June 6, 1939. F. J. SHEPARD, JR., ET AL 2,161,659

SELECTIVELY OPERABLE MECHANICALLY AND FLUID ACTUATED LIFTING TRUCK

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Fig. 2.

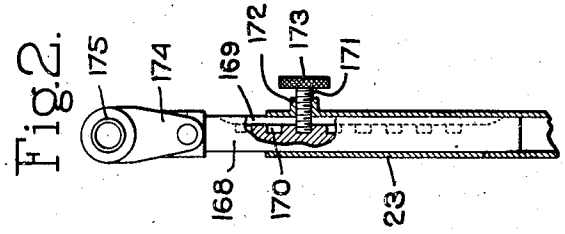


Fig. 1.

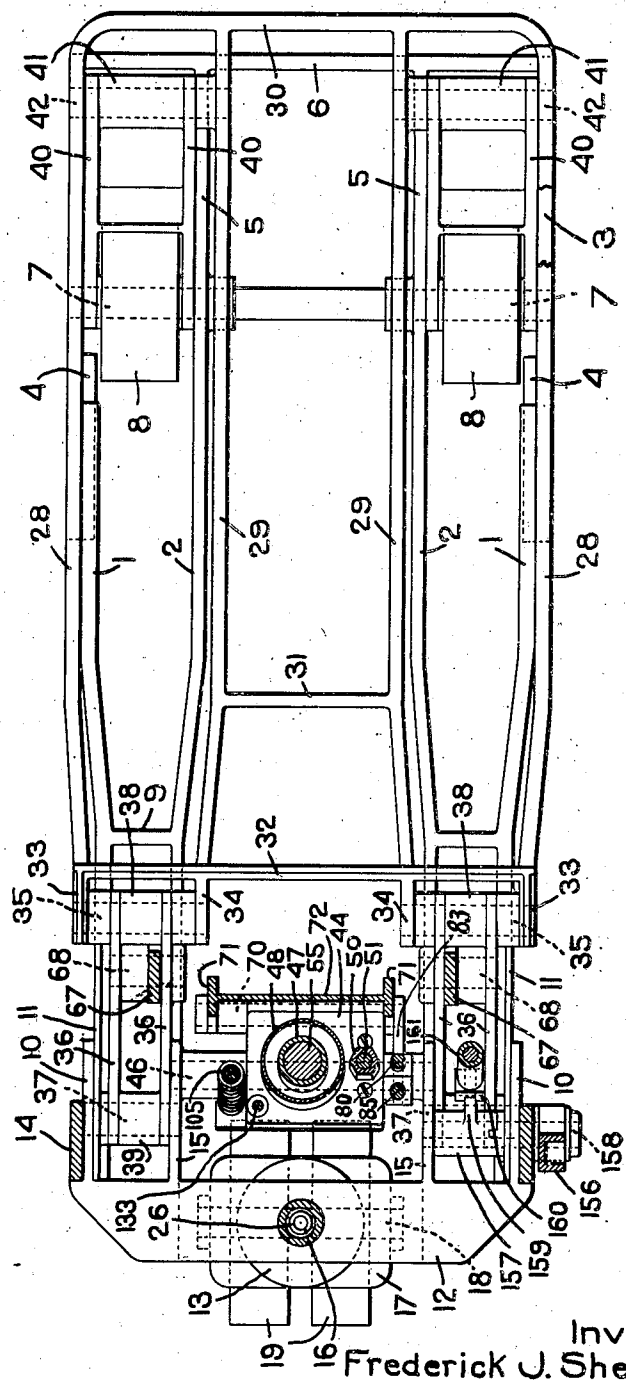
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Fig. 3.



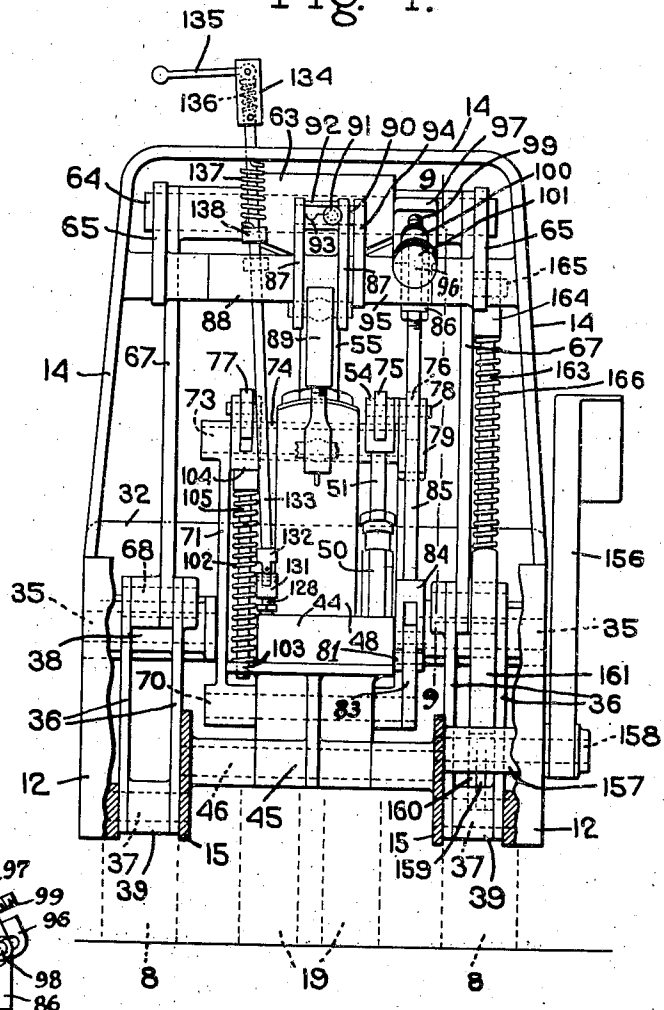
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Fig. 4.



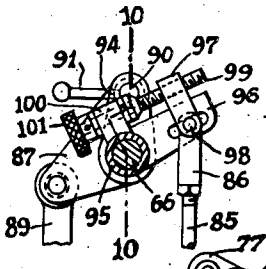
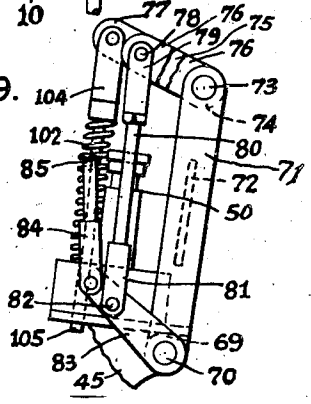


Fig. 9.



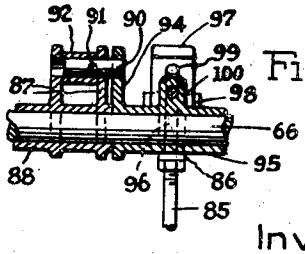


Fig. 10.

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Fig.5.

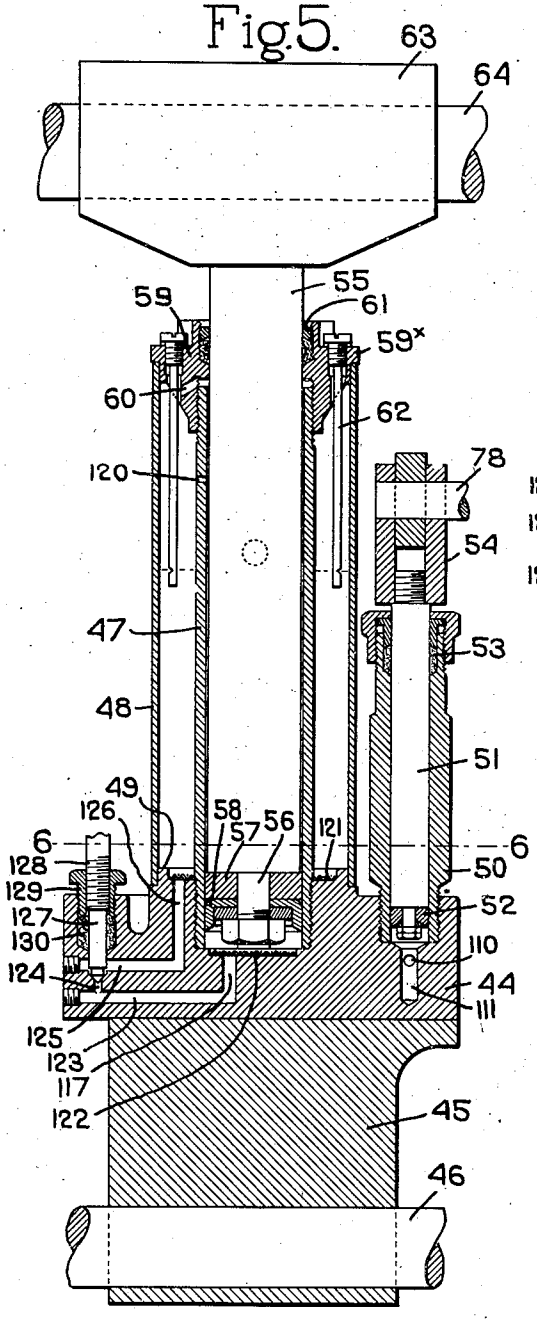


Fig.6.

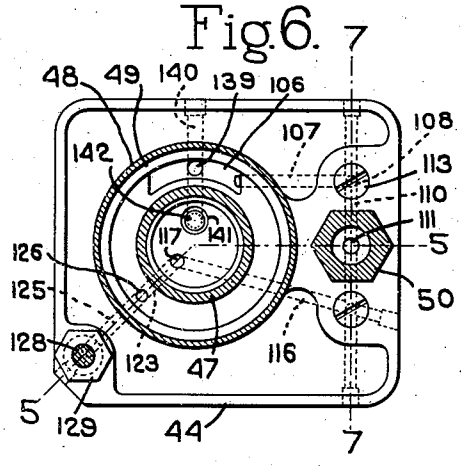


Fig.7.

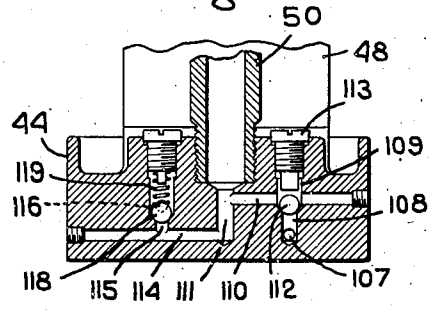
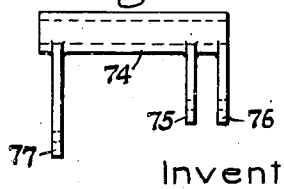


Fig.11.



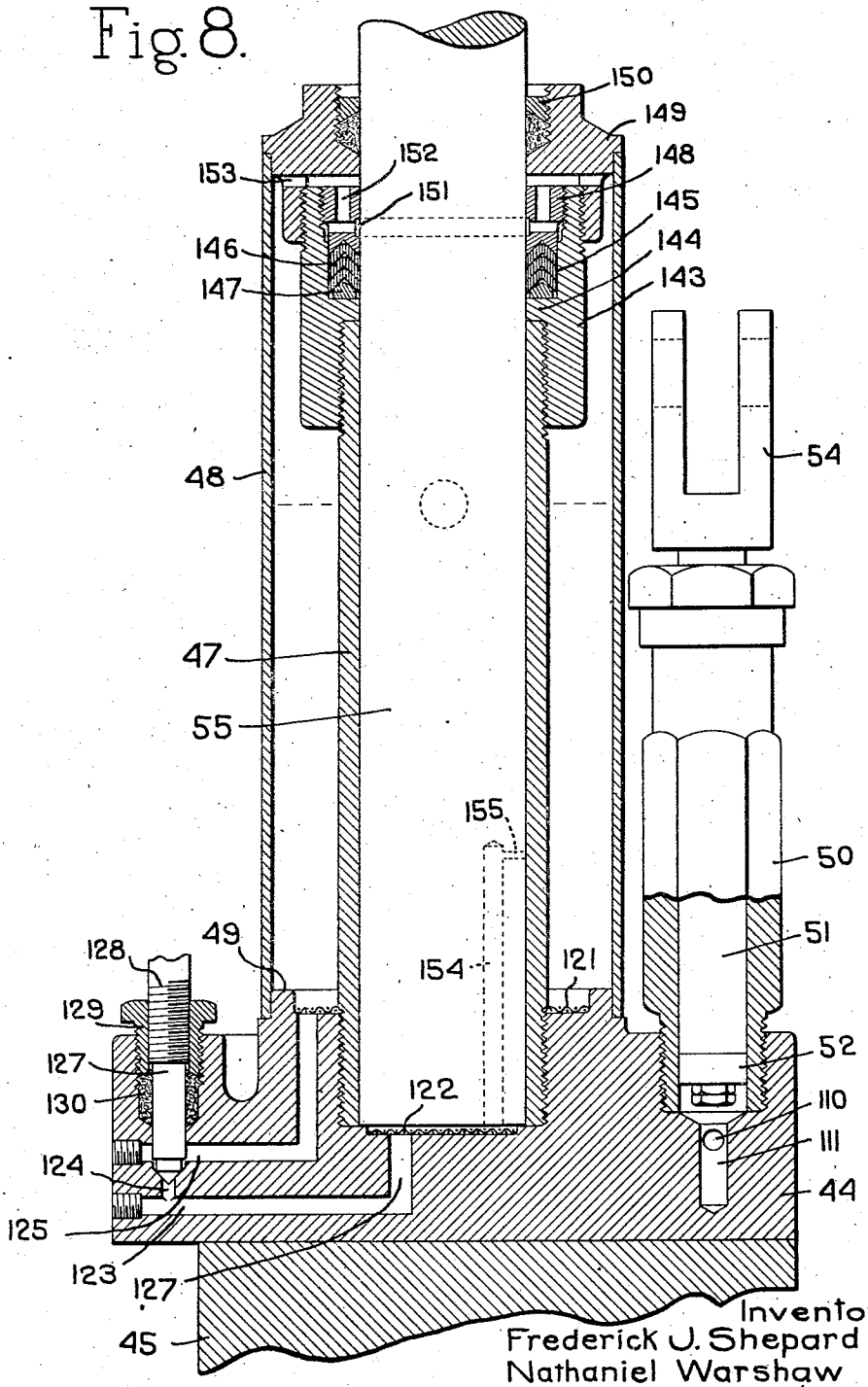
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Fig. 8.



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Patented June 6, 1939 2,161,659

UNITED STATES PATENT OFFICE

2,161,659

SELECTIVELY OPERABLE MECHANICALLY AND FLUID ACTUATED LIFTING TRUCK

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Application October 24, 1936, Serial No. 107,422

22 Claims. (Cl. 254—10)

This invention relates to improvements in elevating trucks having an upwardly movable platform adapted to be introduced beneath the article to be transported, or more usually beneath a skid supporting one or more articles to be transported, with means for raising the load supporting means to lift the article or skid from the floor a sufficient distance to enable it to be transported by the truck to its destination.

Elevating trucks of this character are employed to transport not only relatively light loads, but very heavy loads, and it is desirable in order to save time and effort upon the part of the operator to provide manually operable means for raising the weighted load supporting means to the desired height rapidly when a light load is being transported, or to employ such manually operable force multiplying means as to enable heavy loads to be lifted with a minimum effort upon the part of the operator.

Inasmuch as it is desirable to have the load supporting means when in lowered position a considerable distance below the article or skid so that the truck can be conveniently manipulated in backing the same beneath the article or skid, it is desirable that means shall be provided for rapidly raising the load supporting means until the under surface of the article or skid is engaged by the load supporting means, and if the load is not a heavy one for further raising the load supporting means to the desired height for transportation of the article. However, where heavy loads are to be transported it is desirable to employ force multiplying means for raising the load supporting means after it has engaged the under surface of the article or skid. We are aware that this has heretofore been accomplished by providing fluid actuated lifting mechanism comprising a lifting cylinder and ram for raising the load supporting means with a plurality of pumps selectively operable to force fluid under pressure into the ram cylinder as disclosed in the patent to Daniel E. Hennessy No. 2,009,970 granted July 30, 1935, but in this construction the manipulation of the pump plunger for raising the load supporting means rapidly requires a plurality of reciprocations and also requires manipulation of mechanism to disconnect the actuating mechanism from the pump plunger which is not to be employed in the lifting operation.

One of the objects of the present invention is to provide mechanically operated means for raising the load supporting means until the load supporting means engages the under face of the article or skid to be raised and fluid actuated mechanism operable thereafter to raise the load supporting means preferably step by step in which the lifting force applied to the load supporting means is greatly multiplied over that exerted by the operator.

The mechanically actuated lifting mechanism desirably is so constructed as to be operated by a foot pedal which permits the operator easily to raise the load supporting means into engagement with the under face of the article or skid to be lifted, but which also will enable him by projecting his force suddenly upon the pedal to raise a load of substantial weight to the desired height as is disclosed in the patents to Daniel E. Hennessy Nos. 1,867,825 and 1,867,826 granted July 19, 1932.

The present invention embodies the advantageous features of all of the above patents and particularly comprises mechanically actuated rapid lifting mechanism for initially raising the load supporting means and fluid actuated mechanism for applying greater force to raise the weighted load supporting means rapidly step by step. Preferably the mechanically actuated load supporting means is raised by pedal mechanism and the fluid actuated load supporting means operated by vertical swinging movements of the tongue when in any steering position, as will hereinafter be described.

In the preferred construction suitable means are provided for connecting the load supporting means to the fluid actuated ram, and the mechanically actuated means also acts upon the ram to raise the load supporting means without the introduction of fluid under pressure into the ram cylinder. When, however, the ram is raised by the mechanically actuated lifting mechanism a vacuum will be created beneath the ram piston or shaft, and a further object of the invention is to provide means for admitting fluid into the ram cylinder to fill the space beneath the ram piston as the ram is raised and to retain it therein, so that when the mechanical lifting mechanism is released the load supporting means will be sustained at the height to which it is raised and operation of the fluid actuated mechanism will thereupon raise the load supporting means step by step to the desired height.

A further object of the invention is to provide extensible means connecting the mechanically actuated pedal mechanism to the ram which will permit release of the pedal mechanism when the load supporting means is raised to a predetermined height without interfering with the further upward movement of the load supporting means

produced by the operation of the fluid actuated lifting mechanism.

Another object of the invention is to provide a fluid operated jack for lifting the load supporting means having an actuating lever for reciprocating the pump plunger, with means for adjusting the effective leverage of said actuating lever to vary the force applied to the plunger and the length of the stroke of the plunger. By such adjustment of the effective leverage applied through the pump plunger actuating lever, lighter loads may be lifted by the fluid actuated lifting mechanism more rapidly by fewer strokes of the pump plunger, while exceedingly heavy loads may be lifted more slowly by a greater number of strokes of the plunger and by the application of greater force to the pump plunger.

Another object of the invention is to provide fluid actuated lifting mechanism of the character described with novel means for releasing the fluid which supports the ram and load supporting means which comprises an outlet passage connecting the cylinder chamber to the reservoir provided with a valve having a screw threaded stem operable when rotated in one direction to close the conduit, with resilient means acting upon the valve stem to hold the valve in closed position, and manually operable means for rotating the valve in the opposite direction against the force of the spring gradually to open the valve. By reason of this construction the descent of the load supporting means is always under manual control and the danger of dropping of the load too rapidly is obviated.

A further object of the invention is to provide an elevating truck of such construction as to provide ample clearance beneath the frame of the truck to enable it to pass over doorway sills and the abrupt angles of inclines joining a ramp to a floor, also to enable the load supporting means to be sufficiently lowered to enable the truck to be readily backed beneath the skid, with ample clearance and to have means for lifting the load supporting means to such height as will prevent the legs of the article being lifted or the skid from engaging such usual obstructions as may be present in the path of the loaded truck. This is accomplished in the present invention by providing the rear end of the main frame with downwardly extending offset portions in which the axle of the rear wheels of the truck is mounted and in so constructing the load supporting means that when in lowered position it will telescope upon the main frame in such manner that the upper surface of the main frame and the upper surface of the load supporting means will be in substantially the same plane when the load supporting means is in lowered position.

Another object of the invention is to provide means for holding the steering tongue normally in vertical position particularly when the load supporting means is raised by independently actuated pedal operated mechanical lifting means and for providing spring actuated means for holding the foot lever or pedal normally in substantially vertical position to permit the truck to be manipulated in a minimum space.

Another object of the invention is to provide an elevating truck having steering mechanism including a tongue mounted to swing vertically, upwardly movable load supporting means, and means for lifting the load supporting means operable by vertical swinging movements of the tongue with an adjustable tongue extension having means for positively locking said extension in longitudinally adjusted positions, thereby enabling a greater or less leverage to be applied to the lifting mechanism in correlation to the weight of the load to be lifted.

These and other objects and features of the invention will more fully appear from the following description and the accompanying drawings and will be particularly pointed out in the claims.

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

Fig. 1 is a side elevation of the preferred form of elevating truck, the upper portion of the arch of the frame being broken away and the top of the arch and the shaft extending transversely across the same being shown in section and illustrating the load supporting means in raised position and also showing in dotted lines the position of the load supporting means when in lowered position;

Fig. 2 is a detail view partly in section of the portion of the tubular tongue and an extension therefor and illustrating means for locking the extension in adjusted positions;

Fig. 3 is a horizontal sectional view on line 3—3, Fig. 1, viewed downwardly, and illustrating particularly the main frame of the truck and the manner in which the load supporting means is mounted thereupon;

Fig. 4 is a front elevation of the truck illustrated in Fig. 1, the front portion or head of the frame being broken away and the positions of the steering wheels and rear wheels illustrated in dotted lines;

Fig. 5 is a detail view, mainly in vertical section on line 5—5 Fig. 6, of the fluid operated power unit showing the manner in which it is mounted upon a horizontal shaft in the main frame which is shown in elevation, and also showing the ram and ram shaft in elevation, and the manner in which the ram is pivotally mounted upon a shaft which is connected to the load supporting means;

Fig. 6 is a horizontal sectional view on line 6—6 Fig. 5;

Fig. 7 is a detail sectional view on line 7—7 Fig. 6, viewed from the right toward the left; and,

Fig. 8 is a view, mainly in section, of a modified form of the fluid actuated ram cylinder construction on line 5—5 Fig. 6.

Fig. 9 is a detail sectional view on line 9—9 Fig. 4 viewed from the left toward the right, a portion of the rod connecting the upper and lower lever mechanisms being broken away to display the mechanism therebeyond;

Fig. 10 is a detail vertical sectional view on line 10—10 Fig. 9;

Fig. 11 is a view of the sleeve and arms of the pump plunger actuating and restoring mechanism.

The elevating truck illustrated in the accompanying drawings has a main frame formed of parts electrically welded together to provide an integral construction. The main frame comprises essentially a pair of side frames each of which is formed of substantially outer and inner horizontal bars 1 and 2 (see Figs. 1 and 3) the rear ends of which are offset downwardly a distance substantially equal to the vertical depth of the side bars, preferably by welding, to the under face of the side bar 1, extensions 3, the front ends 4 of which are of greater thickness than the side bars 1 so that the upper surfaces thereof extend outwardly from the outer plane of the

side bars 1 a sufficient distance to form rests for the load supporting means when in lowered position, as will hereinafter more fully appear. The inner side bar members 2 are similarly provided with downwardly offset extensions 5 and the rear ends of all the side bars are rigidly secured by welding to a rear connecting girder 6. The rear axle 7 of the main frame is journaled in the downwardly offset extensions 3 and the rear wheels 8, which are rotatably mounted upon the shaft 7 between the rearward extensions 3 and 5 of the side frames, desirably are provided with antifriction bearings (not shown).

The front ends of the side frames 1 and 2 desirably converge and are integrally connected by webs 9 and from such webs extend forwardly in parallelism. The front ends of the side bars 1 are connected by welding to a head 10 and this union may also be strengthened by gusset plates 11 which are welded to the side bars 1 and to the head 10. The head 10 has an integral forwardly extending bridge 12 of hollow rectangular vertical cross section and is provided centrally of its length with a tubular bearing for a steering post, the lower end of said bearing having welded to it an enlarged circular disk 13 adapted to be engaged by the fork of the steering mechanism and to permit antifriction bearings (not shown) to be interposed between the frame and the fork of the steering mechanism. The head is also provided with a vertical arch 14 which desirably is located slightly rearwardly of the bridge member 12 and is welded at its lower ends to the head. The front ends of the side bar members 2 likewise are welded to flanges 15 extending rearwardly from the head. By reason of this construction a very rigid integral main frame is provided which is essential for trucks of heavy duty.

The steering mechanism comprises a hollow vertical steering post 16 which is mounted in the central bearing in the bridge 12 and is provided with a fork 17 having at its lower end an axle 18 upon which a pair of steering wheels 19 are mounted. A split collar 20, which is clamped upon the upper end of the steering post, is provided with parallel forward extensions 21 in the upper end of which a shaft 22 forms the fulcrum for a vertically swinging tongue. The swinging tongue comprises a handle member 23 which is bolted in the socket of a member 24 which is pivotally mounted upon the shaft 22 and is provided with a forked rearward extension 25, the lower end of which is adapted when the tongue is in substantially vertical position to engage the upper end of the collar member which is secured to the steering post.

One of the features of the invention comprises means for normally maintaining the tongue in vertical position in order that the truck may occupy a minimum amount of space and also to provide a convenient support which may be grasped by the operator when operating the pedal actuated mechanical lifting mechanism which will hereinafter be described. In the present construction the tongue is normally held in vertical position by a coiled spring 26 which is located within and axially of the hollow steering post and is secured at its upper end to the tongue and at its lower end to a pin 27 extending diametrically across the tubular steering post.

The mechanism for raising the load supporting means comprises manually actuated mechanism, preferably operable by the depression of a foot lever and a selectively operable fluid actuated jack hereinafter described, the pump plunger of which is reciprocated by mechanism operable by vertical swinging movements of the tongue, the lifting jack mechanism also acting to sustain the load supporting means at any desired elevation, with manually operable means for releasing the fluid pressure to permit the descent of the load supporting means.

The load supporting means comprises horizontal side frames having outer and inner side bars 28 and 29 complementary to the side bars 1 and 2 of the main frame, and spaced apart sufficiently to telescope over the side bars 1 and 2 when the load supporting means is in lowered position and to rest upon the upper surface of the rearward extensions 3 of the main side frames in such manner that the upper horizontal plane of the bars 28 and 29 of the load supporting means and the upper horizontal plane of the bars 1 and 2 of the side frames will substantially coincide when the load supporting means is in lowered position and resting upon the rearward extensions 3 of the side frames. By reason of this construction the load supporting means may be lowered to a minimum height to permit the truck readily to be introduced between a skid or article to be transported and by reason of the downwardly offset rear end portions of the main frame sufficient under-clearance is given to the truck to enable it to pass over sills, angularly disposed surfaces of a floor and ramp, and other obstructions which normally would interfere with proper transportation of the truck.

The rear ends of the side frames 28 and 29 are integrally connected to a horizontal girder 30 and the inner side bars 29 may also be connected by a suitable web or webs 31. The side bars 28 and 29 of the load supporting means desirably converge toward each other at their front ends and are connected by welding to a dash or standard 32 having forwardly projecting flanges 33 and 34 having shafts 35 forming pivots for front pairs of parallel links 36 the lower ends of which are pivoted upon shafts 37 in the main frame. The parallel links 36 desirably are each formed of a pair of flat triangular plates, as illustrated in Fig. 3, spaced apart by and welded to sleeves 38 and 39 which are journaled respectively upon the shafts 35 and 37. The rear end of the load supporting means is likewise connected to the main frame by parallel links 40 comprising parallel plates welded at their rear ends to sleeves 41 which are journaled at their upper ends upon shafts 42 in the load supporting means, said links 40 being pivotally mounted at their lower ends upon the rear axle 7.

In order to provide ample width of the side frames 28 and 29 of the load supporting means to receive the bearing shafts 42, the rear end portions of the side frames are provided with wider portions 43 extending downwardly and having beveled edges the forward edges of which are adapted to engage the complementary beveled surfaces upon the rear end of the extensions 3 and 5 of the end frame.

The mechanism for raising the load supporting means, as heretofore stated, comprises mechanically actuated means preferably operable by a pedal for raising the load supporting means rapidly into engagement with the under surface of the skid or article to be lifted, and which also may be employed to raise the load supporting means when carrying a relatively light load to a sufficient height to enable the load to be transported and selectively operable fluid actuated means for raising the load supporting means

step by step when a heavy load is to be lifted. Inasmuch as the ram of the fluid actuated lifting mechanism is connected to the load supporting means and adapted to be raised by the upward movement of the ram, either when actuated by fluid under pressure or by mechanical lifting mechanism, the fluid actuated mechanism will be first described.

The fluid actuated mechanism comprises a preferably hydraulic jack having a base block 44 which is rigidly secured to or formed integral with a downwardly extending bracket 45 which is journaled at its lower end upon a shaft 46 mounted at its ends in the inner flanges 15 of the head to which the inner side bars 2 of the main frame are welded. By reason of this construction the lifting jack is pivotally mounted upon the main frame in such manner that the ram may swing longitudinally of the truck. The base block 44 has a central bore provided with screw threaded walls which receive the lower end of a vertical ram cylinder 47 of the fluid actuated lifting mechanism (see Fig. 5).

The reservoir for the fluid comprises a cylinder 48 which is preferably concentric with the cylinder 47 and tightly fits at its lower end upon the outer surface of an annular boss 49 extending upwardly from the base block 44. The base block also is provided at a suitable distance from the cylinder with another bore having a screw threaded wall which receives the screw threaded lower end of a vertical pump cylinder 50. A pump plunger 51 is reciprocably mounted in the pump cylinder 50 and is provided at its lower end with a screw threaded extension of smaller diameter presenting a shoulder and a piston packing 52 is clamped against said shoulder by suitable nuts upon the extension. The upper end of the pump cylinder 51 is provided with a suitable stuffing box 53 and the upper end of the pump plunger is screw threaded and engaged by a fork or clevis 54 adapted to be attached to an actuating mechanism.

As illustrated in Figs. 5 and 6 the ram comprises a ram shaft 55 which is reciprocably mounted in the cylinder 47 and is provided at its lower end with an extension 56 of relatively small diameter and a piston head 57 and cup packing 58 are clamped against the shouldered end of the ram shaft by a suitable nut and washer. A cap or head 59, which is screwed upon the upper end of the cylinder 47, is provided with a lateral extension or flange 59_x which seats firmly upon the upper end of the reservoir cylinder 48. One or more recesses 60 in the cap 58 communicates with the space between the upper end of the cylinder 47 and the under face of the cap and provides a relief passage for discharging any fluid which may work up along the surface of the ram shaft into the reservoir. The upper end of the cap is countersunk and screw threaded to provide a stuffing box in which a suitable packing is forced tightly against the ram shaft by a nut 61. The cap 58 may be provided with one or more bores having screw threaded walls for the insertion of measuring rods 62 to determine the height of liquid in the reservoir when the ram shaft is in lowered position, the rod or rods 62 being provided at their upper ends with enlarged screw threaded portions engaging the screw threads in the bore and also with a slotted head to receive the bit of a screw driver.

The upper end of the ram shaft 55 has secured to or integral with it a relatively large head 63, preferably of substantially rectangular cross section, which is bored horizontally and mounted upon a shaft 64, the ends of which are pivotally mounted in links 65, the other ends of which are pivotally mounted upon a horizontal shaft 66 which extends transversely across and is mounted in the upper portion of the arch 14 of the main frame. Links 67, which are also mounted at their upper ends upon the shaft 64 which extends through the head of the ram, are pivotally connected at their lower ends to shafts 68 which are mounted in the front parallel links 36. By reason of this construction the lifting of the ram head 63 raises the rear ends of the forward parallel links 36 swinging them about their pivots 37, thereby moving the front end of the load supporting means upwardly and forwardly. At the same time the forward movement of the load supporting means swings the rear parallel links upwardly and forwardly so that the load supporting means is raised in substantial parallelism with the main frame.

Suitable mechanism is provided for actuating the pump to draw fluid from the reservoir and force it into the lower end of the cylinder, thereby to raise the ram shaft and ram. In view of the fact that the ram head 63 is guided in an arcuate path by the links 65 as it is raised and lowered, suitable mechanism is provided for reciprocating the pump plunger in an axial direction irrespective of the inclination of the pump cylinder to the vertical. A sleeve 69 is welded to a rearwardly extending flange on the bracket 45 and has rotatably mounted in it a shaft 70 upon the ends of which is mounted a pump lever support comprising upwardly extending links 71 connected by a web 72. A shaft 73, which is mounted in bosses in the upper ends of the links 71, forms a fulcrum for a pump lever which comprises a sleeve 74 having integral therewith at one end forwardly projecting arms 75 and 76 and at the other end an integral forwardly projecting arm 77. The arm 75 extends between and is connected to the clevis 54 of the pump plunger by a pin 78. This pin extends also through the arm 76 and secures the same to a clevis 79 at the upper end of a rod 80 (see Fig. 1), the lower end of which is provided with a similar clevis 81 connected by a pin 82 to the intermediate portion of a lever 83 which is fulcrumed at its lower end upon the shaft 70 which extends through the sleeve 69 on the bracket 45. The forward end of the lever 83 is pivotally connected to a clevis 84 upon the lower end of a pump actuating link or rod 85 having a screw threaded upper end upon which a clevis 86 is adjustably mounted and adapted to be secured in adjusted position by a lock nut. The clevis 86 is pivotally connected at its upper end to a pump actuating lever mechanism which is fulcrumed upon the shaft 66 which extends across the upper portion of the arch of the main frame and is adapted to be actuated by vertical swinging movements of the tongue.

In order to permit the lifting of the ram and load supporting means selectively by mechanical lifting mechanism and by fluid operated lifting mechanism, the pump actuating lever, which is mounted upon the shaft 66, is formed in two sections adapted selectively to be connected together or to be disconnected from each other. One of the sections of the pump plunger actuating lever comprises parallel triangular plates 87 which are fulcrumed upon the shaft 66 and spaced from the adjacent link 65 by a sleeve 88. The forwardly extending arms of the lever

plates 87 are pivotally connected to the upper end of a strut 89 the axis of which is substantially coaxial with the axis of the steering post and the lower end of the strut 89 is pivotally connected to the forked tongue extension 25. A pin 90 is slidably mounted in the rear end portions of the rearwardly extending arms of the lever plates 87 and is provided with a forwardly extending handle 91 which extends through a longitudinal slot in a sleeve 92 which encloses said pin and is welded at its ends to the lever plates 87. The sleeve is provided with recesses 93 which serve to lock the pin in adjusted positions. When the pin 90 is thrust to the right, as illustrated in Fig. 4, the end of the pin 90 extends into a socket in the arm 94 of the other section of the actuating lever 87, thus locking the sections of the actuating lever together. The arm 94 is integral with a sleeve 95 which also has a rearwardly extending arm 96, (see Fig. 1) which is provided adjacent its rear end with a longitudinal slot. A slide 97, which is mounted upon the rearwardly extending lever arm 96, is pivotally connected to the clevis 86 by a pin 98 which extends through the forked arms of the slide, the slot in the lever arm 96, and the arms of the clevis 86. An adjusting screw 99, which is rotatably secured in a boss 100 extending upwardly from the sleeve 95, is provided with a knurled head 101 by means of which the screw may be rotated to move the slide 97 forwardly or backwardly, thereby varying the effective length of leverage of the pump actuating lever which is transmitted through the pump link or rod 85 to the lever 83 through which reciprocation is imparted to the pump plunger. By reason of this construction the effective force applied to the pump plunger and its length of stroke may be adjusted in correlation to the weight of the load upon the load supporting means. Therefore, by adjusting the slide 97 rearwardly toward the end of the lever arm the pump plunger may be given a longer stroke with a lesser force applied to the pump plunger than when the slide is adjusted forwardly in such manner as to shorten the effective length of the lever arm 96.

By moving the pin 90 to the left (Fig. 1) into the other recess 93 in the sleeve 92, the pin 90 may be disengaged from the rearwardly extending lever arm 94, thereby detaching the mechanism which is operated by the vertical reciprocating movements of the tongue from the fluid actuating mechanism, so that the ram head and ram may be lifted independently of the fluid actuated lifting mechanism.

Desirably means are provided for aiding in raising the pump plunger when the swinging tongue is raised after having been depressed. In the preferred construction illustrated herein a pump return spiral spring 102, which is seated at its lower end upon an extension 103 of the bracket 45 which supports the base 44 of the fluid actuating mechanism and at its upper end engages the lower end of a clevis 104 upon a downwardly extending guide rod 105 which projects through the bracket extension 103. The clevis 104 is pivotally connected to the forwardly extending arm 77 of the sleeve 74, other arms 75 and 76 of which are pivotally connected respectively to the pump plunger 51 and to the rod 80 through which power is transmitted to the pump plunger from the lever 83 (see Figs. 1 and 4). The action of the spring 102 when compressed, therefore, tends to raise the pump plunger and to restore the lever mechanisms and tongue to upraised position.

Suitable means are provided for transmitting fluid pressure upon the actuation of the pump plunger to the lower portion of the ram cylinder, thereby to raise the ram and load supporting means. In the preferred constructions illustrated herein the base block 44 is provided with suitable conduits through which the fluid is drawn from the reservoir into the pump upon the upward movement of the plunger and forced from the pump into the lower end of the cylinder upon downward movement of the pump plunger. These conduits are particularly shown in Figs. 5, 6, and 7, in which the base block is provided with an arcuate recess 106 which communicates with one end of a bore 107 which communicates with a vertical bore 108 having a countersunk portion 109. The upper end of the bore 108 communicates with a transverse bore 110 leading to a vertical bore 111 which communicates with the lower end of the pump cylinder. The countersink 109 of the bore 108 provides a valve seat for a ball valve 112 and the upper countersunk portion of the bore 108 is provided with a screw threaded plug 113 the end of which is located slightly above the ball so as to permit the ball to be raised when fluid is drawn from the reservoir through the bores 107, 108, and 110 by the upward or suction movement of the pump plunger. Upon discontinuance of the upward movement of the plunger the ball 112 will drop to its seat and prevent retrograde movement of the fluid when the pump plunger is forced downwardly.

The bore 111, which communicates with the lower end of the pump, also communicates with a bore 114 which is plugged at its outer end and which communicates intermediate of its ends with a short vertical bore 115 which in turn communicates with a bore or conduit 116 leading to a vertical bore 117 extending downwardly from the bottom of the ram cylinder. The vertical bore 115 is countersunk to provide a seat for a ball valve 118 which is normally held seated by a spring 119 the upper end of which is engaged by a screw threaded plug in the enlarged countersink of the bore 115. Upon depression of the pump plunger the fluid is forced through the conduits 111, 115, 116, and 117, into the ram cylinder, thereby raising the ram. When the fluid is forced in this direction the ball valve 118 is raised, permitting the fluid to flow into the ram cylinder, but immediately upon cessation of depression of the pump plunger the valve 118 is seated, thereby preventing the return of any fluid from the ram cylinder to the pump. It will therefore be obvious that the reciprocation of the pump plunger will serve to draw fluid from the reservoir and force it under pressure into the ram cylinder, thereby raising the ram and the load supporting means.

Upward movement of the ram piston is limited by providing a port 120 in the wall of the cylinder at a predetermined height to permit escape of fluid from the ram cylinder to the reservoir when the piston at the lower end of the ram shaft is raised to a sufficient height.

In order to prevent clogging of the conduits for the fluid an annular screen 121 is located in the recess formed between the ram cylinder and the flange 49 and a similar screen 122 is also located in a countersink in the base below the end of the ram cylinder.

Fluid may be introduced into the reservoir

through a suitable plugged aperture located slightly above the normal level of the liquid in the reservoir when the ram is in lowered position as illustrated by the dotted circle Fig. 5.

An important feature of the invention comprises manually controlled means for releasing the fluid pressure in the pump cylinder, to permit the descent of the load supporting means, of such construction that the descent of the load supporting means can be accurately controlled and which requires continuous manual control during the descent of the load supporting means, so that unless the operator continuously maintains control of such releasing mechanism the escape of fluid under pressure from the cylinder will be instantly stopped, thereby preventing such descent of the load supporting means as would be likely to create shock which might damage the articles being transported or the truck itself.

The means for releasing fluid pressure in the ram cylinder, which is shown particularly in Figs. 5 and 6 of the drawings, comprises a conduit 123 which communicates with the lower end of the ram cylinder through the screen 122 and is plugged at its outer end, but communicates intermediate of its ends with a vertical port 124 leading to a conduit 125 having an outer plugged end and the inner end of which communicates with a vertical bore 126 the upper end of which communicates through the screen 121 with the reservoir. The base block 44 is provided with a vertical bore in axial alinement with the port 124 to receive a valve stem 127 the lower end of which is reduced in diameter and tapered to provide a valve fitting a complementary valve seat at the upper end of the port 124. The valve stem 127 has an enlarged screw threaded portion 128 which engages complementary internal threads in a nut 129 which is externally threaded to engage threads in the wall of the countersink. The countersink is of sufficient depth to receive a suitable packing 130 thereby providing a stuffing box for the valve stem which will prevent escape of the liquid under pressure which is forced through the conduits 123 and 125 from the ram cylinder into the reservoir.

Desirably the means for controlling the outlet valve is mounted at a convenient place upon the upper end of the arch 14 and in view of the fact that the fluid actuated unit and ram cylinder are pivotally mounted upon the base to swing forwardly and rearwardly, means are provided for actuating the outlet valve which will not be interfered with by such swinging movement of the power unit.

In the preferred construction illustrated, (see Fig. 4) the upper end of the valve stem 127, 128, is provided with a clevis 131 which is pivotally connected to a complementary member 132 which is fixedly secured to a rod 133 extending upwardly through the arch 14 and has secured to its upper end a preferably cylindrical head 134 provided with an operating handle. For convenience of manipulation the upper end of the head 134 is diametrically slotted and the ball-shaped end of a lever 135 is so mounted in the slot that it can be moved from vertical position either to the right or left into horizontal position. A coiled spring 136 seated at its lower end upon the upper end of the rod 133 and has at its upper end a suitable bearing engages the flattened face upon the ball adapted to hold the lever in vertical position, but also serves to hold the lever in either of the horizontal positions in which the operator may choose to position it.

In order to insure the maintenance of the valve 127 in closed position and to close it if the operator should release the operating lever 135, a coiled spring 137 which surrounds the rod 135 is secured at one end to the arch 14 and at its other end to a collar 138 which is fixedly secured upon the rod 133, the tension upon the spring 137 being such as to tend to rotate the rod 133 in a direction to close the valve.

When it is desired to release the fluid under pressure from the ram cylinder the handle 135 is turned in the direction to unscrew the screw threaded portion 128 of the valve stem from the nut 129, thereby gradually raising the valve and permitting the fluid to flow through the conduit 123, the port 124 and conduit 125 into the reservoir. If the operator should release the handle at any time the spring 137 will rotate the valve stem in a direction to restore the valve to seated position, thereby preventing any uncontrolled descent of the load supporting means.

In order to permit fluid to flow from the reservoir into the ram cylinder when the ram is raised by mechanical means hereinafter described, the base block 44 is provided with a conduit comprising a vertical bore 139 leading downwardly from the reservoir and communicating with a horizontal bore 140 which is plugged at its outer end and which at its inner end communicates with a vertical bore 141 in the bottom of the ram cylinder. The upper portion of the bore 141 is countersunk to provide a seat for a ball valve 142. When therefore the ram cylinder is raised mechanically the ball will be unseated to permit fluid to flow from the reservoir into the ram cylinder. Any suitable means, such as a small port in the upper end of the wall of the reservoir or a looseness of the fit of the screw threaded portion of the measuring rods 62, may be provided to permit sufficient air to enter the reservoir to establish atmospheric pressure therein during the raising of the ram plunger. However, this is not found necessary in practical experience as the normally high level of the liquid in the reservoir then in the ram cylinder will insure the filling of the ram cylinder beneath the plunger when thus raised mechanically. Upon cessation of the upward movement of the ram the ball will immediately seat thereby preventing the return of fluid from the ram cylinder to the reservoir. By reason of this construction the fluid in the ram cylinder will prevent downward movement of the ram and the load supporting means will be retained in raised position unless and until the fluid is released from the ram cylinder in the manner herein described.

A preferred and simplified form of ram cylinder and ram shaft construction is illustrated in Fig. 8 of the drawings. In this construction the ram shaft 55 is carefully surfaced to fit tightly but slidably in the ram cylinder 47, thereby obviating the necessity of a piston head and packing at the lower end of the ram shaft. The upper end of the cylinder 47 is screw threaded and has mounted upon it a cylindrical sleeve 143 having a central recess provided with an internal screw threaded wall complementary to the screw threads upon the upper end of the cylinder and is provided with a web 144 which fits upon the ram shaft 55. The sleeve is bored from its upper end to provide a chamber 145 adapted to receive a suitable chevron packing formed of a plurality of annular packing rings 146 V-shaped in cross section and superimposed upon each other upon an annular ring 147 having a V-shaped upper

surface complementary to but of somewhat wider angle than those of the V-shaped packing rings. The upper end of the sleeve 143 is counterbored and internally screw threaded to receive an externally threaded nut 148 having a V-shaped under surface adapted to engage the uppermost of the V-shaped rings of the chevron packing. The upper end portion of the sleeve 143 is externally screw threaded and is engaged by an internally screw threaded downwardly extending flange on a cap 149 having a peripheral flange which engages the upper end of the cylindrical reservoir wall 48 and serves to clamp the reservoir wall firmly upon the shoulder on the base block surrounding the annular boss 49 of the base block. The upper portion of the cap is counterbored and internally screw threaded to receive a nut 150 which clamps a packing tightly upon the ram shaft, thereby providing a stuffing box construction effective to guide the ram shaft and to prevent the escape of fluid.

In order to limit the upward movement of the ram shaft to a position safely within the ram cylinder and also to determine the upward movement of the load supporting means, means are provided for releasing fluid under pressure from the ram cylinder when the ram shaft has reached a predetermined height. In the particular construction illustrated the nut 148 is provided intermediate of its length with an annular groove 151 having radial outlets which communicate with vertical bores 152 leading to a space between the cap and the nut 148 which communicates with radial bores 153 in the cap through which the fluid may be discharged into the reservoir. The ram shaft 55 is provided with a vertical bore 154 extending upwardly from its lower end to a predetermined height with a lateral port 155 extending therefrom through the wall of the ram and adapted when registering with the groove 151 to discharge fluid under pressure into it. While the port 155 registered with the groove 151 fluid passes from the ram cylinder through it and the vertical bores 152 in the nut into the space between the nut and the lower face of the cap and is discharged through the outlet 153 into the reservoir. Upon cessation of the reciprocation of the pump cylinder the ram shaft will lower slightly until the port 155 is out of registry with the groove 151 and the ram shaft and ram will then be sustained in upraised position by the fluid which is trapped in the cylinder beneath the ram shaft.

The selectively operable mechanical lifting means

As heretofore stated, one of the principal objects of the present invention is to provide mechanically operated means for rapidly raising the load supporting means into engagement with the under face of the skid, where heavy loads are to be lifted, with fluid actuated means thereafter operable to apply greater power to lift the load supporting means step by step.

In the preferred embodiment of the invention illustrated herein the mechanically actuated lifting mechanism comprises a lever preferably in the form of a pedal 156 fixedly secured to a sleeve 157 which is mounted upon a stud shaft 158 extending through and mounted in the head 10 and the flange 15 forming one side of the main frame. The sleeve 157 has an integral rearwardly extending arm 159 the rear end of which extends into the forked head 160 of a tubular thrust member 161 and is pivotally secured to it by a pin 162. A thrust rod 163, which is telescopically and slidably mounted in the tubular thrust member 161, is provided with an enlarged head 164 which is pivotally mounted upon a stud 165 which extends outwardly from a link 67 which connects the head 63 of the ram to the front parallel links 36 connecting the load supporting means to the frame. The rod 163, which extends into the tubular thrust member 161, is of such length that when the foot lever is in raised position and the load supporting means in lowered position it will engage the head 160 or other suitable abutment at the lower end of the tube, so that when the lever is depressed the tube member and rod will be in effect a continuous thrust member which when the pedal is depressed will raise the link 67 and the head 63 of the ram and will pull the front parallel links 36 upwardly and forwardly thereby directly raising the load supporting means. As the load supporting means is thus mechanically raised fluid will flow from the reservoir through the conduits 139, 140, and 141 into the cylinder and upon cessation of the upward movement of the ram shaft the ball valve 142 will close and by trapping the fluid in the ram cylinder will sustain the load supporting means in its raised position. A coiled spring 166, which is interposed between the head 164 of the thrust rod 163 and the upper end of the tube 161, exerts a downward pressure upon the rearwardly extending arm 159 of the pedal actuated lever and tends to hold the pedal 156 in vertical position illustrated in Fig. 1 and to return it to that position after it has been depressed and released. The pedal lever 156 may be prevented from passing beyond a predetermined substantially vertical position by a pin 167 projecting from the side frame into the path of the pedal arm.

The telescoping thrust members comprising the tube and rod above described also provide in effect an extensible thrust member adapted to permit further raising of the load supporting means by the fluid operated jack without interference with the actuation of the fluid actuated mechanism.

In order to facilitate convenient manipulation of the fluid actuated mechanism when heavy loads of different weight are to be lifted, the tongue is provided with an adjustable extension by means of which the leverage applied by the operator with substantially the same exertion of force may be varied. A preferred construction is illustrated in Fig. 2 in which a cylindrical bar 168 is slidably mounted in the end portion of the tubular tongue 23. The bar 168 is provided with a longitudinally extending groove 169 having at intervals suitable depressions or sockets 170 adapted to be engaged by the end of a screw threaded locking member 171 which is mounted in a boss 172 near the end of the tubular tongue member and is provided with a knurled head 173 by means of which it can be readily rotated. The screw 171 normally extends at all times into the slot 169, thereby preventing rotation of the bar 168 within the tubular tongue 23.

In order to adjust the tongue extension 168 lengthwise of the tubular tongue, it is only necessary to back off the screw 173, slide the bar 168 longitudinally until the selected socket 170 is in alinement with the screw 171, and then rotate the screw in a direction to seat it in the selected socket so that it will firmly hold the bar in adjusted position. The bar 168 is provided at its outer end with a suitable fitting 174 having a transverse tubular handle member 175, of con-

venient size to be grasped by the operator, extending through it.

If desired a sheet metal cover or casing (not shown) may be provided to enclose the fluid actuated and mechanically actuated means except the pedal and the parts of the pump actuating lever which extends forward of the arch 14. All of the actuating mechanism may be thus concealed and protected from dust and injury.

In the operation of the truck the load supporting means may be lowered by manipulation of the handle 135 to open the outlet valve, thereby permitting fluid to flow from the ram cylinder into the reservoir until the load supporting means has reached its lowermost limit and the upper surface thereof is flush with the upper surface of the main frame. When in such lowered position the truck can be readily backed beneath the skid weighted with the articles to be transported, or beneath an article whose base is of sufficient height to permit the introduction of the truck therebeneath. After the truck has been positioned beneath the skid or other article to be transported the foot pedal lever 156 is depressed by the foot of the operator thereby rotating the sleeve 157 to which it is rigidly connected so that the rearwardly extending arm 159 of the sleeve will raise the tubular thrust member, thereby compressing the spring 166 which surrounds the thrust rod 163 until the coils of the spring engage each other, or until the lower end of the rod 163 engages the head 160 of the tubular thrust member 161. Such depression of the pedal lever causes the thrust members to raise the link 67 and the ram head and the load supporting means to which the respective ends of the link 67 are connected. A single depression of the foot pedal therefore raises the load supporting means quickly until the latter engages the floor of the skid.

As the ram head is thus raised by the mechanical lifting mechanism operated by the foot lever, liquid flows freely from the reservoir to the ram cylinder through the bores 139, 140, and 141, (Fig. 6), thus filling the ram cylinder as the ram piston is raised. Counterflow of the fluid is prevented by the valve 142 in the bore 141 so that when the foot pedal is released the ram and load supporting means are retained in raised position by the fluid in the ram cylinder.

When the load supporting means engages the floor of the skid the foot pedal is released and the expansion of the spring 166, when relieved of the pressure upon it, forces the tubular section 161 of the thrust member downwardly, thereby restoring the foot lever to its normal upraised position as shown in Fig. 1.

If it is desired to lift the load supporting means by the foot lever when the tongue is in upright position, as shown in Fig. 1, the handle 91 of the pin 90 is moved to the left, Figs. 4 and 10, to release the pin 90 from engagement with the arm 94 of the right hand section of the actuating lever. If the tongue is in lowered position such disconnection is not necessary as the lifting of the ram will swing the tongue upwardly.

In order to lift the load supporting means and the skid or other article engaged by it, the tongue is rocked to a position in which the pin 90 can be inserted into the socket in the arm 94 of the actuating lever section. The pin 90 is then moved to the right, Figs. 4 and 10, into engagement with the socket, thus locking the sections of the actuating lever together. The tongue is then raised and lowered vertically to actuate the pump and thereby force fluid into the ram cylinder.

During the downward swinging movement of the tongue the tongue extension 25 raises the strut 89 vertically in the direction of the axis of the steering post irrespective of the steering position of the tongue. The upward movement of the strut 89 rocks the actuating lever, the forwardly extending arms 87 and 94 of which are now connected by the pin 90, causing the rearwardly extending adjustable arm 96 to depress the link 85, thereby swinging the lever 83, to which the lower end of the link 85 is connected, downwardly about its fulcrum 70.

The link 80, which is connected to the lever 83 intermediate of the connection of the link 85 and the fulcrum 70 of the lever 83, is thereby drawn downwardly and as the upper end of the link 80 is connected to the forwardly extending arm 76 of the sleeve 71 the arm 76 is swung downwardly. Inasmuch as the sleeve 74 has also forwardly extending arms 75 and 77 they also are swung downwardly. As the arm 75 is pivotally connected to the pump plunger the pump plunger is forced downwardly thereby forcing the fluid from the reservoir into the ram cylinder and raising the ram.

The other arm 77 of the sleeve 74 is connected to a guide rod 75 which is encircled by the spring 102 and the downward movement of the arm 76 thereby compresses the spring 102, thus storing up power which when downward pressure on the tongue is released tends to restore the lever mechanisms and the tongue to upraised position, thus relieving the operator partially at least of the effort of raising the tongue. Repeated vertical swinging movements of the tongue will therefore pump fluid into the ram cylinder thereby raising the ram and load supporting means step by step.

By reason of the construction above described it is obvious that the mechanically actuated lifting mechanism is supplementary to the fluid actuated mechanism and is not alternative therewith as in prior elevating truck constructions and that the ram cylinder and ram cooperate with the mechanical lifting mechanism to retain the load supporting means in raised position, thus obviating the necessity of employing mechanical locking means to retain the load supporting means in raised position which otherwise would be necessary.

When the load supporting means is thus raised to the desired height, the truck may be drawn to its destination. When it is desired to lower the skid or other article the operator will grasp the handle 135 and rotate it in a direction to raise the outlet valve from its seat, thereby permitting oil to flow from the ram cylinder into the reservoir at a rate which is controlled at all times by the operator. If at any time the operator releases the handle 135 the spring 137 will immediately act upon the rod 133 to rotate the valve stem in a direction to close the valve promptly, thereby preventing further descent of the load.

It will be understood that the preferred embodiment of the invention disclosed herein is of an illustrative character and is not restrictive, and that various changes may be made in form, construction and arrangement of parts within the meaning 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. An elevating truck having upwardly movable load supporting means and means for rais-

ing the load supporting means comprising a fluid operated jack having a reservoir, a cylinder, a ram connected to said load supporting means and means for forcing fluid under pressure from said reservoir to said cylinder to raise the load supporting means step by step, and an auxiliary mechanically operable lifting mechanism, selectively operable means for actuating said mechanical lifting mechanism to raise the load supporting means, means for admitting fluid from said reservoir to said cylinder upon the raising of said load supporting means by said mechanically operable mechanism, and means for releasing the fluid from said cylinder to permit the load supporting means to descend.

2. An elevating truck having upwardly movable load supporting means and means for raising said load supporting means comprising a fluid operable jack having a cylinder and a ram connected to said load supporting means, actuating means for forcing fluid under pressure into said cylinder to cause said ram to raise said load supporting means, and auxiliary mechanically actuated lifting means engaging said ram and operable to raise said ram and said load supporting means in advance of the actuation of said fluid actuating means.

3. An elevating truck having upwardly movable load supporting means and means for raising said load supporting means comprising a fluid operable jack having a cylinder and a ram connected to said load supporting means, means for forcing fluid under pressure into said cylinder to cause said ram to raise said load supporting means, mechanically actuated means operable to raise said load supporting means in advance of the actuation of said fluid actuated means, and means operable during the raising of said load supporting means by the mechanically actuated means to admit fluid to said cylinder and retain it therein, thereby to prevent the lowering of said load supporting means upon release of said mechanically actuated lifting means, and manually controlled means for releasing fluid from said cylinder to permit the lowering of said load supporting means.

4. An elevating truck having steering mechanism including a tongue mounted to swing vertically and upwardly movable load supporting means comprising mechanically actuated means operable to raise said load supporting means rapidly into engagement with the device to be lifted and fluid actuated lifting means operable by vertical swinging movement of the tongue to raise said load supporting means step by step, and means actuated by the mechanically actuated lifting means to cause the fluid of the fluid actuated lifting means to prevent descent of the load supporting means when raised by said mechanically actuated lifting means.

5. An elevating truck having steering mechanism including a tongue mounted to swing vertically and upwardly movable load supporting means comprising mechanically actuated lifting means operable by a single stroke of a pedal lever to raise the load supporting means to a predetermined height and fluid actuated lifting means operable by vertical swinging movements of said tongue thereafter to raise said load supporting means step by step and means actuated by the mechanically actuated lifting means to cause the fluid of the fluid actuated lifting means to prevent descent of the load supporting means when raised by said mechanically actuated lifting means.

6. An elevating truck having steering mechanism including a tongue mounted to swing vertically and upwardly movable load supporting means, means for raising said load supporting means comprising a fluid operated jack having a substantially vertical cylinder and a ram, means connecting the upper end of said ram to said load supporting means, mechanical lever-actuated means for preliminarily raising said ram and load supporting means to cause the load supporting means to engage the device to be lifted, means operable to admit and retain fluid in said cylinder as said ram is raised by said mechanically actuated means, and means operable by vertical swinging movements of the tongue to force fluid under pressure into said cylinder thereafter to raise said load supporting means step by step, and manually controlled means for releasing fluid from said cylinder to permit descent of said load supporting means.

7. An elevating truck having a wheel-supported main frame and an upwardly movable load supporting means, means for raising said load supporting means comprising a fluid operated jack mounted on said main frame having a substantially vertical cylinder and ram, means connecting the upper end of said ram to said load supporting means, a lever fulcrummed on said main frame having an extensible connection to said ram operable to raise said ram and said load supporting means to a predetermined height and thereafter to permit further upward movement of said ram, means for admitting fluid to said cylinder as the ram is raised, and means for forcing fluid under pressure into said cylinder further to raise said ram and load supporting means.

8. An elevating truck having a wheel-supported main frame provided with steering mechanism including a tongue mounted to swing vertically and upwardly movable load supporting means, means for raising said load supporting means comprising a fluid operated jack mounted on said main frame having a substantially vertical cylinder and ram, means connecting the upper end of said ram to said load supporting means, a lever fulcrummed on said main frame having an extensible connection to said ram operable to raise said ram and load supporting means to a predetermined height and thereafter to permit further upward movement of said ram, means for admitting fluid to said cylinder as the ram is raised, and means operable by vertical swinging movements of the tongue to force fluid under pressure into said cylinder further to raise said ram and load supporting means step by step.

9. An elevating truck having a wheel-supported main frame provided with steering mechanism including a tongue mounted to swing vertically and upwardly movable load supporting means, means for raising said load supporting means comprising a fluid operated jack mounted on said main frame having a substantially vertical cylinder and ram, means connecting the upper end of said ram to said load supporting means, a foot lever fulcrumed on said main frame, telescoping thrust members connecting said foot lever to said ram operable by a single depression of said foot lever to raise said ram and load supporting means to a predetermined height and thereafter to permit further upward movement of said ram, means for admitting fluid to said cylinder as the ram is raised, and means operable by vertical swinging movements of said tongue to force fluid under pressure into said

cylinder further to raise said ram and load supporting means step by step.

10. An elevating truck having a wheel-supported main frame provided with steering mechanism including a tongue mounted to swing vertically and upwardly movable load supporting means, means for raising said load supporting means comprising a fluid operated jack mounted on said main frame having a substantially vertical cylinder and ram, means connecting the upper end of said ram to said load supporting means, a foot lever fulcrumed on said main frame, telescoping thrust members connecting said foot lever to said ram operable by a single depression of said foot lever to raise said ram and load supporting means to a predetermined height and thereafter to permit further upward movement of said ram, means for admitting fluid to said cylinder to fill the same as the ram is raised, means operable by vertical swinging movements of said tongue to force fluid under pressure into said cylinder further to raise said ram and load supporting means step by step, and resilient means interposed between said telescoping thrust members operable to raise said foot lever to substantially vertical position upon release of the force applied thereto.

11. An elevating truck having a wheel-supported main frame with a rigid upwardly extending arch adjacent its front end and provided with steering mechanism including a tongue mounted to swing vertically and movable laterally to any steering position, and upwardly movable load supporting means, a fluid operated jack mounted on said main frame comprising a vertical cylinder having a ram connected to said load supporting means and a pump, means for actuating the pump plunger comprising a lever fulcrumed in the arch of said frame and having its forward arm projecting across the vertical axis of the steering mechanism, means operable by vertical swinging movements of the tongue when in any steering position to actuate said lever, and means operable by the rearward arm of said lever for actuating the pump plunger, and means for varying the effective leverage of said plunger actuating lever.

12. An elevating truck having a wheel-supported main frame with a rigid upwardly extending arch adjacent its front end and provided with steering mechanism including a tongue mounted to swing vertically and movable laterally to any steering position, and upwardly movable load supporting means, a fluid operated jack mounted on said main frame comprising a vertical cylinder having a ram connected to said load supporting means and a pump, means for actuating the pump plunger comprising a lever fulcrumed in the arch of said frame and having a forward arm projecting across the vertical axis of the steering mechanism and an arm projecting rearwardly from the fulcrum of said lever, means operable by vertical swinging movements of the tongue to actuate said lever, means operable by the rearward arm of said lever for actuating the pump plunger, and means for adjusting the effective length of the rearwardly extending arm of said lever, whereby the force applied to the pump plunger and the length of stroke of said plunger may be varied.

13. An elevating truck having a wheel-supported main frame with a rigid upwardly extending arch adjacent its front end and provided with steering mechanism including a tongue mounted to swing vertically, and upwardly movable load supporting means, a fluid operated jack mounted on said main frame comprising a vertical cylinder having a ram connected to said load supporting means and a pump, a horizontal shaft mounted in the upper portion of said arch, a pump actuating lever pivotally mounted upon said shaft having a slotted rearwardly extending arm and a forwardly extending arm projecting across the vertical axis of the steering mechanism, means operable by vertical swinging movements of the tongue to actuate said lever, a slide adjustably mounted upon said slotted rearwardly extending arm, means including a screw for adjusting the position of said slide, a link pivotally connected to said slide, and means operable by said link to actuate said plunger, whereby the effective force applied to the pump plunger and the length of stroke of the plunger may be varied by adjustment of said slide upon said rearwardly projecting arm.

14. An elevating truck having a wheel-supported main frame with a rigid upwardly extending arch adjacent its front end and provided with steering mechanism including a tongue mounted to swing vertically, and upwardly movable load supporting means, a fluid operated jack mounted on said main frame comprising a vertical cylinder having a ram connected to said load supporting means and a pump, a horizontal shaft mounted in the upper portion of said arch, a pump actuating lever formed in sections each pivotally mounted upon said shaft, one of said sections having a forward arm projecting across the vertical axis of the steering mechanism, means operable by vertical swinging movements of the tongue to actuate said arm, the other arm of said lever extending rearwardly and having means connected thereto for actuating the pump plunger, releasable means for connecting the arms of said pump actuating lever together, a foot lever pivotally mounted upon said frame, and extensible means connecting said foot lever to said ram operable by a single depression of said foot lever to raise said ram and load supporting means to a predetermined height and means operable during the raising of said ram by said foot lever mechanism to admit fluid to said ram cylinder to fill the same, whereby upon release of the foot lever actuated mechanism the load supporting means will be retained in elevated position by the fluid in the ram cylinder.

15. An elevating truck comprising a main frame having a head, steering mechanism mounted in said head, side frames rigid with said head extending horizontally rearwardly therefrom and having rear end portions offset downwardly therefrom a distance substantially equal to the vertical depth thereof and having laterally extending upper surfaces to provide supports for said load supporting means, wheels having their axles journaled in said downwardly offset portions, thereby providing ample under-clearance for the truck, upwardly movable load supporting means having side frames substantially the same vertical depth as the rearwardly extending main side frames, and positioned to telescope over said main side frames and when lowered to rest upon said supporting surfaces of the offset portions of the main frame so that the horizontal planes of the upper edges of the main side frames and those of the load supporting means will substantially coincide when the load supporting means is in lowered position.

16. An elevating truck comprising a main frame having a head, steering mechanism

mounted in said head, side frames rigid with said head extending horizontally rearwardly therefrom and having rear end portions offset downwardly therefrom a distance substantially equal to the vertical depth thereof and of such greater width than the side frames as to extend outwardly beyond the outer vertical planes of the side frame members and form supports for the load supporting means when in lowered position, wheels having their axles mounted in said downwardly offset portions, upwardly movable load supporting means having side frames of substantially the same vertical depth as the rearwardly extending main side frames adapted when in lowered position to telescope over said main side frames and rest upon the supports of the offset rear end portions thereof, so that the horizontal planes of the upper edges of the main side frames and those of the load supporting means will substantially coincide when the load supporting means is in lowered position, parallel links connecting the load supporting means to the main frame including rearwardly extending links pivotally mounted upon the axles of said rear wheels, and links mounted upon the main frame and connected to the front end of said load supporting means, and means operable to produce an upward and forward movement of said load supporting means.

17. An elevating truck having a wheel-supported main frame with a rigid upwardly extending arch adjacent its front end and provided with steering mechanism including a tongue mounted to swing vertically and having an extension projecting over the vertical axis of the steering post, upwardly movable load supporting means, a fluid operated jack mounted on the main frame comprising a vertical cylinder having a ram connected to said load supporting means and a pump, means for actuating the pump plunger comprising a lever fulcrumed in the arch of said frame and having its forward end projecting across the vertical axis of the steering mechanism and having a strut extending in the direction of the axis of the steering post connecting the same to said tongue extension, means operable by said pump actuating lever to reciprocate said pump plunger, and a spring connected to said tongue extension operable normally to hold said tongue in vertical position.

18. An elevating truck having a wheel-supported main frame with a rigid upwardly extending arch adjacent its front end and having a head, steering mechanism having a vertical tubular steering post mounted in said head, a vertically swinging tongue fulcrumed upon said steering post and having an extension projecting across the vertical axis of the steering post, a spring connected to said tongue extension located within said tubular steering post and having its lower end rigidly connected to said steering post operable normally to hold said tongue in vertical position, upwardly movable load supporting means, fluid actuated means including a ram cylinder mounted on said frame, a ram therefor connected to said load supporting means operable by vertical swinging movement of said tongue to force fluid under pressure into said ram cylinder thereby to raise said load supporting means, and auxiliary pedal actuated mechanical means operable preliminarily to raise said load supporting means while the tongue is retained in vertical position and means for admitting fluid into said ram cylinder to fill the same as the load supporting means is raised by said pedal actuated means.

19. An elevating truck comprising a wheel-supported main frame with an arch adjacent its front end and provided with steering mechanism having a tongue mounted to swing vertically, load supporting means connected to said main frame by front and rear pairs of parallel links, a fluid operated jack unit pivotally mounted at its lower end on said main frame and comprising a pump and a vertical cylinder and ram, a horizontal shaft mounted in the head of said ram, lifting links connecting said ram shaft to said front parallel links, a horizontal shaft in the upper portion of said arch, links pivotally mounted at their front ends on said arch shaft and at their rear ends on said horizontal ram shaft operable to insure substantially vertical movement of said ram, and means operable by vertical swinging movements of said tongue to actuate the pump plunger and thereby force fluid under pressure into said cylinder to raise said ram and load supporting means.

20. An elevating truck having a wheel-supported main frame having steering mechanism including a vertically swinging tongue and load supporting means movable upwardly relatively thereto, means for raising said load supporting means comprising a fluid operated lifting jack unit having a base block pivotally mounted on said main frame, a cylinder and a pump extending vertically upwardly from said base, a ram shaft slidably fitting said cylinder having a ram connected to said load supporting means, a tubular reservoir enclosing said cylinder having at its upper end a head closing the upper end of said reservoir and provided with a stuffing box tightly embracing said ram shaft, said base block having conduits provided with suitable check valves for conducting fluid from said reservoir to said pump and upon actuation of said pump to conduct fluid under pressure from the pump to said cylinder to raise said ram, means operable by vertical swinging movements of said tongue to actuate the pump plunger, pedal actuated means mechanically connected to said ram operable by a single depression of said pedal to raise said ram and load supporting means, and a valved conduit in said base communicating with said reservoir and cylinder operable to permit fluid to flow from said reservoir into said cylinder when the ram is raised by said pedal actuated means.

21. An elevating truck having a wheel-supported main frame having steering mechanism including a vertically swinging tongue and load supporting means movable upwardly relatively thereto, means for raising said load supporting means comprising a fluid operated lifting jack unit having a base block pivotally mounted on said main frame, a cylinder and a pump extending vertically upwardly from said base, a ram shaft slidably fitting said cylinder, a tubular reservoir enclosing said cylinder having at its upper end, a head closing the upper end of said reservoir having a part detachably secured to said cylinder and provided with a stuffing box tightly embracing said ram shaft, said base block having conduits provided with suitable check valves for conducting fluid from said reservoir to said pump and fluid under pressure from the pump to the bottom of said cylinder to raise said ram, means operable by vertical swinging movements of said tongue to actuate the pump plunger, pedal actuated means mechanically connected to said ram operable by a single depression of said pedal to raise said ram and load supporting means, and a valved conduit in said base com-

municating with the bottoms of said reservoir and cylinder operable to permit fluid to flow from said reservoir into said cylinder when the ram is raised by said pedal actuated means, and screens in the bottoms of said cylinders and reservoirs respectively for straining the oil which passes through the respective conduits.

22. An elevating truck having a wheel-supported main frame with a rigid upwardly extending arch adjacent to the front end thereof, load supporting means movable upwardly relatively to said main frame, means for raising said load supporting means comprising a fluid operated jack pivotally mounted on said main frame having a reservoir, a pump and a vertical cylinder, a ram reciprocably mounted in said cylinder, means pivotally connected to said ram and to said load supporting means to permit relative longitudinal movement between said load supporting means and said frame, means for actuating the plunger of said pump, suitably valved conduits for conducting fluid from said reservoir to said pump and for conducting fluid under pressure from said pump to said cylinder to raise said ram and load supporting means, an outlet conduit leading from said cylinder to said reservoir, a valve for said conduit having a screw threaded stem operable when rotated in one direction to close said conduit and when rotated in the opposite direction gradually to open said conduit, a rod mounted in said arch having a flexible connection to said valve stem, a spring engaging said arch and said rod acting normally to rotate said rod in a direction to cause the valve to close said outlet conduit, and a handle on said rod for rotating the valve stem against the force of said spring in a direction to open said conduit.

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