapted to receive one end of a cylinder 89 thereon, held by a spring-pressed nut and bolt 91 joined to the end of the cylinder and passing loosely through a hole in the angle iron 88. Transversely of the upper platform 74 is provided an angle iron 92 adapted to receive the butting free end of a piston or plunger 93, the opposite end of which fits slidably into the cylinder 89. The free end of the piston is also held in position by a spring-pressed nut and bolt 90 passing loosely through the angle iron 92. With this arrangement it will be seen that if a fluid is supplied to the cylinder 89 tending to force the piston 93 outwardly, the latter will force the upper platform rearwardly and upwardly into the position shown in Fig. 3. Likewise, upon withdrawing the fluid from the cylinder 89—or by simply releasing the fluid—the upper platform 74

will fall forward and down, thus returning to the position indicated in Fig. 1.

To provide for such operation of the lifting device a pressure pipe line 94, preferably containing relatively heavy oil, is provided, leading from the pump 95. As shown in Fig. 10, this pump may comprise an inlet 96, from an oil supply reservoir 97, and feed line 98 passing through a rotatable valve 99 (controlled by the handle and link connections 101) and through conduit 102 to the pair of intermeshing gears 103, 104 which are driven in such direction as to force the oil out into the line 94, as shown by the arrows (or the reverse) thus providing the actuating pressure necessary to operate the lifting device 4 as above described.

The gear 103 of the pump is driven through shafts 105 and 106 through a clutch 107, operated by the hand lever 108, as required. Shaft 106 is geared through chain 109 to the crank shaft of the engine 5, by which it is driven.

In practical operation therefore, the operator will start and run the engine 5 as in any conventional type of internal combustion engine. But he will then control its operation upon the apparatus as indicated above and in the drawings. For example, with the clutch out, in the usual way, he will then let it in so as to drive the driving wheels 52, 53 through the train of connections including shaft 13, gears 26 and 27, shaft 28, gear 51 and differential set of gears in the casing 47.

By turning the steering wheel 55 the shaft 62, through the small gears 61, 59 and 57, and large disc 41, will rotate the entire rear end including the wheels 52 and 53, about and independently of the vertical driving shaft 28. Moreover, it is to be observed that the axle and wheels may thus be rotated to the right or left almost or quite at right angles with the frame or chassis 2, thus directing and carrying the main body portion of the apparatus practically sidewise. This is especially useful and effective in turning around without forward movement as well as in turning corners, avoiding collision and in positioning the lifting device where required. By providing the brake band 15 on the drive shaft 13, quick and effective control is provided whether the clutch 11 is in or out.

The apparatus will be driven about as required and to the position for picking up its load. It will then be headed directly at the tub 85 to be taken up. If not previously in lowered position the lifting platform 74 will be lowered by opening the valve 99 in the oil line, thus letting the weight of the platform force the oil in the cylinder 89 back through the line 94, through the pump 95 and into the supply tank 97.

With the apparatus headed toward the tub, and the lowered platform 74 directed between the skids 86, the truck is run directly forward until the lifting platform 74 is entirely beneath the tub and the arms 87 extend along the outside of each of the skids 86 thereon (see Fig. 2).

The clutch 11 will then be thrown out in the usual way, but with the engine 5 still running the valve 99 in the oil line will be opened and the clutch 107 let in briefly and lightly so as to drive the oil pump 95, thus pumping the oil through the line 94 into the cylinder 89, forcing the piston 93 outward and rearward, and thus forcing the lifting platform 74 up under the tub 85 and raising the tub off the floor, as shown in Fig. 3.

Since a small volume of oil is sufficient to effect this relatively short movement of the piston 93 in the cylinder 89, it is not necessary to let the pump 95 operate more than a few seconds. For this reason a too positive or continued operation of the clutch 107 will pump too much oil and develop too much pressure on the piston 93. Some excess pressure may be permissible and will be dissipated back through the pump 95, but it is easily prevented by light manipulation of the clutch 107 or by partially closing the valve 99, if necessary. When the load is lifted, the valve 99 is completely closed and the clutch 107 thrown out of engagement, the retained pressure of the oil in the cylinder 89, line 94 and pump 95 being sufficient to maintain the lifting platform in the elevated position of Fig. 3. The skids of the tub being clear of the floor, the entire apparatus, with its load, whether heavy or light, is free to travel wherever desired.

To deliver the load, it will only be necessary to bring the apparatus in such position as to hold the tub where it is to be deposited and then to open the valve 99, whereupon the weight of the load upon the lifting platform 74 will force it down, as the oil escapes from the cylinder 89, back through the line 94, around the gears 103, 104 of the oil pump, through the valve 99 and into the oil supply tank 97. If the load is light, the oil heavy, or the pump gears fit closely together, so as to restrict a sufficiently rapid return flow of the oil to the supply tank, the pump may be arranged to be operated in reverse, so as to pump the oil back from the cylinder and into the supply tank.

The apparatus may then be backed away from the tub,—thus withdrawing the lifting device from beneath the tub,—and proceed to the handling of other loads.

It may be noted that while the weight of the engine 5 will be borne largely upon the wheels 52, 53, it is distributed away from the steering mechanism so as not to interfere therewith or cause the moving parts to bind under any conditions of operation. It will also be observed that the apparatus receives the load 85—(which will vary from no load to a maximum of a ton or more)—directly above the wheels 73. Hence the load puts a minimum of stress or strain upon the apparatus as a whole, which is accordingly substantially unaffected by the widest of variations in the load carried.

Another type of lifting device may be provided as shown in Figs. 11, 12 and 13, in which the frame 111 is attached to the depending portion of the truck portion 3, as by bolts 112. But instead of having two platforms, the frame 111 has a transverse angle iron 113 fixed therein, to which is fixed the end of a piston 114 by a loose, spring-pressed bolt and nut 115, passing therethrough. The piston 114 slides into a compression cylinder 116, the opposite end of which abuts a transverse angle iron 117, to which it is secured by a loose, spring-pressed nut and bolt 118. This angle iron 117 may be attached to the first by a pair of spaced tension springs 119.

At each end of angle iron 117 is provided a pin 121 projecting laterally thereof and adapted to enter and slidably engage horizontal guide slots 122 on the inner sides of the frame 111. Pivoted to the pins 121 are links 123, the other ends of which receive the ends or hubs 124 of the axle 125 upon which the wheels 126 are mounted. The ends of the shaft or axle 125 are received in forwardly inclined (that is, inclined

downwardly to the right, as shown in Fig. 12) guideways 127 in the frame 111. The frame 111 may be reinforced at and about these guideways by welding upon the outside supplementary strips 128.

By now connecting the cylinder 116 to the compression line 94 (see Fig. 1) this modified form of lifting device may be operated in a manner analogous to the one described above. That is, when the lifting device, in lowered position, is run in beneath the load 85 the valve 99 in the oil line will be opened and the pump 95 started, whereupon the oil enters the cylinder 116 under pressure against the head of the piston 114. In this case the free end of the piston will remain in fixed position, while the cylinder will move away from it forcing the angle iron 117 directly forward and it in turn, through links 123, forces the axle 125 (and wheels thereon 126) forwardly in the inclined slot 127. Owing to this inclined disposition of the slots 127 in which the axle of the wheels is thus forced under such compression, the rear part of the platform 111 is lifted above the horizontal, as shown in Fig. 13. This brings the platform to bear upon the underside of the tub 85 lifting the skids 86 from the floor, whereupon the truck, lifting device and load are free to be transported as before. The valve 99 is closed and the pump 95 stopped. This retains the oil in the cylinder under compression and the piston and cylinder in extended position.

To deliver the load, when in the desired position, the weight of the load may be sufficient to cause the wheels to roll and the axle to slide backward in the slots 127 (thus allowing the load to descend) simply by opening the valve 99 in the oil line. But with lighter loads, etc., it may be desirable to make such action positive, and to reverse the pump 95 by the clutch 107, or the like, which may be arranged to effect direct or reversible engagement with the shaft 106, and thus positively pump the oil from the cylinder 116 and back into the oil supply tank 97, drawing the ends 124 of axle 125 backward in the slots 127 until they reach their former position, in which movement the load is lowered and rests upon its skids 86 on the ground and the truck and lifting device may then be withdrawn and leave the load in the desired position.

Whether the apparatus is carrying a load or not the operation of the same in moving from place to place is especially adapted for narrow maneuvering in close quarters. It is characterized by having substantially no overhanging structure beyond the driving and steering wheels and especially by not extending beyond the wheels upon the lifting device. Even the load itself does not overhang appreciably if at all. Accordingly, since the engine and load are compactly arranged amidships of the vehicle, it occupies a minimum area. Moreover, by providing for driving the same wheels as are used for steering and also relieving them from appreciable direct weight (i. e., except that of the operator), they are free to respond to rapid and extensive movement through nearly 180° arc. The engine is suspended away from the driving and steering wheels and a substantial part of its weight as well as all of the direct weight of the load is borne by the small wheels of the lifting device. Accordingly, the whole apparatus is easily rotated upon these forward wheels as a center. On the other hand, any larger radius of turning or revolving movement may be made by appropriate control of the steering wheels and of course the

truck may be driven straight forward or back, as desired. In backing, also, the steering wheels are very effective to secure an accurate directioning and control of the position of the forward part of the lifting device and load. This is important, for example, in guiding and running the lifting device beneath a given tub and accurately between the skids on which it is supported—especially when it is one of a closely aligned row of tubs, or the like—without striking the other tubs and also without running the lifting platform in at an angle so as to bind between or wrench the skids of the tub apart. Again, when in position, and as the lifting platform is raised it moves slightly backward toward the truck so that as it comes up under the truck or load it not only lifts it but draws it slowly and firmly backward a short distance. This will ordinarily be sufficient to free it from contact with or binding between adjacent tubes which may lean or be pressed against it. This is very important not only in the easy extraction of the tub but in saving the tub itself and adjacent tubs from crushing or fracture. In other cases it may be advantageous in avoiding disturbance of the loads which such adjacent tubs or containers may carry.

Furthermore, when the load is raised, and thus slightly withdrawn, the apparatus may be driven off almost at once. For, since the forward or load-bearing wheels are now substantially beneath if not beyond the farther side of the tub or other load which it has lifted, there is no overhang which the operator must allow for as the steering wheels are turned in the direction in which the apparatus is to be backed away. The load accordingly follows and is drawn clear of the adjacent tubs quickly, so that the apparatus as a whole may then be headed in any direction which it is to take.

I claim:

1. Apparatus for transporting heavy loads for short distances, comprising a pair of wheels capable of being steered and driven, means for driving the same, a pair of supporting wheels, a frame mounted between and upon said pairs of wheels, including a platform for receiving the load, and means to adjust the position of said supporting wheels, relative to said platform, thereby to lift the platform and load thereon.

2. Apparatus for transporting heavy loads for short distances, comprising a pair of wheels, of relatively large diameter, capable of being steered and driven, a horizontal frame mounted thereon, means for steering and driving said wheels, a second pair of small, load-supporting wheels, a platform rigidly attached to said frame at one end and not extending appreciably beyond said small, load-supporting wheels, at the other end, and means for adjustably mounting said platform upon said load-supporting wheels whereby lifting and lowering said platform may be effected by adjustment of the load-supporting wheels relatively thereto.

3. Apparatus for transporting heavy loads for short distances, comprising a pair of wheels capable of being steered and driven, means for driving the same, a pair of supporting wheels, a frame mounted between and upon said pairs of wheels for receiving the load, an inclined guideway in said frame to receive said supporting wheels and means to adjust said supporting wheels in the guideways, thereby to lift the frame and load thereon.

4. Apparatus for transporting heavy loads for short distances, comprising a pair of wheels, of relatively large diameter, capable of being steered and driven, a horizontal frame mounted thereon, means for steering and driving said wheels, a second pair of small, load-supporting wheels, a platform mounted thereon by means of inclined guideways to receive said load-supporting wheels,

and rigidly attached to said frame at one end and not appreciably extending beyond said small, load-supporting wheels, at the other end, and means to adjust the load-supporting wheels in said guideways for lifting and lowering said platform.

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