

May 29, 1951

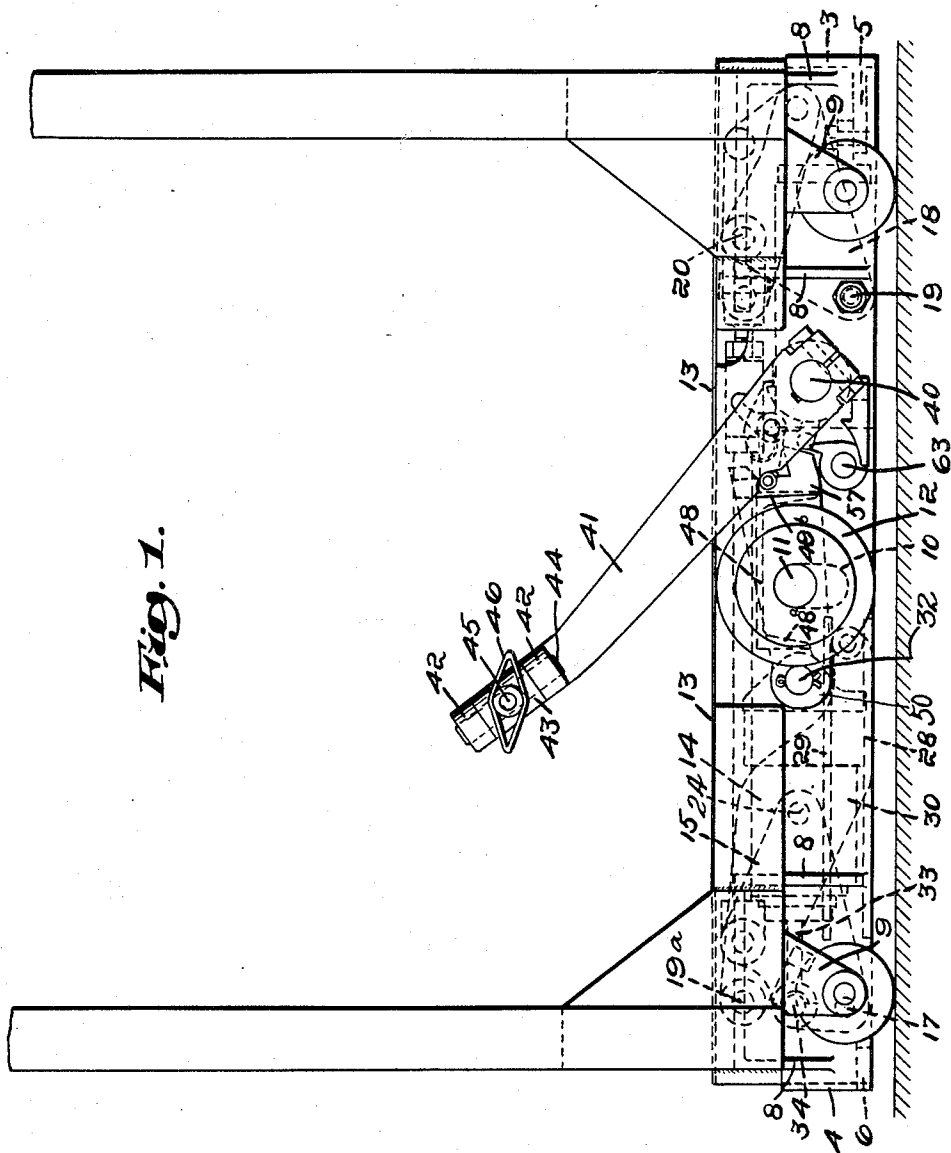
R. HASTINGS, JR
HIGH LIFT DOLLY

2,555,233

Filed May 5, 1948

7 Sheets-Sheet 1

Fig. 1.



Inventor:
Russell Hastings, Jr.
by Heard Smith & Tennant
Attorneys

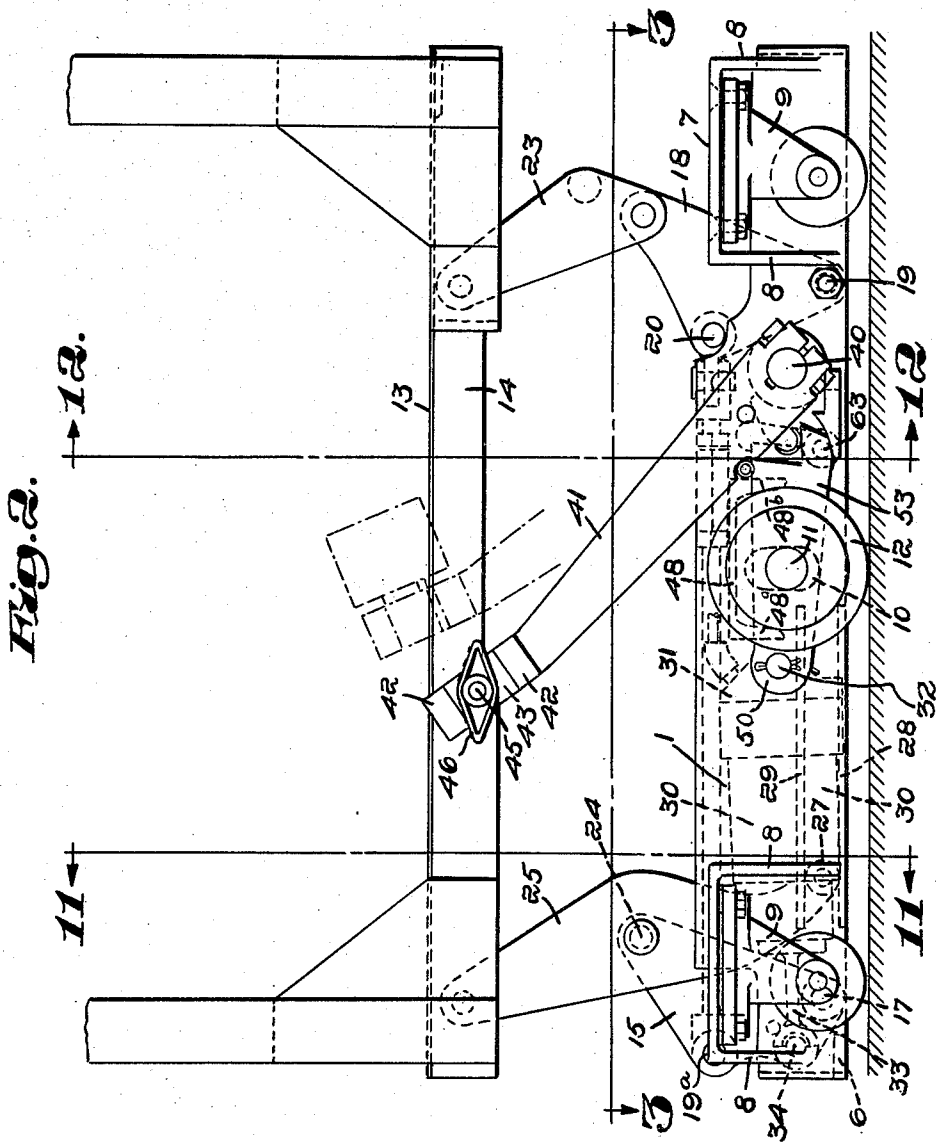
May 29, 1951

R. HASTINGS, JR
HIGH LIFT DOLLY

2,555,233

Filed May 5, 1948

7 Sheets-Sheet 2



Inventor:
Russell Hastings, Jr.
by **Heard Smith & Tennant**
Attorneys

May 29, 1951

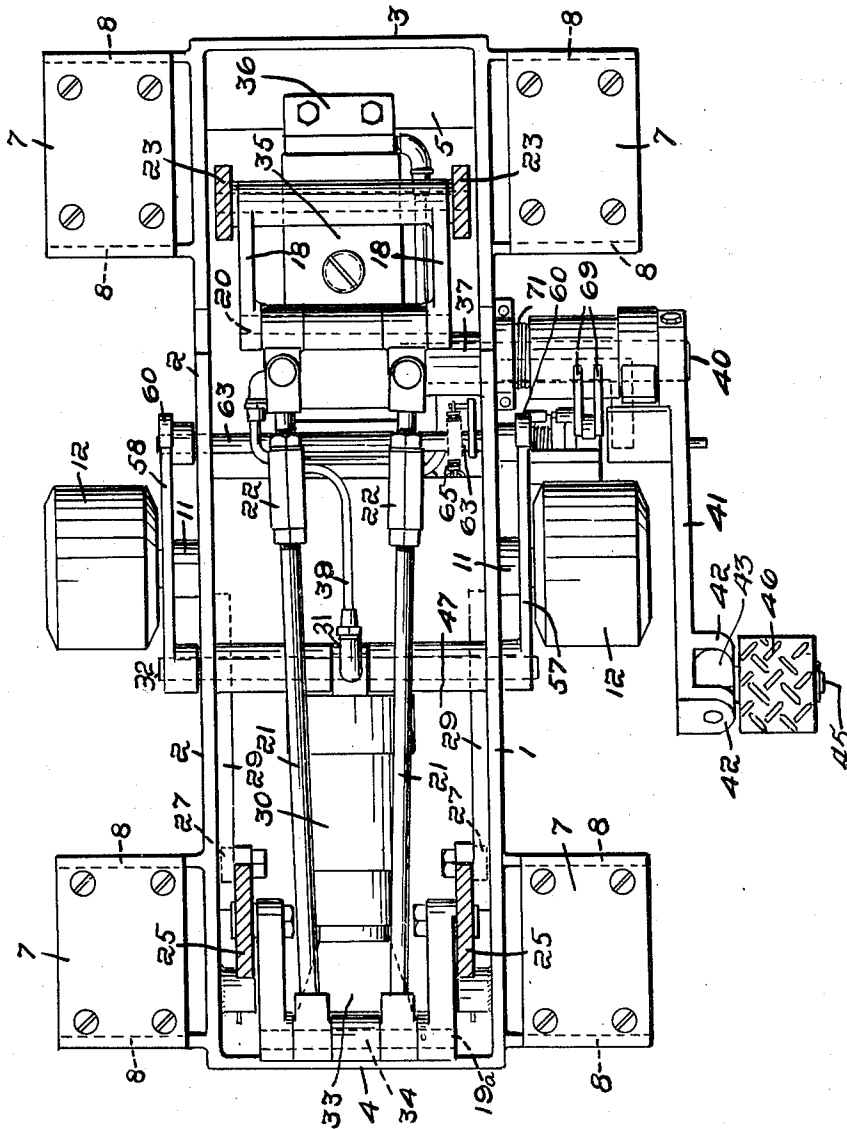
R. HASTINGS, JR
HIGH LIFT DOLLY

2,555,233

Filed May 5, 1948

7 Sheets-Sheet 3

Fig. 3.



Inventor:
Russell Hastings, Jr.
by **Heard Smith & Tennant**
Attorneys

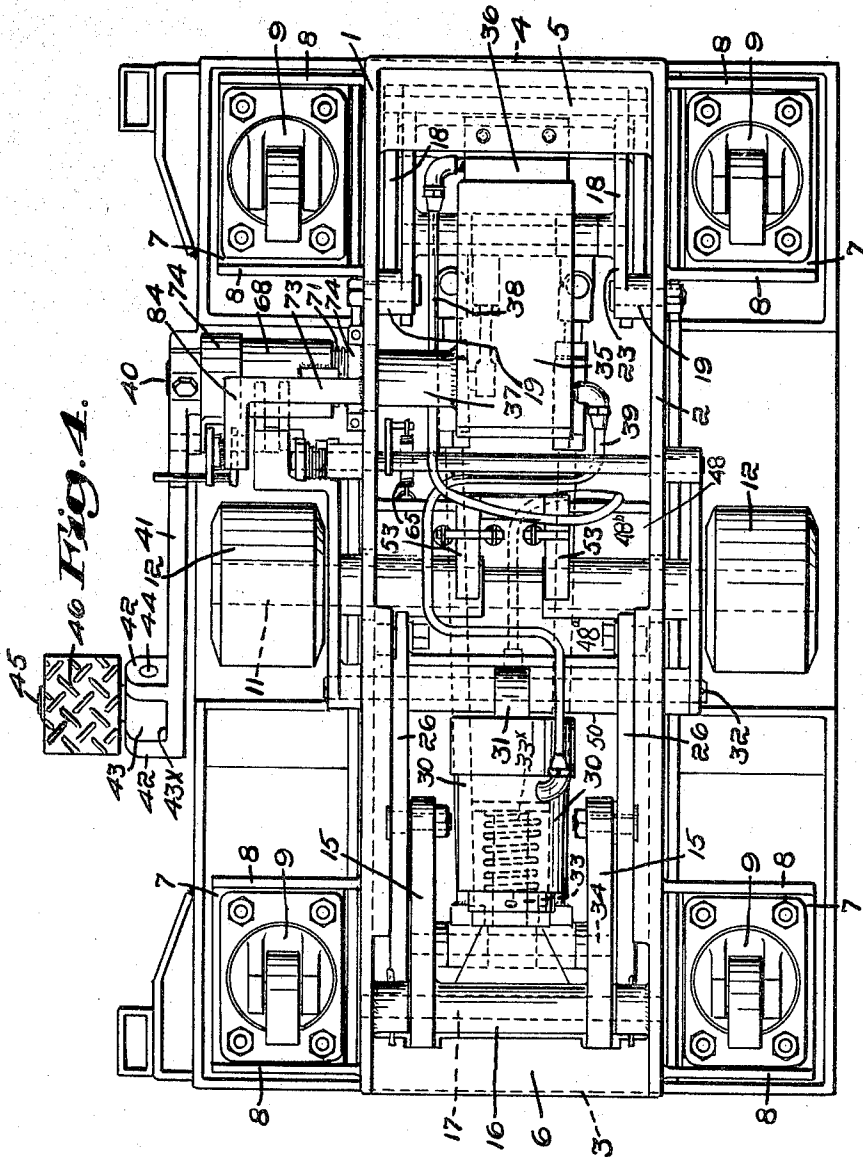
May 29, 1951

R. HASTINGS, JR
HIGH LIFT DOLLY

2,555,233

Filed May 5, 1948

7 Sheets-Sheet 4



Inventor:
Russell Hastings, Jr.
by *Harold Smith & Tennant*
Attorneys

May 29, 1951

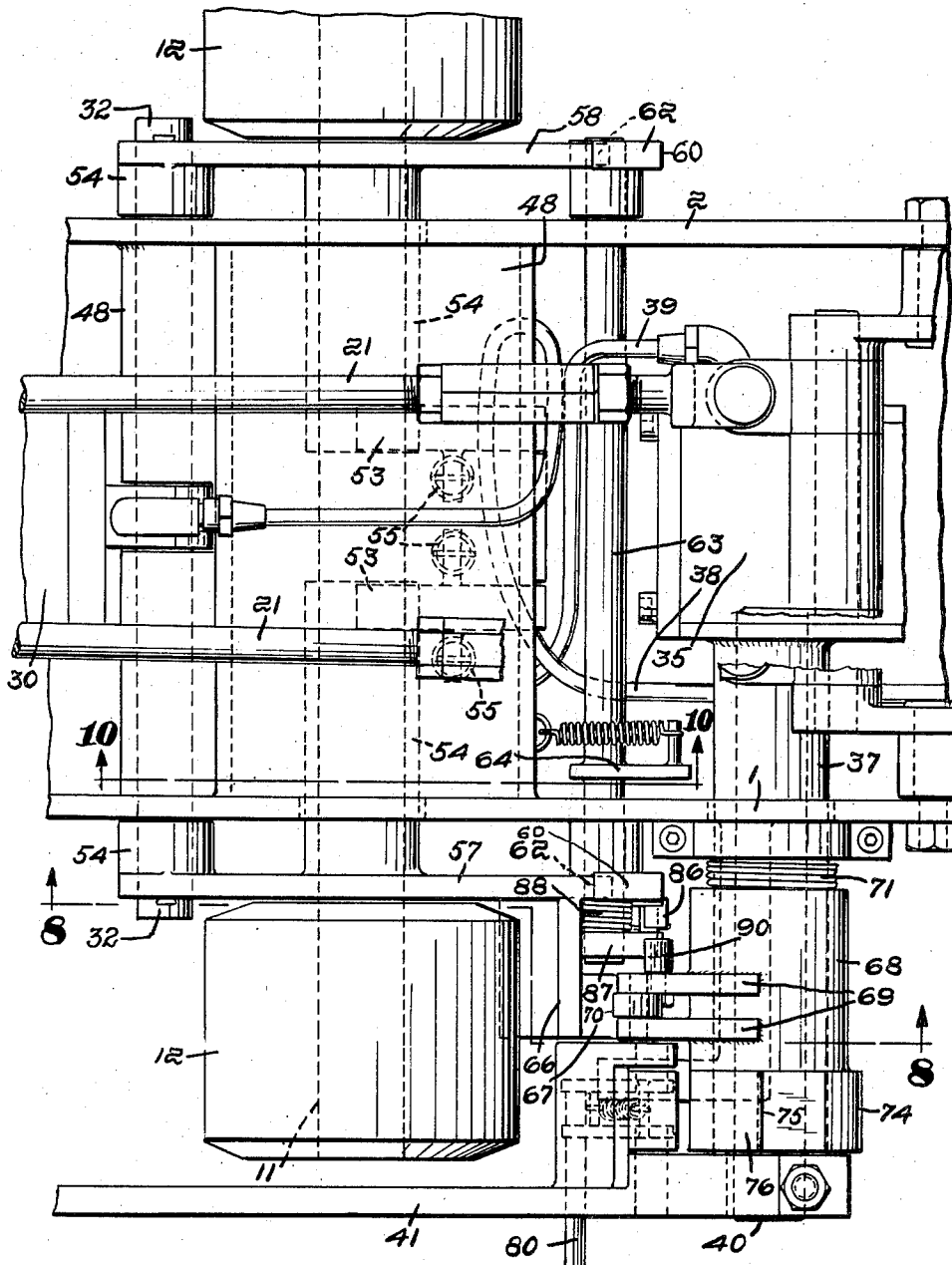
R. HASTINGS, JR
HIGH LIFT DOLLY

2,555,233

Filed May 5, 1948

7 Sheets-Sheet 5

Fig. 5.



Inventor:
Russell Hastings, Jr.
By *Heard Smith & Tennant*
Attorneys

May 29, 1951

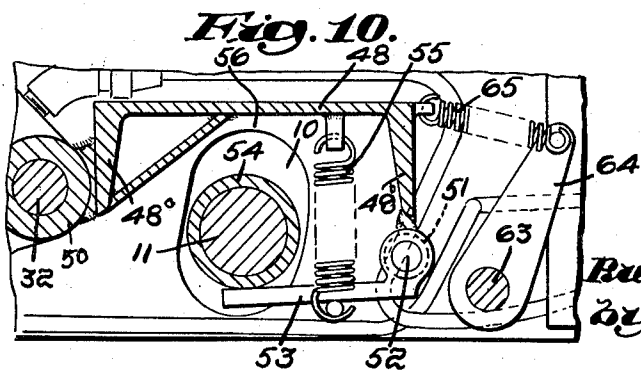
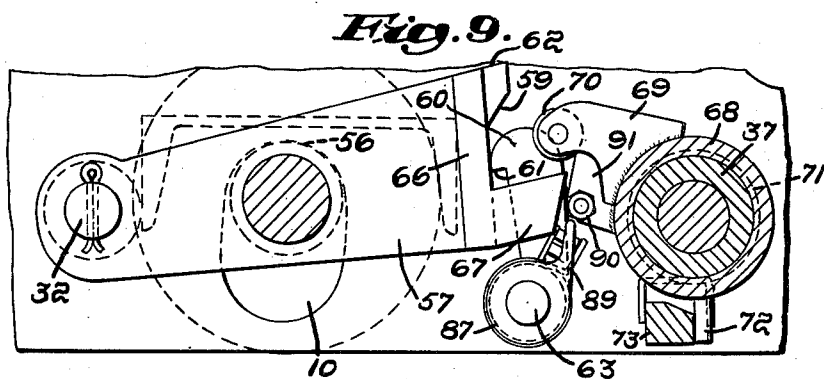
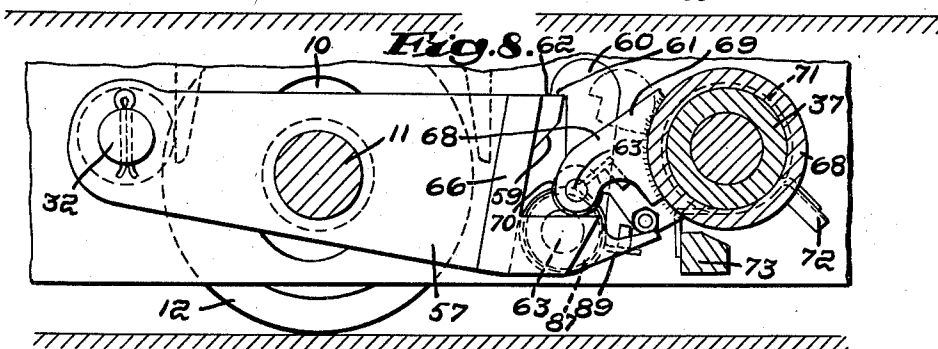
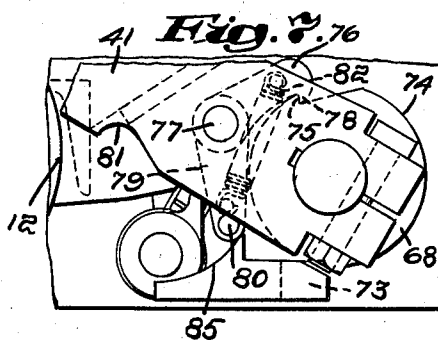
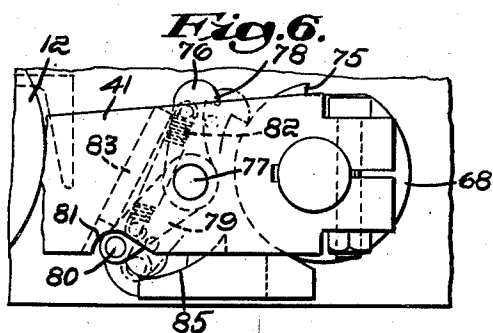
R. HASTINGS, JR

2,555,233

HIGH LIFT DOLLY

Filed May 5, 1948

7 Sheets-Sheet 6



Inventor:
Russell Hastings, Jr.
by *Hard Smith & Tennant*
Attorneys

May 29, 1951

R. HASTINGS, JR
HIGH LIFT DOLLY

2,555,233

Filed May 5, 1948

7 Sheets-Sheet 7

Fig. 11.

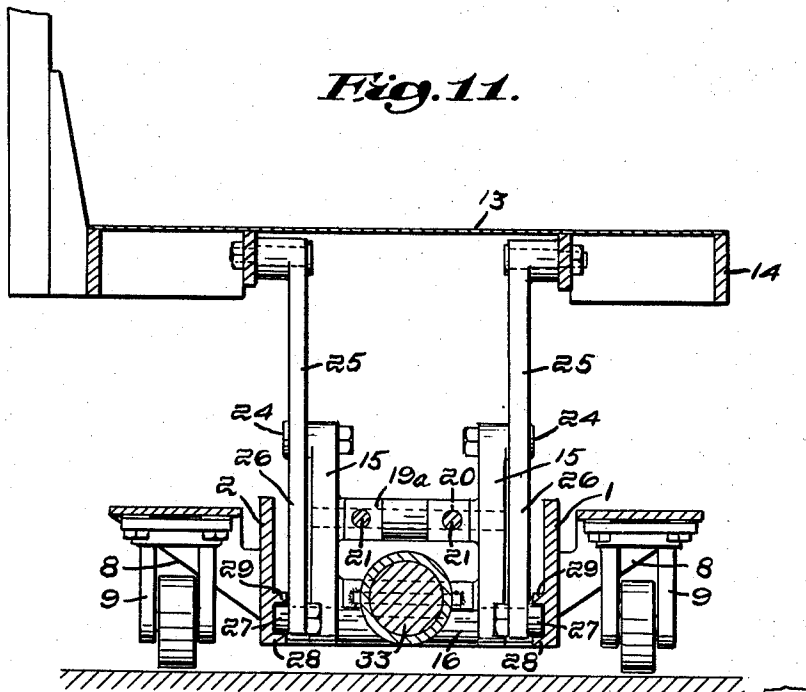
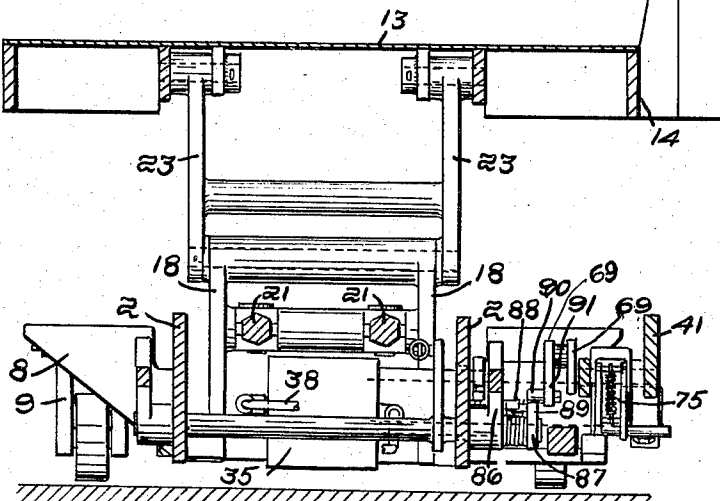


Fig. 12.



Inventor:
Russell Hastings, Jr.
By *Harold Smith & Tennant*
Attorneys

UNITED STATES PATENT OFFICE

2,555,233

HIGH-LIFT DOLLY

Russell Hastings, Jr., Wellesley, Mass., assignor to
Lewis-Shepard Company, Watertown, Mass.,
a corporation of Massachusetts

Application May 5, 1948, Serial No. 25,139

10 Claims. (Cl. 254—9)

1

This invention relates to improvements in floor trucks having a wheel supported horizontal main frame, a platform mounted thereon and movable upwardly and downwardly relatively thereto, and one of the objects of the invention is to provide means located entirely below the platform for supporting the platform in parallelism with the main frame and having means for raising the platform vertically relatively to the main frame without any horizontal displacement with respect thereto.

More particularly the invention relates to improvements in dollies designed particularly for transporting material of greater length than that of the dolly frame, such as warp beams or spools of textile machinery, and other long articles in which the dolly is positioned beneath the center of gravity of the article to be transported and the platform thereof raised vertically to load the article upon the dolly and lowered to deposit the article upon a suitable support.

One of the objects of the invention is to provide means for raising the platform of a floor truck vertically relatively to the supporting frame when positioned beneath the center of gravity of the load which will avoid horizontal displacement of the center of gravity of the load relatively to the dolly frame such as would unbalance the load.

A further object of the invention is to provide means for reducing to a minimum the clearance to adjacent objects by eliminating lateral or end motion of the platform relatively thereto.

Another object of the invention is to provide a dolly construction which will enable the dolly to be pushed in any direction to position it beneath the center of gravity of the load to permit vertical raising of the platform thereby to load the article upon the dolly and also to enable the loaded dolly to be positioned properly with respect to the means for supporting the load when it is discharged by the lowering of the dolly platform, and also to enable the dolly to be easily positioned beneath the mechanism for supporting the article when the platform is lowered to discharge the load from the dolly.

More specifically one of the objects of the invention is to provide a dolly having a rectangular frame with supporting casters at its corners to enable it to be pushed readily in any direction, and provided with a platform having linkages for supporting the platform and means for actuating the linkages to raise the platform vertically relatively to the frame with a straight line motion while the platform itself remains horizontal.

Another object of the invention is to provide a

2

dolly having a frame with casters at its corners and midway of its length bull wheels with means for depressing the bull wheels relatively to the frame to raise the frame and free its casters from engagement with the floor thereby selectively to enable the dolly to be supported upon the casters or bull wheels for transportation.

Another object of the invention is to provide a mechanism operated by a foot lever with means selectively operable thereby to actuate the links for raising the platform of the dolly relatively to its frame or for actuating the mechanism to depress the bull wheels relatively to the frame and detachably lock the bull wheels in the depressed position in which the dolly frame and its load are wholly supported upon the bull wheels.

These and other objects of the invention hereinafter described will be more particularly pointed out in the claims.

A preferred embodiment of the invention is illustrated in the accompanying drawings in which,

Fig. 1 is a side elevation of the dolly embodying the invention showing the platform in lowered position resting upon its casters and the bull wheels in retracted position;

Fig. 2 is a side elevation of the same showing the platform in raised position and the frame and dolly carried by the depressed bull wheels;

Fig. 3 is a horizontal sectional view on the line 3—3, Fig. 2 viewed downwardly;

Fig. 4 is an underneath plan view of the dolly shown in Figs. 1 and 2;

Fig. 5 is an enlarged detail plan view on the line 3—3, Fig. 2, of the central portion of the main frame, the central bull wheels and the mechanism for depressing them relatively to the frame to support the frame, its platform and the load carried thereby;

Fig. 6 is an enlarged detail side view of a central portion of the main frame showing a portion of the bull wheels in raised position, the pedal lever in lowered position and the mechanism for connecting the lever to the bull wheel depressing means in inoperative position;

Fig. 7 is an enlarged detail view similar to Fig. 6 showing the pedal lever in partially raised position and its pawl engaging means for actuating the bull wheel depressing mechanism in engaged position;

Fig. 8 is an enlarged detail sectional view on the line 8—8, Fig. 5, showing the bull wheel in depressed position and the mechanism for locking it in such position;

Fig. 9 is an enlarged detail view similar to Fig.

3

3 showing the bull wheel in raised position and the relative positions thereto of the depressing and locking mechanism shown in Fig. 8;

Fig. 10 is a detail sectional view on the line 10—10, Fig. 5, of the mechanism for raising the bull wheel;

Fig. 11 is a detail vertical sectional view on the line 11—11, Fig. 2; and

Fig. 12 is a detail sectional view on the line 12—12, Fig. 2.

The dolly shown in the drawings comprises an integral rectangular frame having vertical side frames 1 and 2 connected at their respective ends by angle bars which have vertical flanges 3 and 4 flush with the ends of the side frames and inwardly extending horizontal flanges 5 and 6 flush with the plane of the lower edges of the side frame, all welded at their ends to the respective side frames.

Each of the side frames has welded to the outside of its ends brackets having a horizontal plate 7 flush with the upper edges of the side frames and downwardly extending spaced triangular flanges 8. The base plate of a caster assembly 9 located between the flanges 8 is bolted to the horizontal plate 7 of the bracket. The rolls of the caster assembly extend slightly below the lower edge of the frame so that when the casters engage the floor, the frame is supported a short distance above the floor as shown in Fig. 1.

Each of the side frames 1 and 2 is provided centrally of its length with a vertical recess 10 which serves as a clearance for a vertically movable axle 11 of a pair of wide bull wheels 12 which are rotatably mounted upon the respective ends of the axle.

The mechanisms hereinafter described are provided for raising the bull wheels out of engagement with the floor when the dolly is supported upon the casters and for depressing the bull wheels against the floor with sufficient force to raise the frame upwardly and remove its casters from engagement with the floor thereby enabling the dolly selectively to be supported upon the bull wheels when it is desired to transport the load considerable distances in the direction of its length, and when the bull wheels are raised and the frame supported upon the casters, to enable it to be readily pushed in any direction.

The dolly is provided with a load supporting platform 13 which is movable vertically relatively to the frame and comprises a flat metal plate having integral downwardly extending flange 14 which when in lowered position surrounds the main frame and the caster supporting brackets, but is recessed along the side between said brackets so as not to interfere with the upward movement of the bull wheels when they are raised from engagement with the floor.

Platform lifting mechanism

The preferred means for raising the platform vertically illustrated herein comprises a toggle-like construction as illustrated in Figs. 1 to 4 having suitably spaced pairs of like triangular levers fulcrumed at their respective lower ends upon end portions of the frame and pivotally connected at their upper ends to pairs of parallel links which are mounted at their upper ends upon longitudinal bars welded to the under side of the frame as shown in Fig. 11. The toggle-like lifting mechanism differs from the usual toggle mechanism in that the links of one of the pairs which are connected to the platform extend

4

beyond their pivotal connections to the upper ends of the lever by which they are operated and engage at their lower ends means for guiding them horizontally in parallelism with the horizontal plane of the platform thereby to cause the platform to be raised vertically and enabling the levers and links when the platform is depressed to lie wholly below the plane of the top edges of the side frames 1 and 2 so that when the platform is lowered, it may rest upon the upper edges of the side frames.

The toggle-like mechanism comprises a pair of front triangular levers 15, the lower ends of which are connected by a sleeve 16 which is journaled on a shaft 17, the ends of which are mounted in the end portions of the side frame and provide a fulcrum for said levers as shown in Fig. 4.

A complementary pair of like rear triangular levers 18 are fulcrumed at their lower ends upon stud shafts 19 projecting inwardly from the lower end portions of the side frames.

The base portions of the triangular front and rear levers extend forwardly from their fulcrums, and the respective pairs of levers 15 and 18 are connected adjacent their front angles respectively by shafts 19a and 20 as shown in Fig. 3. The shafts 19a and 20 are connected by a pair of adjustably extensible rods 21 which are in aligned sections adjustably connected by internally threaded rectangular sleeves 22 having at their end portions internal right and left-hand screw threads which engage complementary screw threads on the aligned sections of the respective bars, thus enabling the bars to be adjusted in length to insure uniform equal movement of the parallel levers 15 and 18.

The upper ends of the rear pair of levers 18 are pivotally connected to the lower ends of the toggle links 23 of the usual type, the upper ends of which are pivotally connected to the members which extend downwardly from the platform as shown in Fig. 12. The upper ends of the front pair of levers 15 are connected by stud shafts 24 to the central portions of links 25 which are connected at their upper ends to the platform as shown in Fig. 11. It will thus be seen that in the case of each lever the pivotal point of attachment to the connecting rods is located on an extension well forward of a line through the fulcrum point and the point of connection to the link. The links 25 have extensions 26 beyond the pivotal connections 24 provided at their lower ends with laterally projecting means, preferably provided with anti-friction rollers 27 which extend into horizontal guideways formed by suitable narrowly spaced parallel bars 28 and 29 which are formed integral with or welded to the lower portions of the side frames 1 and 2 and extend longitudinally thereof so that when the front levers are forced forwardly to raise the platform, the extensions 26 of the links thus restrained in the guideway to cause the upper ends of the links which are connected to the platform to move in an accurately vertical straight line and by reason of the connection of the front and rear triangular levers 15 and 18 will cause the rear end of the platform also to move vertically in parallelism with the main frame.

The mechanism for actuating the toggle levers comprises a hydraulic cylinder 30 having at its rear end a bracket 31 which is journaled upon a shaft 32 which is mounted at its ends

on the side frames 1 and 2. The piston rod 33 of the hydraulic cylinder pivotally engages a shaft 34 which connects the forwardly extending base portions of the levers 15 between the fulcrum 17 thereof and the shaft 19a which connects the forwardly projecting base portions of the levers, so that when the piston of the hydraulic cylinder is forced forwardly, the toggle-like mechanism will be straightened to lift the platform as illustrated in Figs. 2 and 11, and when the piston is retracted, the toggle-like mechanism will be lowered to a position wholly within the main frame as shown in Fig. 1.

Suitable means are provided for supplying liquid under pressure to the hydraulic cylinder to raise the platform and retain it in any raised position, and means are provided for releasing the pressure to permit the lowering of the platform. As illustrated herein in Figs. 3 and 4, a rectangular tank 35 which is mounted in the rear portion of the dolly frame is provided with a rearwardly projecting bracket 36 which is bolted to the flange 5 of the rear angle plate 4 connecting the side frames 1 and 2. The tank 35 is supported at its front end upon a tubular bearing sleeve 37 which is welded to the side of the tank adjacent its front end and extends through and well beyond the side frame 1. The tank 35 contains a suitable reservoir and pump of conventional character which need not be described in detail further than to state that liquid under pressure is forced by the pump through a suitable inlet pipe 38 into the pressure chamber of the cylinder 30 and returned therefrom to the reservoir through a return pipe 39. The pump within the tank 35 is actuated by a shaft 40 which is journaled in the bearing sleeve 37 and has fixedly secured to its outer end a pedal lever 41 provided at its outer free end with a pair of spaced bosses 42 between which a sleeve 43 is journaled upon a pin 44 mounted in the bosses 42. The sleeve 43 has the laterally projecting shaft 45 upon which a pedal 46 is mounted. The sleeve 43 is provided with an extension 47 having a flat face 43x adapted to engage the lever 41 between the bosses 42 and normally to hold the pedal shaft 45 perpendicular to the pedal lever 41, but to permit the pedal lever to be swung substantially into the plane of the pedal lever when not in use to permit the dolly to pass through narrow spaces and to avoid injury to people passing the dolly.

Suitable means, not shown, are provided for normally raising the pedal lever 41 into up-raised position as shown in Figs. 1 and 2, such for example, as a heavy coil compression spring associated with the pump mechanism in such manner as to oppose the motion of the pump piston. As illustrated herein a coiled compression spring 33x within the cylinder 30 surrounds the piston rod 33 and abuts at one end against the piston and at its other end against the cylinder head tends to force the piston inwardly against the fluid pressure in the cylinder thereby to draw the toggle-like links into lowered position within the frame.

In order to raise the platform, the pedal lever is repeatedly depressed by operator's foot thereby actuating the pump to force liquid into the cylinder and cause its piston to swing the front levers 15 upwardly, thereby causing expansion of the front toggle-like mechanism and, by the means above described, simultaneously to expand the rear toggle-like mechanism thus raising the

platform vertically. After each depression, the pedal will be automatically restored by the lifting spring to upraised position. As indicated in Fig. 1 the shaft 34 is directly above the fulcrum 17 when the platform is in lowermost position and, as indicated in Fig. 2, this shaft has moved about the fulcrum axis to a point well forward and downward when the platform is in its raised position. During this movement the force for lifting the platform exerted by the lever has been applied through the shafts 24 which, when the platform is in lowermost position, are well rearward of the fulcrum and which have moved upward and forward to a point well above the fulcrum when the platform is in raised position. Consequently, the lifting force applied by the pedal through the pump and the cylinder and piston to the shaft 34 is applied at the start of the raising movement directly above the lever fulcrum where it is most effective and where the force applied from the lever to the link to raise the platform is greatest, and as the movement continues to the end the force applied to the lever decreases in effectiveness just as the force required to be applied from the lever to the link diminishes. That is, the amount of movement required to move the lever is about inversely proportional to the expanding movement of the toggle in the raising of the platform and therefore each actuation of the pedal by the same pressure will give substantially the same increment of lift to the platform.

The lifting of the platform vertically may be arrested at any time by discontinuing the operation of the pedal and the platform will be held at that height. The raising of the pedal lever above the position which it normally assumes under the action of the return spring opens a control valve which permits the flow of liquid from cylinder back to tank, thereby causing the return of the links to the lowered position.

The bull wheel depressing and retracting mechanism

The pedal mechanism above described is also selectively employed for depressing the bull wheels to lift the frame and raise its casters from the floor so that the frame and load upon the platform either in lowered or upraised position may be pushed as in usual types of dollies.

In the preferred construction as illustrated in Figs. 1, 2, 5, and 10, a transverse channel-shaped cross girder 48, which is located below the rods 21 and symmetrically over the vertical recesses 10 of the side frames, is welded at its ends and the flanges 48a and 48b thereof to the side frames 1 and 2. The front flange 48a has welded to it a sleeve 50 which forms the bearing for the shaft 32 upon which the cylinder supporting bracket 31 and upon which the bull wheel depressing levers are fulcrumed.

As shown in Fig. 10, the rear flange 48b has welded to its lower edge a sleeve 51 forming bearings for a shaft 52 upon the ends of which are secured bull wheel lifting arms 53, the end portions of which underlie bearings 54 in which the axle 11 of the bull wheel is rotatably mounted as shown in Fig. 10. Spiral tension springs 55 which are connected at their lower ends to the respective lifting levers 53 and at their upper ends to the girder 48 normally raise the bull wheel axle in the vertical recesses 10 in the side frames and hold the axle thereof in engagement with the upper end walls 56 of the recesses 10 thereby retaining the bull wheels out of contact with the

floor so that the frame is supported upon its corner casters.

The bearings 54 for the bull wheel axle, as shown in Figs. 5 and 10, extend through the vertical recesses 10 in the side frames 1 and 2 and are welded to the central portions of bull wheel depressing levers 57 and 58 which are fulcrumed on the shaft 32, the bearings 50 of which are welded to the front flange 48a of the cross girder. The free ends of the levers 57 and 58 have upwardly and outwardly inclined portions 59 upon which locking latches 60 ride when the bull wheel axle is forced downwardly until the shoulders 61 of the locking latches 60 engage over the upper edges 62 of the ends of the respective levers as shown in Fig. 8.

The locking latches 60 are fixedly connected at their lower ends to a shaft 63 which is journaled in the side frames 1 and 2 and has fixedly secured to it an upwardly extending arm 64, the upper end of which is connected by a coiled tension spring 65 to the cross girder 48 as shown in Fig. 10. The spring 65, therefore, tends continuously to press locking dogs 60 into engagement with the ends of the levers 57 and 58 so that when the bull wheel actuating levers are depressed, the shoulders 61 of the locking dogs 60 will snap over the ends 62 of the levers 57 and 58 and lock the bull wheel axle in its depressed position and the casters raised from the floor as shown in Fig. 2.

The pedal lever 41 not only is adapted to actuate the pump to raise the platform vertically through the toggle-like mechanism above described, but is also selectively employed to actuate the mechanism for forcing the bull wheels downwardly to raise the main frame and clear the casters from the floor. This is accomplished by the following mechanism which is illustrated in Figs. 1 to 5, and the steps in the operation of which are shown in Figs. 6 to 9 inclusive.

The lower portion of the end of the lever 57 has welded to it an outwardly offset arm 66 provided with a rearward extension 67 having a flat upper surface adapted to be engaged and depressed by an arm of a bull wheel actuating tube 68 which is rotatably mounted on the bearing sleeve 37 of the pedal shaft. Means are provided for detachably connecting the bull wheel actuating tube to the pedal lever.

The bull wheel actuating tube 68 is provided adjacent its outer end with a pair of forwardly projecting arms 69 between which is rotatably mounted a roller 70 adapted when swung downwardly in a counterclockwise direction to engage the flat upper face of the extension 67 of the bull wheel supporting lever 57. A torsion spring 71, which surrounds the bearing sleeve 37, is anchored at one end to a lug 72 projecting from the bull wheel actuating tube 68 and is connected at its other end to an abutment arm 73 forming part of and projecting outwardly from a bracket which is welded to the frame, tends to rotate the bull wheel actuating tube in a clockwise direction and raise the roller 70 out of engagement with the extension 67 of the lever 57 as shown in Fig. 9. Motion in this direction is limited by contact of the lug 72 with the abutment arm 73 as shown in Fig. 9.

The bull wheel actuating tube 68 has integral therewith or welded to its outer end a collar 74 of somewhat greater diameter and provided with a longitudinally cutaway recess providing a lip 75 adapted to be engaged by an upwardly extending pawl 76 which is pivotally journaled upon a pin 77 which is mounted in and projects inwardly

from the pedal lever 41 at such distance from the axis of the shaft thereof that the hooked end 78 will engage the lip 75 upon downward movement of the pedal lever and rotate the bull actuating tube in a counterclockwise direction thereby causing its arms 69 to engage and depress the end 67 of the bull wheel supporting levers 57 and 58 to locking position. Means are provided to be actuated by the foot of the operator to cause the pawl 76 to engage the lip 75 on the collar 74 when the pedal is raised so that a depression of the pedal lever when forced downwardly will depress the bull wheels as above described, and which upon the following upward movement of the pedal lever under the action of its spring will automatically release the pawl 76 from such engagement when pressure between the hooked end 78 of the pawl and the lip 75 is released. As illustrated herein, the pin 77 which extends inwardly from the pedal lever 41 not only has pivotally mounted upon it the pawl 76, but also a downwardly extending arm 79 having at its lower end a long outwardly extending pin 80 projecting beneath the under edge of the pedal lever 41 and adapted to be swung by the foot of the operator rearwardly into engagement with said lower edge in proximity to its lower end, or forwardly into engagement with the recess 81 in the lower edge of the pedal lever 41 as illustrated in Fig. 6. A coiled tension spring 82, which connects the end portions of the arm 79 and pawl 76 as shown in Figs. 6 and 7, is adapted to be swung over the end of the pin 77 as shown in Figs. 6 and 7 to position the pawl 76 into engagement with the periphery of the collar 74 when the outwardly extending pin 80 is in engagement with the lower portion of the edge of the pedal lever as illustrated in Fig. 7, or into engagement with an abutment 83 when the pin 80 is swung into engagement with the recess 81 as shown in Fig. 6. The abutment arm 73 is provided with a forward extension 84 having at its end a concavely cam upper surface 85 lying in the downward path of the pin 80 and which is adapted to be engaged by the pin 80 during the downward swinging movement of the lever when it reaches approximately 15% of the end of its normal total travel, and further downward movement of the pedal lever when the pin 80 engages the cam surface 85 will swing the arm 79 forwardly thus causing the arm to swing forwardly sufficiently to produce an over center movement of the spring 82 with respect to the shaft 77 and automatically swing the arm 79 into engagement with the abutment 83 as illustrated in Fig. 6 so that when the pedal lever is moved upwardly and pressure of the hooked end 78 of the pawl upon the lip 75 of the bull wheel actuating collar is relieved, the pawl 76 will swing forwardly into engagement with the abutment 83 as shown in Fig. 6, thus freeing the collar and bull wheel depressing mechanism from its connection to the bull wheel actuating sleeve, and freeing the pedal lever for actuation of the pump and the platform lifting mechanism as above described.

Means are provided, for releasing the locking dogs from the bull wheel supporting levers, which are actuated by a total depression of the pedal lever to permit the bull wheels to be raised from the floor and out of engagement therewith under the control of the operator through the pedal lever 41, and the action of the spring 55 which connects the cross girder 48 to the lifting arm 53 as shown in Fig. 10. The foot actuated pin 80 which controls the position of the pawl 76 which

connects the pedal lever to the bull wheel actuating tube 74 is first swung into engagement with the lower edge portion of the pedal lever as shown in Fig. 7.

The mechanism for releasing the locking dogs comprises two narrowly spaced disk-like members 86 and 87 which are mounted upon the end of the locking dog shaft 63 which projects beyond the side frame. The disks 86 and 87 are connected together by a strong torsion spring 88 encircling the shaft 63 between them. The inner disk 86 is fixedly secured to the shaft 63 and the outer disk 87, which is rotatably mounted upon it, is provided with a projecting arm 89 normally held in up-right position by the spring 88 in the path of a roller 90 which is mounted upon and extends inward from a shorter downward extension 91 of the inner parallel arm 69 of the bull wheel actuating tube 68 as shown in Figs. 5, 8, 9 and 12.

When the pedal lever is forced downwardly, after the bull wheel supporting lever 57 is locked in downwardly depressed position by the dogs 60, initial contact is made by the roller 90 with the upper surface of the arm 89 of the disk 87. Further downward movement of the pedal arm causes the roller 90 to rotate the disk arm 89 downwardly in a clockwise direction and load the torsion spring 88 and cause it to rotate the disk 86 and the shaft to which it is attached in a clockwise direction with torque enough to overbalance the force exerted by the spring 55, thereby tending to withdraw the locking dogs 60 from locking position. The dogs, however, are held at that time from detachment from the end of the bull wheel supporting levers 57 and 58 by the frictional engagement of the hooked ends 61 of the dogs 60 with the upper edge surface 62 of the bull wheel supporting levers 57 and 58, as shown in Fig. 8.

Further downward movement of the pedal lever 41 brings the roller 90 on the end of the arms 69 of the bull wheel actuating tube into contact with the extension 67 of the bull wheel supporting lever 57 as shown in Fig. 8 and upon slight further depression of the lever 57 thereby reduces the frictional engagement between the shoulders 61 of the dogs 60 and the surface 62 of the bull wheel depressing levers 57 and 58 so that the dogs are withdrawn from locking engagement. Upward movement of the pedal lever under the control of the operator lowers the dolly frame with respect to the bull wheels until it is supported on its casters. Further upward movement of the pedal lever permits the bull wheel axle to be retracted from the floor under the action of the springs 55 (Fig. 10) until the bull wheel axle 11 engages the upper walls 56 of the recess 10 and the bull wheel tires to contact with the under surface of an overlying plate of the dolly frame which may be mounted upon or formed integral with the horizontal plates 7 upon which the caster assemblies are respectively mounted, illustration of which is omitted from the drawings to enable mechanisms therebeneath to be shown. The upward movement of the pedal lever also raises the roller 90 out of engagement with the arm 89 which projects from the disk 87 and permits the torsion spring 88 to restore the arm to upright position. When in this upright position a succeeding downward movement of the pedal lever 41 causes the roller 90 to make engagement with the back or lower side of the arm 89, thus loading the torsion spring 88 in a direction to cause engagement between the locking dogs 60 and the upper edges 62 of the bull

wheel depressing levers 57 and 58 when the bull wheels are depressed to engage the floor and raise the dolly frame.

In the operation of the invention the bull wheels are normally held in raised position from the floor by the springs 55 so that the casters of the dolly will rest upon the floor and enable the dolly to be moved in any direction to position it beneath the center of gravity of the article to be transported. The pedal may then be repeatedly depressed by the operator to actuate the pump and thereby raise the platform vertically to load the article upon it.

In order to force the bull wheels downwardly thereby to raise the dolly frame and the supporting casters therefor from the floor to permit transportation of the dolly upon the bull wheels, the operator will swing the foot actuated pin 80 downwardly and rearwardly from the position shown in Fig. 6 to that illustrated in Fig. 7 thereby swinging the spring 82 which connects the arm 79 and the pawl 76 over the shaft 77 upon which they are pivoted causing the foot actuated pin 80 to engage the under face of the pedal lever 41 and the pawl 76 to engage the collar 74 of the wheel actuating tube 68. Upward movement of the pedal lever 41 will then cause the shoulder 78 of the pawl 76 to engage the lip 75 of the collar. Downward depression of the pedal lever 41 will thereupon rotate the bull wheel actuating tube 68 in a counterclockwise direction first causing the roller 90 to engage the rear face of the arm 89 on the disk 87 to rotate in a counterclockwise direction so that the force of the torsion spring 88 will rotate the shaft 63 and its arms 64 in a direction to supplement the action of the spring 55 (Fig. 10) to force the locking dogs 60 against the ends of the bull wheel depressing levers 57 and 58. Further downward movement of the pedal levers 41 will cause the roller 90 upon the ends of the arms 69 to engage the upper face of the extension 67 of the bull wheel depressing levers thereby forcing them downwardly until the upper ends of the locking dogs 60 after having been forced rearwardly by the cams 59 on the ends of the bull wheel depressing levers will snap over the upper edges 62 of said levers thereby locking the bull wheels in depressed position. Further and final downward movement of the pedal levers 41 will cause the foot actuated pin 80 to engage the cam surface 85 on the extension 84 of the bracket 73 and thereby swing its arm 79 over the end of the shaft 77, thus causing the spring 82 to swing the pin 80 into engagement with the recess 81 in the under edge of the pedal lever 41. Upon the next upward movement of the pedal lever 41 the spring 82 will disengage the dog 76 from the lip 75 on the collar 74 thereby enabling the pedal lever to be operated to actuate the pump and operate the lifting mechanism, as above described.

When it is desired to raise the bull wheels from contact with the floor and support the dolly frame upon its casters the pin 80 will again be swung downwardly and rearwardly by the foot of the operator from the position shown in Fig. 6 to that shown in Fig. 7. The pedal lever 41 will then be raised to its extreme upward position so that the hooked end 78 of the pawl 76 will engage the lip 75 on the collar 74 so that upon depression of the pedal lever the bull wheel actuating tube 68 will be rotated in a counterclockwise direction. The initial downward movement of the pedal lever 41 will thereby cause the roller 90 upon the downward extension of the arm 69 to con-

11

tact with the upper surface of the arm 89 of the disk 87 (Figs. 8 and 12). Further downward movement of the pedal lever 41 will cause the roller 90 to rotate the arm 89 in a clockwise direction to the position shown in Fig. 8 thereby tending to produce a clockwise rotation of the shaft 63 with sufficient torque to overbalance the force exerted by the spring 65 (Fig. 10) and thereby tend to release the engagement of the locking dogs 60 with the upper edges 62 of the bull wheel depressing levers 57 and 58. Such release however is initially prevented by the friction between the shoulders 61 of the locking dogs and the contact faces 62 of the bull wheel depressing levers.

Further downward movement of the pedal lever 41 brings the roller 70 into engagement with the extension 67 of the bull wheel depressing lever 57 and upon its depression permits the release of the latches 68 from engagement with the surfaces 62 on the ends of the levers 57 and 58.

Continued downward movement of the pedal lever 41 to the end of its travel causes the engagement of the foot actuated pin 80 with the cam surface 85 (Fig. 7) thereby swinging the pin 80 forwardly to the position shown in Fig. 6, and by thus swinging the spring 82 over the end of the shaft 77 leaving the pawl 76 ready to be swung out of engagement with the lip 75 on the collar 74 when the force of engagement therewith is relieved. Upward movement of the pedal lever 41 will then release such engagement and as the locking dogs 60 will have been released from engagement with the ends of the bull wheel depressing lever 57 and 58 the dolly frame will descend until it is supported upon its casters. After the casters have engaged the floor the bull wheels are raised further from the floor by the lifting levers 53 and springs 55 (Fig. 10) until the bearing sleeves 54 engage the upper walls 53 of the slots 10. Inasmuch as all connection between the pedal lever 41 and the bull wheel depressing mechanism has been released normal operation of the pedal lever 41 can then be carried on to actuate the pump and thereby raise the platform as above described.

By reason of the construction above described a dolly is provided which by reason of the length of the toggle-like levers and links will enable the platform to be raised to a greater height than has heretofore been accomplished. A dolly is provided which can be selectively transported upon the bull wheels or upon the casters, and means operable by the actuation of the pedal selectively to actuate an hydraulic pump to raise the platform or by shifting the position of the foot actuated pin 80 mechanically to transfer the support for the dolly frame to and from the casters and bull wheels with a minimum effort on the part of the operator thereby to permit the desired manipulation of the dolly and its load.

It will be understood that the particular embodiment of the invention shown and described herein is of an illustrative character and that various changes in form, construction and arrangement of parts may be made within the spirit and scope of the following claims.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is:

1. A lifting dolly comprising a main frame having casters to support it horizontally and vertically movable bull wheels intermediate of its length, a platform movable vertically relatively to said frame, a pedal lever, mechanisms respectively operable by downward actuation of

12

said pedal lever to raise said platform and/or to depress said bull wheels to raise the frame and free its casters from engagement with the floor.

2. A lifting dolly comprising a main frame having casters to support it horizontally and vertically movable bull wheels intermediate of its length, a platform movable vertically relatively to said frame, a pedal lever, mechanisms respectively operable by downward actuation of said pedal lever to raise said platform and/or to depress said bull wheels to raise the frame and free its casters from engagement with the floor, means for locking the bull wheels in depressed position for transportation thereon, and means operable by subsequent downward actuation of said pedal lever for releasing said locking means.

3. A lifting dolly comprising a main frame having casters to support it horizontally and vertically movable bull wheels intermediate of its length, a platform movable vertically relatively to said frame, a pedal lever, mechanisms respectively operable by downward actuation of said pedal lever to raise said platform and/or to depress said bull wheels to raise the frame and free its casters from engagement with the floor, spring actuated dogs for locking said bull wheels in depressed position, means operable by subsequent downward depression of said pedal lever further to depress the bull wheels, and means operable thereby to release the locking dogs to permit retraction of the bull wheels from engagement with the floor.

4. A lifting dolly comprising a main frame having casters to support it horizontally and vertically movable bull wheels intermediate of its length, a platform, toggle-like mechanism having suitably spaced pairs of parallel levers fulcrumed at their lower ends on said frames and pairs of parallel links pivotally connected to the upper ends of said levers and pivotally connected to the platform, means for guiding one of said pairs of links to cause vertical movement of the platform, pedal lever actuated hydraulic means for actuating one of said pairs of levers to raise the platform, and means selectively operable by said pedal lever to depress the bull wheels thereby to raise the platform and free its casters from the floor.

5. A dolly comprising a rectangular frame having vertically movable bull wheels intermediate of its length and provided with casters for supporting the frame horizontally, a platform, toggle-like lifting mechanism having levers fulcrumed on the frame and links pivotally connected to said levers and to the platform, and means cooperating therewith to guide the platform vertically, a hydraulic cylinder mounted on the frame having a piston connected to one of the pairs of levers, a tank mounted on said frame containing a liquid reservoir and pump, means for conducting liquid to and from said cylinder, a bearing mounted on the tank and frame, a pump shaft mounted in said bearing provided with a pedal lever operable by depression thereof to supply liquid to the cylinder to raise the platform, means for depressing the bull wheels to raise the frame and lift its casters from the floor comprising a bull wheel actuating tube rotatably mounted on said bearing, means for detachably connecting said tube to said pedal lever and thereupon operable by predetermined depression of said lever to rotate the tube upon said bearing, means operable thereby to force the bull wheel downwardly, and spring actuated

means for locking the bull wheel in depressed position.

6. A dolly comprising a rectangular frame having vertically movable bull wheels intermediate of its length and provided with casters for supporting the frame horizontally, a platform, toggle-like lifting mechanism having levers fulcrumed on the frame and links pivotally connected to said levers and to the platform, and means cooperating therewith to guide the platform vertically, a hydraulic cylinder mounted on the frame having a piston connected to one of the pairs of links, a tank mounted on said frame containing a liquid reservoir and pump, means for conducting liquid to and from said cylinder, a bearing mounted on the tank and frame, a pump shaft mounted in said bearing provided with a pedal lever operable by depression thereof to supply liquid to the cylinder to raise the platform, means for depressing the bull wheels to raise the frame and lift its casters from the floor comprising a bull wheel actuating tube rotatably mounted on said bearing, means for detachably connecting said tube to said pedal lever and thereupon operable by predetermined depression of said lever to rotate the tube upon said bearing, means operably thereby to force the bull wheel downwardly, and spring actuated means for locking the bull wheel in depressed position, and means operable by subsequent full depression of said pedal lever to release said locking means thereby to permit upward movement of the bull wheels.

7. A dolly comprising a rectangular frame having vertically movable bull wheels intermediate of its length and provided with casters for supporting the frame horizontally, a platform, toggle-like lifting mechanism having levers fulcrumed on the frame and links pivotally connected to said levers and to the platform, and means cooperating therewith to guide the platform vertically, a hydraulic cylinder mounted on the frame having a piston connected to one of the pairs of links, a tank mounted on said frame containing a liquid reservoir and pump, means for conducting liquid to and from said cylinder, a bearing mounted on the tank and frame, a pump shaft mounted in said bearing provided with a pedal lever operable by depression thereof to supply liquid to the cylinder to raise the platform, means for depressing the bull wheels to raise the frame and lift its casters from the floor comprising a bull wheel actuating tube rotatably mounted on said bearing, means for detachably connecting said tube to said pedal lever and thereupon operable by predetermined depression of said lever to rotate the tube upon said bearing, means operable thereby to force the bull wheel downwardly, and spring actuated means for locking the bull wheel in depressed position, and spring actuated means for raising the bull wheel out of engagement with the floor.

8. A floor truck having horizontal parallel wheel-supported side frames, a platform, a pair of similar parallel levers at each end of the side frames and fulcrumed thereon, parallel links pivoted on the levers and on the platform, the said levers each having an extension extending well forward of a line through its fulcrum point and the pivotal point of the link thereon, a rigid connection between the forward and rearward pairs of levers pivotally connected at its ends to the said forward extensions, one pair of said links having downwardly extended portions slidably connected at their lower ends to the side frames, and means for actuating one of said pairs of levers pivotally connected to the forward extensions thereof thereby to raise and lower the platform vertically without horizontal displacement.

9. A floor truck having horizontal parallel wheel-supported side frames, a platform, a pair of similar parallel levers at each end of the side frames and fulcrumed thereon, parallel links pivoted on the levers and on the platform, the said levers each having an extension extending well forward of a line through its fulcrum point and the pivotal point of the link thereon, a rigid connection between the forward and rearward pairs of levers pivotally connected at its ends to the said forward extensions, one pair of said links having downwardly extended portions slidably connected at their lower ends to the side frames, the pivotal connection between each lever and link positioned well rearward of the fulcrum when the platform is in its lowermost position, and means for actuating one of said pairs of levers pivotally connected to the forward extension thereof at a point directly above the fulcrum when the platform is in its lowermost position.

10. A floor truck having the construction defined in claim 9, in which the said means comprises an hydraulic cylinder and piston, the one connected to the side frames and the other to the said levers at the said point, and a pedal actuated pump for operating the cylinder and piston, whereby equal increments of force applied to the pedal will give substantially equal increments of lift to the platform.

RUSSELL HASTINGS, Jr.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,114,282	Murphy	Oct. 20, 1914
1,667,267	Pitcher	Apr. 24, 1928
2,023,410	Davis et al.	Dec. 10, 1935
2,243,892	Bedford et al.	June 3, 1941
2,417,394	Framhein	Mar. 11, 1947
2,476,380	Manke	July 19, 1949