June 27, 1939. H. NILSON 2,163,959

LIFTING JACK

Filed March 18, 1937 4 Sheets-Sheet 1

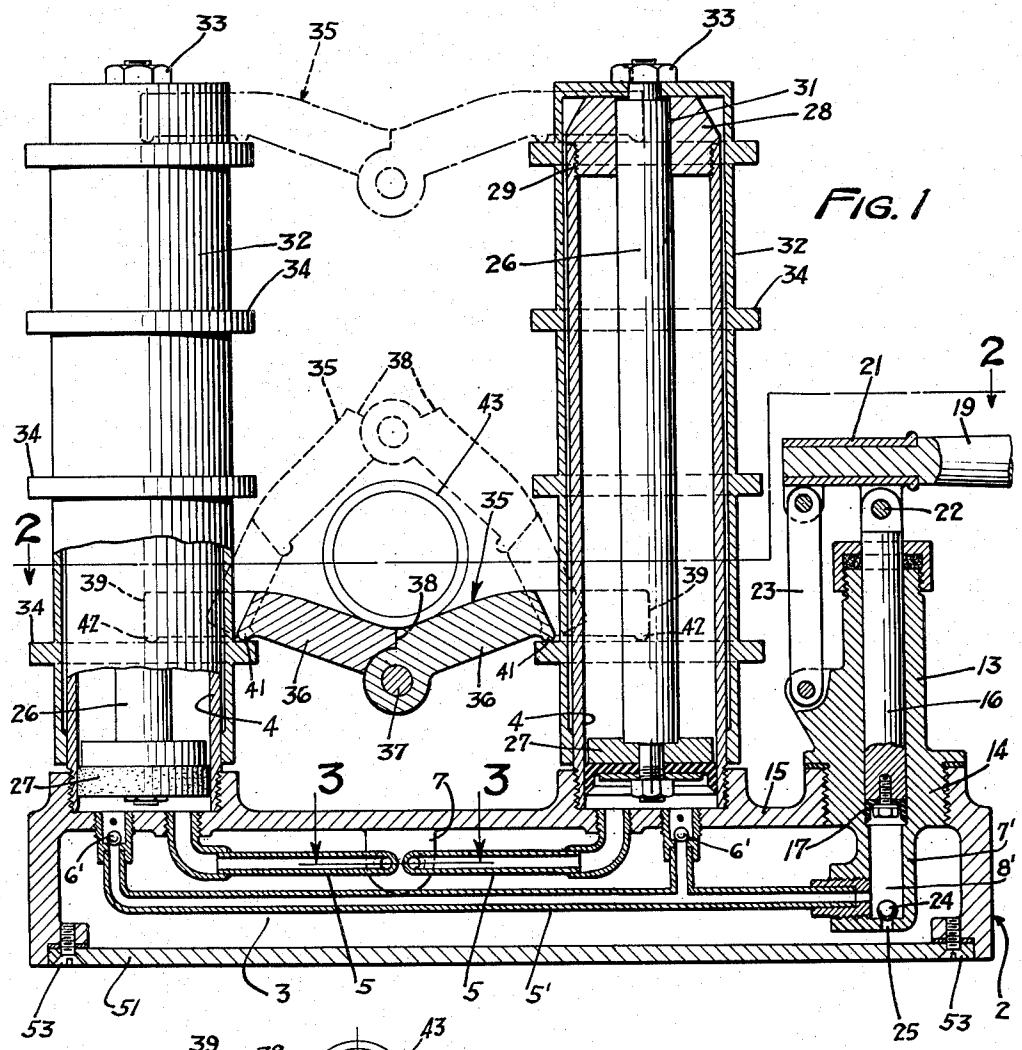

FIG. 1

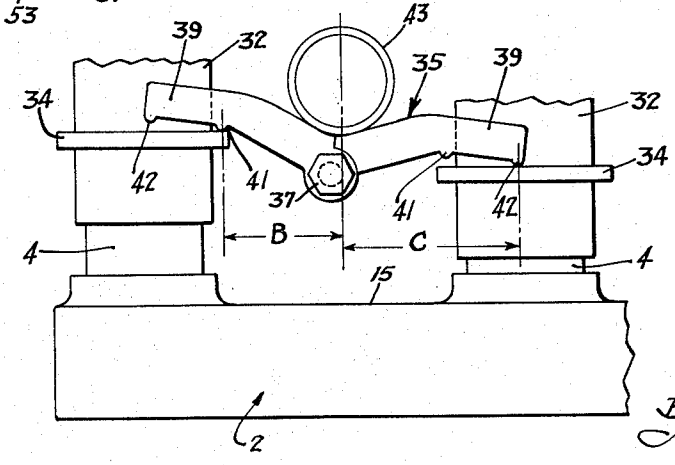

FIG. 5

Inventor
HAROLD NILSON
By Cook, Paul & Moore
ATTORNEYS

June 27, 1939. H. NILSON 2,163,959

LIFTING JACK

Filed March 18, 1937 4 Sheets-Sheet 2

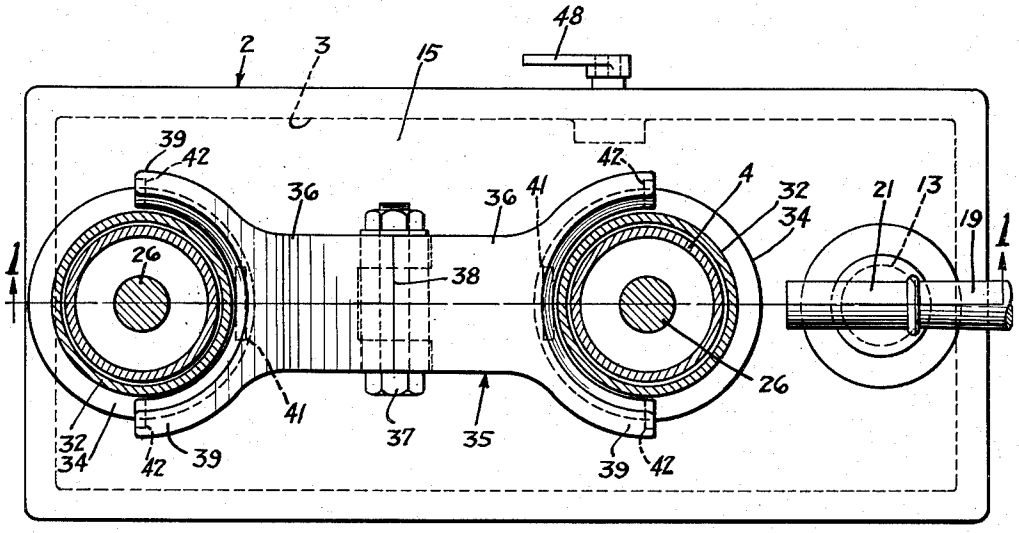

FIG. 2

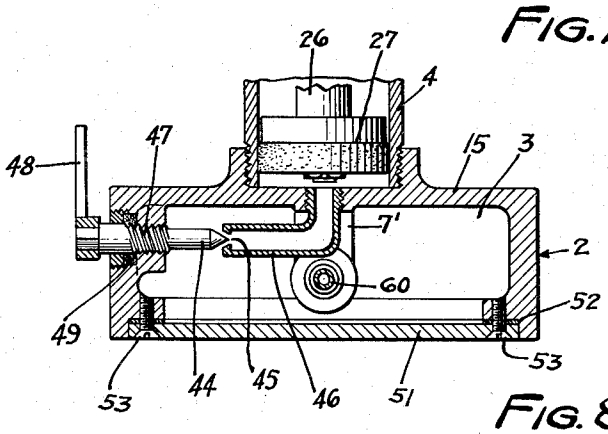

FIG. 8

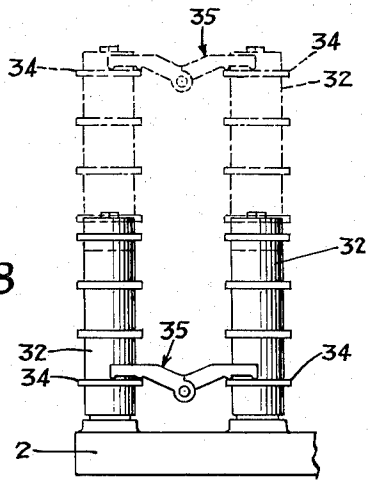

FIG. 6

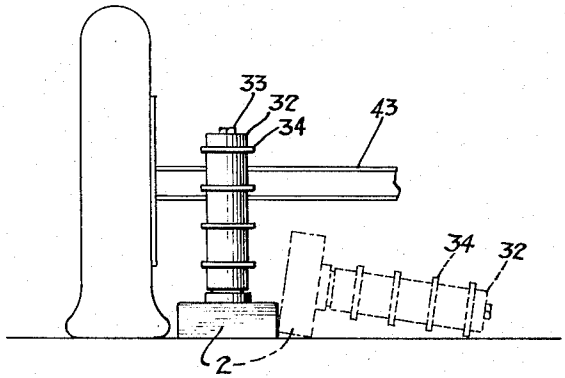

FIG. 4

Inventor
HAROLD NILSON
By Paul, Paul & Moore
ATTORNEYS

June 27, 1939. H. NILSON 2,163,959

LIFTING JACK

Filed March 18, 1937 4 Sheets-Sheet 3

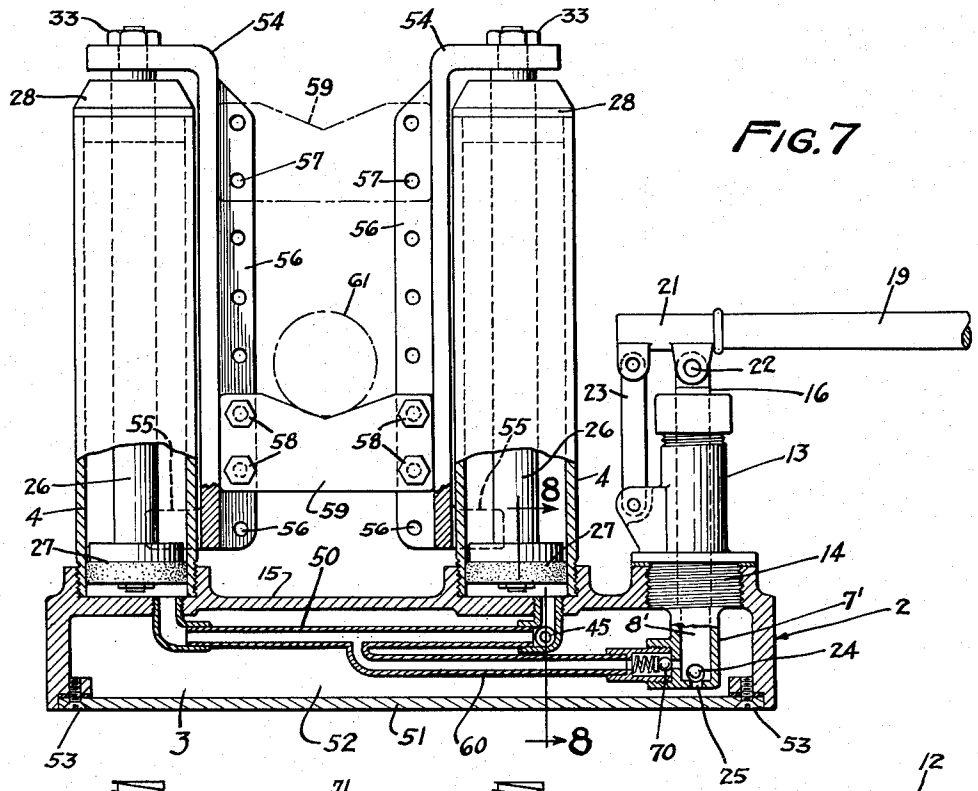

FIG. 7

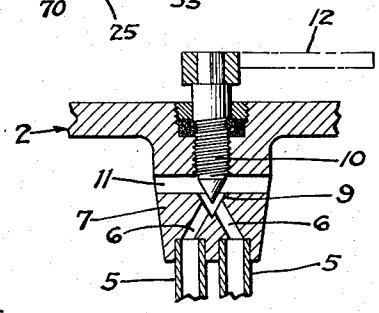

FIG. 3

FIG. 9

Inventor
HAROLD NILSON
By Paul, Paul & Moore
ATTORNEYS

June 27, 1939. H. NILSON 2,163,959

LIFTING JACK

Filed March 18, 1937 4 Sheets-Sheet 4

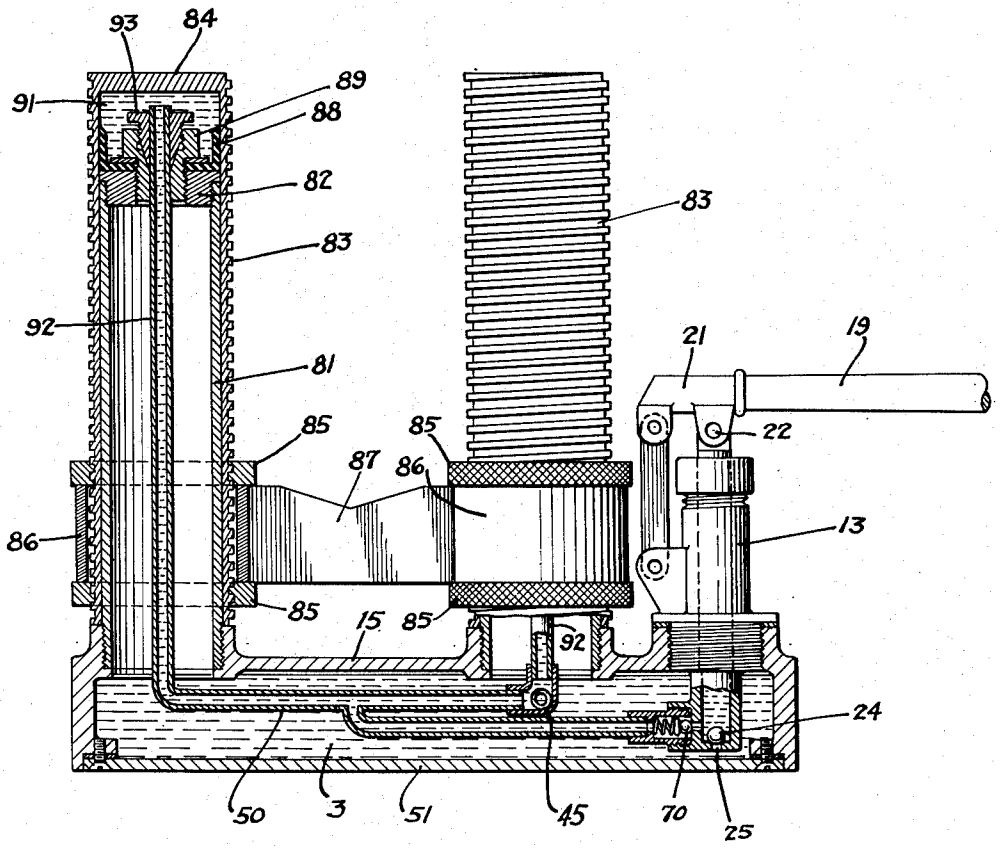

FIG. 10

Inventor
HAROLD NILSON
By Paul, Paul & Moore
ATTORNEYS

Patented June 27, 1939 2,163,959

UNITED STATES PATENT OFFICE

2,163,959

LIFTING JACK

Harold Nilson, Wayzata, Minn., assignor of one-fifth to John A. Edeby, Wayzata, Minn., and two-fifths to Emil Berglund, Minneapolis, Minn.

Application March 18, 1937, Serial No. 131,666

5 Claims. (Cl. 254—89)

This invention relates to new and useful improvements in lifting jacks and more particularly to jacks adapted for use in connection with automotive vehicles.

An object of the present invention is to provide a twin-cylinder jack comprising a load-engaging element adapted for vertical adjustment on said cylinders, whereby the jack may be used for lifting loads of varying heights.

A further object is to provide a jack of the class described comprising a suitable base having cylinders mounted thereon in spaced relation and each carrying a lifting member, and a load-engaging element being supported on said lifting members between the cylinders and having means embodied in the construction thereof for equalizing the load between the cylinders when the jack is operated to elevated the load.

A further object is to provide a hydraulic jack comprising a pair of cylinders each having a plunger mounted for vertical movement therein, and said cylinders being spaced apart to permit a vehicle axle or other device to be lifted, to be supported therebetween, and a load-engaging element being supported on said plungers and bridging the gap between the cylinders, and whereby the weight of the load is substantially equally distributed between the plungers.

A further object is to provide a jack of the character described comprising a pair of spaced cylinders having a load-engaging element supported therebetween and adapted for vertical adjustment to adapt it to the height of the load, and whereby the load to be elevated will be supported between the cylinders, thereby to equally distribute the weight of the load thereon, and said jack being so constructed that it may readily be tilted to a horizontal position to insert it beneath a vehicle axle, after which it is returned to its normal upright position with the lifting element in position beneath the axle, and whereby the load will be supported between the cylinders.

A further object is to provide a jack comprising a suitable base having a pair of threaded posts mounted thereon in spaced relation and adapted for rotary movement, a load-engaging element having threaded sockets receiving said posts, and a mechanism for simultaneously rotating said posts to vertically translate the load-engaging element.

Other objects of the invention reside in the novel arrangement of the spaced upright members which support the load-engaging element; in the construction of the load-engaging element and the manner of supporting it on said posts; in the means provided whereby said element may be vertically adjusted upon the lifting members to adapt the jack to loads of different heights; and in the provision of such a jack which is simple and inexpensive in construction, is sturdy and rugged, and is comparatively light in weight, whereby it may readily and conveniently be inserted beneath a load or removed therefrom.

Other objects of the invention will appear from the following description and accompanying drawings and will be pointed out in the annexed claims.

In the accompanying drawings there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown as various changes may be made within the scope of the claims which follow.

In the drawings:

Figure 1 is a sectional elevation substantially on the line 1—1 of Figure 2, showing the general construction of the jack;

Figure 2 is a sectional plan view on the line 2—2 of Figure 1;

Figure 3 is a detail sectional view on the line 3—3 of Figure 1;

Figure 4 is a view on a smaller scale showing one way of inserting the jack beneath the axle of a vehicle;

Figure 5 is a view showing the means for equalizing the weight of the load between the two lifting members;

Figure 6 is a diagrammatic view showing in full and dotted lines the load-engaging element in its lowermost and uppermost position;

Figure 7 is a view showing a construction wherein the load-engaging element is rigidly secured to the lifting members;

Figure 8 is a cross-sectional view on the line 8—8 of Figure 7;

Figure 9 is a view showing a construction wherein a pair of threaded posts are utilized for vertically translating the load-engaging element; and

Figure 10 is a view showing a construction wherein the pistons or plungers are fixedly mounted on the upper ends of the upright posts.

The novel jack herein disclosed is shown comprising a suitable base 2 provided with a fluid chamber 3 and having a pair of cylinders 4 mounted thereon in spaced relation.

Conduits 5 connect the lower ends of the cylinders to suitable ports 6 provided in a valve housing 7, shown integrally formed with a wall of the base 2. A valve seat 9 is provided in the housing 7 adapted to be engaged by a suitable needle valve, generally indicated by the numeral 10. A passage 11 establishes communication between the interior of the base 2 and the valve seat 9, when the valve is open. The valve 10 is provided with a suitable operating handle 12, indicated in dotted lines in Figure 3. The conduits 5 and the valve 10 control the return of the fluid from the cylinders to the base.

The means for supplying fluid to the cylinders is shown comprising a pipe 5' connected to the cylinders by suitable check valves 6', which are normally in closed position, as shown in Figure 1. One end of the pipe 5' is connected to a suitable housing 7' having a valve chamber 8' shown provided with an intake opening 25 at its lower wall, normally closed by a check valve 24. The housing 7' is shown integrally formed with a tubular member 13 which constitutes a pump cylinder. The tubular member 13 is provided with an enlarged threaded portion 14 received in threaded engagement with the upper wall 15 of the base 2. A piston 16 is mounted in the bore of the member 13, and has a suitable packing 17 at its lower end for preventing leakage around the piston. The piston 16 is operated by a suitable handle 19 detachably received in a fitting 21 pivotally connected to the upper end of the piston 16 by a suitable pin 22. The fitting 21 is operatively connected to the member 13 by a suitable link 23, clearly illustrated in Figure 1.

As best shown in Figure 1, a suitable plunger 26 is mounted in each cylinder 4 and each is provided at its lower end with a suitable head, generally indicated by the numeral 27, which engage the walls of their respective cylinders in leak-tight relation. A suitable plug 28 is shown secured to the upper end of each cylinder, as by means of threads 29, and each has a guide opening 31 adapted to slidably receive and guide the plungers 26 in their vertical movement.

Suitable lifting members 32, here shown as being cylindrical in cross section, are slidably fitted over the cylinders 4 and secured to the upper ends of the plungers 26 by suitable nuts 33, whereby these lifting members become, in effect, integral parts of the plungers 26 so that when the latter are actuated, said lifting members will be correspondingly actuated.

A feature of the invention resides in the spacing apart of the cylinders 4 upon the base member 2, whereby the load may be supported therebetween, as best illustrated in Figure 1. Each lifting member 32 is shown provided with a plurality of vertically spaced annular ribs or steps 34, adapted to support a suitable load-engaging element, generally indicated by the numeral 35. The load-engaging element is selectively supported on the steps 34, and, in the present instance, is shown comprising oppositely disposed portions 36 pivotally connected together by a suitable pivot 37 and provided with abutment shoulders 38 for supporting the load-engaging element in operative position, as shown in full lines in Figure 1, when a load is supported thereon.

The portions 36 of the load-engaging elements 35 are provided with forked terminals 39 adapted to partially embrace the lifting members 32, whereby they may engage the steps 34, as clearly illustrated in Figures 1 and 2. The load-engaging element 35 may readily be adjusted from one elevation to another upon the steps 34 by simply lifting the center portion of the element upwardly, as indicated by the dotted lines in Figure 1, whereby the forked terminals 39 may readily be moved from one step 34 to another, as will readily be understood.

Another feature of the invention resides in the means provided for equally distributing the weight of the load between the lifting members 32, when the jack is operated to elevate a load, as illustrated in Figures 1 and 5. The forked terminals 39 of the load-engaging element are provided with depending ribs 41 and 42, all of which, when the lifting members 32 travel upwardly at the same speed and when disposed at the same elevation, will engage the corresponding steps 34 of the lifting members 32 upon which the load-engaging element 35 is supported.

During the operation of the jack, should one of the lifting members 32 tend to lead the other member, as illustrated at the left hand side of Figure 5, a greater portion of the weight of the load will be transmitted to said leading member 32, because of the weight of the load being transmitted to said member through the ribs 41 of the adjacent end of the element 35. When the load is thus transmitted from the element 35 to the leading member 32, the distance B between the center of the load and the lifting member 32 is shortened, while, at the same time, the distance C at the opposite end of the element 35 is lengthened, as clearly illustrated in Figure 5. Such change in leverage immediately retards the upward movement of the leading member 32 which results in the weight of the load being substantially equally distributed between the two lifting members 32.

In the operation of the novel jack illustrated in Figures 1 to 6, inclusive, and particularly when the apparatus is used to elevate a load which may be disposed relatively close to the ground, the jack is preferably placed in a horizontal position by tilting it over on one side, as shown in dotted lines in Figure 4. After placing the jack on its side, as above described, it is slid or inserted beneath the axle or load 43, and then returned to its normal upright position, as shown in full lines in Figure 4. The load-engaging element 35 is positioned on the steps 34 at the proper elevation, so that when the jack is tilted to its upright position and the operating handle 19 is operated, the load-engaging element will engage the axle and elevate the load, as will be clearly understood by reference to Figure 1.

It will thus be seen that by spacing apart the lifting members 32, as illustrated in Figures 1 and 2, and by adjustably supporting the load-engaging element 35 thereon, the jack may be used for elevating loads varying greatly in height from the ground level, as shown in full and dotted lines in Figure 6. The jack has been found extremely practical because of the wide range of travel, whereby it may be used in connection with vehicle axles varying greatly in height from the ground or floor line.

The check valves 6' prevent the fluid from returning to the pipe 5', when the pistons are supporting a load, and also prevent the pistons from fluctuating up and down when elevating a load. Without the check valves 6', the fluid in the cylinders may be by-passed back and forth between the two cylinders, which might be objectionable in some instances, particularly, if a greater portion of the load is carried on one piston.

To release the fluid from the pistons to lower the jack, the valve 10 is opened, whereby the fluid is released from the cylinders through the conduits 5 and passage 11 in the valve housing 7, as will be clearly understood by reference to Figures 1 and 3. Because of providing a separate conduit 5 for each cylinder, and controlling the discharge of the fluid therefrom by the valve 10, when the latter is opened, the fluid may flow freely from the conduits 5 back to the chamber 3 of the base without danger of one piston traveling in advance of the other.

The base 2 is provided at its bottom with a suitable cover 51, shown supported in a seat 52 formed in the lower edges of the walls of the base, as clearly illustrated in Figure 8. The cover 51 is secured in leak-tight engagement by suitable screws 53, whereby the chamber 3 is rendered leak-tight. A suitable filler opening, not shown, is provided in the base 2 for introducing fluid into the chamber 3.

In Figures 1 to 6, inclusive, I have shown the lifting members 32 as being cylindrical in cross-section and slidably fitting the cylinders 4. It is to be understood that these members need not necessarily be cylindrical in cross-section as, obviously, they may be otherwise shaped and substantially the same results obtained. In some instances, the load-engaging element 35 may be constructed without the pivot 37. It is also to be understood that, if desired, the release valve 10 may be located at some other point on the base as, for example, the threaded socket which supports the valve stem may be placed on the top wall 15 of the base instead of on the side wall, as shown in Figure 3.

Figure 7 illustrates a construction wherein a conduit 50 is shown having its ends communicating with the bottoms of the cylinders 4. A pipe 60 has one end connected to the conduit 50 and its other end to the valve chamber 8' of the pressure pump 13. A suitable check valve 70 is shown provided at the intake end of the pipe 60.

The structure illustrated in Figure 7 further comprises a pair of lifting members 54 having their upper ends suitably secured to the upper ends of the piston rods 26 by the nuts 33. The lower ends of the members 54 terminate in forks 55 which engage the walls of the cylinders, thereby to guide the lifting members 54 in their up and down movements. The lifting members are shown provided with vertically extending flanges 56 having spaced apertures 57 therein adapted to receive suitable bolts or screws 58 for securing a bridge member 59 to the flanges 56 in adjusted position. The bridge member 59 is adapted to engage the load, indicated by the dotted lines 61, in a manner similar to the structure illustrated in Figure 1. The lifting members 54 and bridge member 59, when secured together as shown in full lines in Figure 7, provide a rigid structure which operates as a unit with the piston rods 26.

To release the fluid from the cylinders shown in Figure 7, a suitable valve 44 is shown provided in the base 2, as clearly illustrated in Figure 8. The valve 44 is adapted to close an opening 45 at one end of the fitting 46 provided in the conduit 50, as shown in Figures 7 and 8. The valve 44 has a threaded portion 47 received in threaded engagement with the wall of the base 2, and is provided at its outer end with a suitable operating handle 48, whereby the valve may be conveniently opened or closed, as will readily be understood. A suitable packing 49 prevents leakage around the stem of the valve 44.

The apparatus illustrated in Figure 7 is operated in substantially the same manner as the structure disclosed in Figures 1 to 6, with the exception that the lifting means, including the lifting members 54 and 59 are preferably secured to the piston rods 26 in fixed relation, whereby they operate therewith as a unit. The pressure fluid may be pumped from the chamber 3 into the cylinders by opening the valve 44 and operating the pump handle 19. When the valve 44 is closed, the fluid is confined in the cylinders 4 and will support the load in its elevated position. The jack is lowered by releasing the fluid from the cylinders by manipulation of the valve 44, as will readily be understood.

The structure illustrated in Figure 9 comprises a suitable base 62 having a cover plate 63 providing the bottom wall thereof. The plate 63 cooperates with the walls of the base to provide a chamber 64 which, if desired, may be utilized to contain a suitable lubricant for the operating mechanism of the jack, subsequently to be described.

A pair of upright threaded posts 65 are shown formed with reduced end portions 66 received in suitable bearings 67 provided in the base 62. Suitable thrust bearings or washers 68 are shown interposed between the shoulders 69 of the posts 65, and the upper ends of the bearings 67, to carry the weight of the load exerted thereon. A suitable load-engaging or bridge element 71 is shown provided with threaded sockets adapted to receive the posts 65, whereby the element 71 may be vertically translated between the full and dotted line positions, when the posts 65 are simultaneously rotated.

The mechanism employed for rotating the posts 65 is shown comprising suitable worm wheels 72, secured to the lower terminals of the reduced extensions 66 of the posts 65. The worm wheels 72 mesh with worms 73 secured to a suitable shaft 74. The shaft 74 is shown mounted in suitable bearings 75, 76, and 77. The bearing 77 is preferably detachably secured to the wall of the casing 62 to facilitate assembling the mechanism in the chamber 64. A suitable operating handle or crank 78 is shown connected to one end of the shaft 74 by a universal joint 79, whereby the shaft may be conveniently rotated to operate the posts 65.

While I have herein described the jack as being particularly useful in connection with automotive vehicles, it is to be understood that it may be used for various other purposes as, for example, lifting heavy beams and other objects. Because of the load being supported between the upright posts or cylinders of the jack, the load is always substantially uniformly distributed on the base, whereby there is little danger of the jack tipping over, when a heavy load is imposed thereon. If desired, the base may be mounted on suitable casters or carrying wheels to facilitate moving the apparatus about from place to place. For ordinary use, however, the apparatus is preferably constructed as shown in the drawings, whereby it may readily be positioned on one side, as shown in dotted lines in Figure 4, to facilitate inserting it beneath a load which is disposed relatively close to the ground line.

Figure 10 illustrates a structure comprising a suitable base 15, similar to the one illustrated in Figures 1 and 7, having upright tubular members 81 mounted thereon in spaced relation. Each member 81 has a suitable plug 82 secured to its upper end. Members 83 are fitted over the tubular posts 81, and are closed at their upper ends, as shown at 84. The members 83 are exteriorly threaded to receive suitable adjusting nuts or collars 85, between which the end portions 86 of a suitable load engaging or bridge element 87 are supported. The element 87 may be relatively adjusted upon the members 83 by adjustment of the nuts or collars 85.

Suitable packings 88 are secured to the plugs 82 of the posts 81 by suitable clamping nuts 89,

received in threaded engagement with the plugs, as shown. The packings 88 engage the bores of the members 83 and cooperate with the walls thereof to provide fluid chambers 91.

A conduit 92 is mounted in each post 81 and have their terminals extending upwardly through the nuts 89 and secured thereto in leak-proof relation by packing nuts 93. The upright conduits 92 are connected at their lower ends with a conduit 50, similar to the one shown in Figure 7.

In the operation of the novel device illustrated in Figure 10, fluid is pumped into the chambers 91 by manipulation of the pump 13, whereby the members 83 are elevated upon the posts 81, as will readily be understood by reference to the drawings. The two members 83 are preferably rigidly secured together by the bridge member 87 and clamping rings 85, and therefore operate as a unit, when translated vertically by manipulation of the pump 13. A release valve 45, similar to the one shown in Figure 7, is provided in the base for releasing the fluid from the chambers 91 to lower the jack.

I claim as my invention:

1. In a portable jack of the type for insertion beneath a vehicle axle, the combination of an elongated base to render substantial bearing support for the jack when the latter is in an upright position, a pair of upright power lift mechanisms mounted upon said base and spaced apart a sufficient distance to allow straddling of the axle by the jack, a bridging element adapted to receive and support the vehicle axle, said bridging element having its opposite end portions connected to said lift mechanisms, an actuating mechanism mounted upon the jack for the purpose of transmitting physical forces to the power lift mechanisms so as to elevate the bridge member and the load supported thereon, and an elongated handle member operatively connected to the actuating mechanism and extending beyond the confines of the base, said member enabling handling of the portable jack so that it may be tilted about one of its elongated base edges and shifted so that the bridging element is directly beneath and transverse of the axle to be supported.

2. In a portable jack of the type for insertion beneath a vehicle axle, the combination of an elongated base to render substantial bearing support for the jack when the latter is in an upright position, a pair of parallel upright power lift mechanisms mounted upon said base and spaced apart a sufficient distance to allow straddling of the axle by the jack, a bridging element adapted to receive and support the vehicle axle, said bridging element having its opposite end portions connected to said lift mechanisms, a hydraulic actuating mechanism mounted upon the base for the purpose of transmitting physical forces to the power lift mechanisms so as to elevate the bridge element and the load supported thereon, and an elongated handle member operatively connected to the hydraulic actuating mechanism for operating the same, said handle member extending beyond the confines of the base so as to enable tilting of the portable jack about one of its elongated base edges and shifting of the same so that the bridging element is directly beneath and transverse of the axle to be supported.

3. In a portable jack of the type for insertion beneath a vehicle axle, the combination of an elongated base to render substantial bearing support for the jack when the latter is in an upright position, a pair of upright substantially parallel hydraulic lift mechanisms mounted upon said base and spaced apart a sufficient distance to allow straddling of the axle by the jack, a bridging element adapted to receive and support the vehicle axle, said bridging element having its opposite end portions adjustably connected to said lift mechanisms, a hydraulic pump mounted upon the base for the purpose of transmitting physical forces to the hydraulic lift mechanisms so as to elevate the bridge element and the load supported thereon, and an elongated handle member operatively connected to the hydraulic pump for operating the same, said handle member extending beyond the confines of the base so as to enable tilting of the portable jack about one of its elongated base edges and shifting of the same so that the bridging element is directly beneath and transverse of the axle to be supported.

4. In a portable jack of the type for insertion beneath a vehicle axle, the combination of an elongated base to render substantial bearing support for the jack when the latter is in an upright position, said base having a fluid chamber therein, a pair of upright hydraulic lift mechanisms mounted upon said base and spaced apart a sufficient distance to allow straddling of the axle by the jack, a bridging element adapted to receive and support the vehicle axle, said bridging element having its opposite end portions connected to said lift mechanisms, communicating passageways within the base chamber connecting the hydraulic mechanisms with the fluid chamber, a pump mounted upon the base for pumping fluid under pressure from the fluid chamber through the passageways into the lift mechanisms thereby to elevate the bridging element and the load supported thereon, and an elongated handle member operatively connected to said pump for actuation of the same, said member extending beyond the confines of the base to enable handling of the portable jack so that it may be tilted about one of its elongated base edges and shifted so that the bridging element is directly beneath and transverse of the axle to be supported.

5. In a portable jack of the type for insertion beneath a vehicle axle, the combination of an elongated base to render substantial bearing support for the jack when the latter is in an upright position, a pair of parallel upright hydraulic lift mechanisms mounted upon the base and spaced apart a distance sufficient to allow straddling of the axle by the jack, a bridging element adapted to receive and support the vehicle axle, said bridging element having its opposite end portions connected to said lift mechanisms, an upright pump mechanism mounted upon the base and parallel to the lift mechanisms, and an elongated handle member operatively connected to the pump mechanism for actuation of the same, said handle member lying substantialy in a horizontal plane and extending beyond the confines of the base so as to readily enable tilting of the jack about one of its elongated base edges and shifting of the same so that the bridging element is directly beneath and transverse of the axle to be supported.

HAROLD NILSON.