Jan. 6, 1948. E. P. GRIME 2,433,900

LIFTING APPARATUS

Filed May 1, 1943

Fig. 1

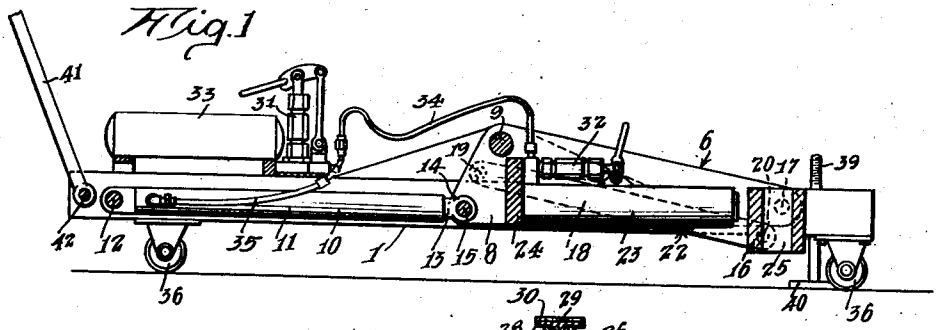


Fig. 2

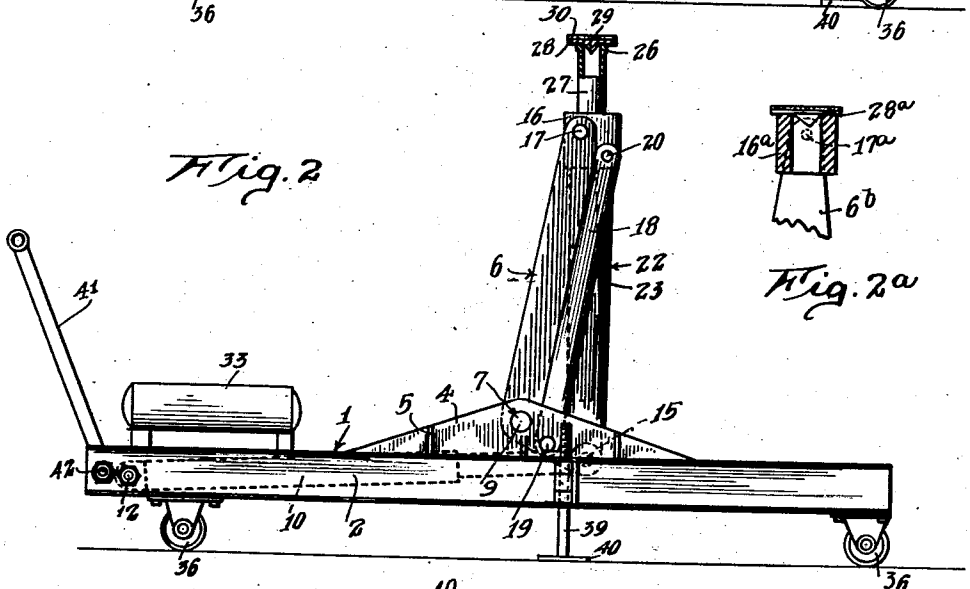


Fig. 2a

Fig. 3

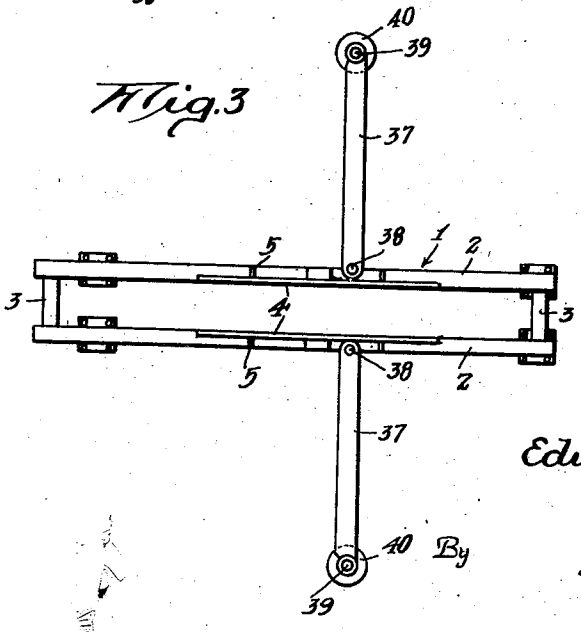
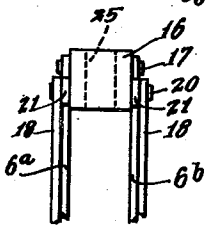


Fig. 4



Inventor

Edward P. Grime

By Lyon & Lyon

Attorneys

Patented Jan. 6, 1948

2,433,900

UNITED STATES PATENT OFFICE

2,433,900

LIFTING APPARATUS

Edward P. Grime, Los Angeles, Calif.

Application May 1, 1943, Serial No. 485,297

5 Claims. (Cl. 254—10)

1

This invention relates to lifts, to lifting devices, performing the function of devices known popularly as jacks.

While the invention is capable of being practiced with power-operated means actuated by any desired agency, in the present specification I have described it as employing means actuated by fluid pressure, such as hydraulic jacks.

Most jacks are capable of lifting the load through a relatively short distance, and if designed for a relatively high lift, this necessarily involves the presence of a relatively long cylinder which, if mounted with its axis in a vertical position, would necessitate the starting of the operation of lifting the load from a relatively high level above the ground. Such a construction would also necessitate the employment of a relatively wide base with lateral bracing to the cylinder to give it stability.

One of the objects of the present invention is to provide lifting apparatus, or a lifting "jack," that will overcome some of these difficulties, and which will have a relatively long range in the travel of the lifting head on which the load rests; also to provide such a jack which is so constructed as to enable the lifting head that raises the load, to start the lift from a point quite near the ground level.

A further object of the invention is to provide a simple construction for apparatus of this kind, which will be of light weight requiring a relatively small amount of material to build, and which is capable of presenting a relatively wide base to give necessary stability to the lifting apparatus when in its most extended state.

Another object of the invention is to provide an apparatus of this kind, which employs two power-developing devices capable of operating in succession to raise the load to the elevating limit of the apparatus.

Another object of the invention is to provide an apparatus of this kind, involving the use of a relatively simple frame on which the jack apparatus is mounted, and to construct and organize the parts of the jack apparatus in such a way that in the position of rest the parts are folded down so as to lie within a relatively low height limit, the construction being such that the first jack means or lifting means will take the load from a relatively low level and raise the same to an elevated point, the second jack means being mounted and so related to the other parts of the combination that it is capable of taking the load at an intermediate level, and then raising

2

the same to a relatively high level, as would be determined by the special service for which this lifting apparatus would be intended.

The invention consists in the novel parts and combination of parts to be described hereinafter, all of which contribute to produce an efficient lifting apparatus.

A preferred embodiment of the invention is described in the following specification, while the broad scope of the invention is pointed out in the appended claims.

In the drawing:

Fig. 1 is a longitudinal section through a lifting apparatus embodying my invention, and employing two hydraulic jacks for supplying the power employed to lift the load. This view shows the apparatus in its condition of rest, and with the lateral stabilizing means also in a folded condition.

Fig. 2 is a side elevation illustrating the primary lifting apparatus in its elevated position, and with the plunger of the secondary or later operating lifting means in a partially extended condition, that is to say, in the relation which it would have when it has taken the load from the primary lifting means and elevated it through a portion of its upward travel to the height limit. This view shows the lateral stabilizing means in its operating position, that is to say, in a position corresponding to the position in which it is illustrated in Fig. 3. The upper portion of the second operating plunger is broken away and shown in section to illustrate its relation to a "pad" or saddle which is in direct contact with the load, and which cooperates with both the devices of the lifting apparatus as will now appear from the inspection of Fig. 2*a*.

Fig. 2*a* is a fragmentary vertical section taken through the lifting head or lifting "block" of the primary lifting apparatus, and illustrating the "pad" or saddle supported upon it, but before the plunger of the secondary lifting apparatus has passed the block to pick up the saddle and raise the load to a higher elevation. This view, however, illustrates a modification in which the block of the primary lifting apparatus is supported by means which constitutes a modification from that illustrated in Fig. 2.

Fig. 3 is a diagrammatic plan illustrating the frame construction for the apparatus illustrated in Figs. 1 and 2, and particularly illustrating the manner in which the stabilizing means is swung out laterally to increase the base area of the frame when it is lifting a load. In this view other parts of the apparatus are omitted.

Fig. 4 is a fragmentary view and is an elevation of the lifting head or block of the primary lifting apparatus, and further illustrating its relation to the lever means that supports it.

Referring to Figs. 1 and 2, in practicing the invention I prefer to provide the same with an elongated frame 1 which, in the present illustration, consists of two substantially parallel side stringers 2 which are preferably made of structural steel such as deep channel iron, the webs of these stringers being connected together at their ends by lateral connections 3 such as illustrated in Figure 3. In order to adapt this frame for my purposes, I prefer to weld two extension webs 4 on the top side of the upper flanges of the stringers. These extensions are in the form of triangular plates with integral braces 5 for stiffening the same. These extensions 4 support a lifting arm or lever 6 on a pivotal axis at 7, enabling this arm to normally occupy a folded-down position as illustrated in Fig. 1, but enabling the same to be swung up to an elevated position as illustrated in Fig. 2. This lever 6 is preferably formed of two spaced lever arms 6*a* and 6*b* (see Fig. 4) which may be identical in construction. These two arms may be formed out of plate material having considerable strength under compression, and they are of substantially triangular form so as to present a downwardly projecting angle 8 which, in the folded position of the arm, is located considerably below the transverse pivot pin 9 which provides the axis 7 on which the arm 6 can swing up or down. At this angle 8 power-operated means is provided for swinging the lever arm 6 upwardly, and for this purpose I prefer to provide a fluid-operated cylinder or hydraulic jack 10 including a cylinder or cylindrical shell 11, one end of which is pivotally supported on a transverse pin 12. From the other end of this cylinder 11 a plunger 13 extends, the end of which is provided with a head 14 mounted on a transverse pin 15 that connects the two lever plates 6*a*, 6*b*. This lifting jack 10 is preferably located as illustrated between the two side stringers 2 of the frame.

Adjacent the free end of the lever arm 6 I provide seat means 16 preferably in the form of a block, to the sides of which the lever plates 6*a* are attached by pivot pins 17. In the embodiment of this connection illustrated in Fig. 2, I also provide a pair of links 18, the lower ends of which are attached by pivot pins 19 to the inner sides of the extension frame plates 4, and the upper ends of these links 18 are attached by pivot pins 20 to the same sides of the block 16 to which the lever plates 6*a* are attached. However, the links 18 are attached on the outside of spacers or bosses 21 so as to throw the links 18 out of the plane of the lever plates 6*a*. This, of course, is merely for establishing clearance. The plates 6*a* and the links 18 constitute a parallel motion device which will maintain the seat means or block 16 in an upright position when it is depressed to a low level position as illustrated in Fig. 1, or when in its elevated position as shown in Fig. 2.

After the arm or lever 6 has been raised to its elevated position illustrated in Fig. 2, then a secondary lifting apparatus comes into operation to take the load off of the seat means 16 and raise the same to a higher elevation. In order to accomplish this I prefer to provide a secondary jack 22 which includes a cylinder 23 which is located between the side stringers 2 of the frame and toward the end of the same which is remote

from the jack 10. The base of this cylinder 23 should be rigidly secured to a cross-head 24 connecting the lever plates 6*a*, 6*b*. This cross-head 24 may be welded into position if desired, and the base of the jack 23 may be welded to the cross-head, taking care, however, that the longitudinal axis of this jack has proper alignment for enabling it to take the load from the seat means 16 and elevate it. Of course, any suitable details of construction could be employed for enabling this to be accomplished, but I prefer to accomplish this effect by providing the seat means 16 with a bore 25 the axis of which is in a vertical position, and this bore is large enough to permit the lifting head 26 of the plunger 27 of this jack to pass up through this opening or bore.

In order to facilitate taking of the load off of the block 16 and transferring it to the lifting head 26, I prefer to provide a "pad" 28 that has a substantially conical centering pin 29 on its under side, sufficient to hold it in place on the upper face of the block 16. When the lifting head of the plunger 26 comes through the bore 25, it simply seats its upper end around the conical centering pin 29 and raises the pad 28 with the load. This transferring of the pad from the block 16 to the plunger head 26 is clearly illustrated in Fig. 2. The upper face of this pad 28 is preferably provided with a real pad 30 of material such as fiber or rather stiff rubber that can exert lifting pressure upon a heavy load without any danger of scratching the surface at which the lifting power is being applied. This is particularly desirable where this jack is used for lifting any part of an aeroplane for "leveling ship" or "trimming ship." The second levers 18 are preferably employed where the jack is designed to carry a very heavy load. In other cases where the service of the jack is not so heavy, I may dispense with the levers or links 18 and connect the upper ends of the lever plates 6*a*, 6*b*, directly to a block 16*a* by pivot pins 17*a* that are located on the medial vertical plane passing through the longitudinal axis of the bore of the block 16*a*. This enables the block to take its position from the position that the pad 28*a* would take from its contact with the face at which the load is being lifted.

The plungers of the two jacks may be operated by any fluid means but preferably are operated by small hand-operated jack pumps 31 and 32; the liquid being supplied to the same from a reservoir 33 preferably mounted in a horizontal position on the end of the frame 1 adjacent to the primary jack 10. The reservoir 33 has a connection not illustrated, that supplies the liquid to a hose connection 34 leading over to the pump 32, and also to another hose connection 35 that leads over to the outer end of the jack cylinder 11.

The frame 1 is preferably mounted on wheels 36 which, if desired, may be caster wheels. In order to give the frame 1 lateral stability I prefer to provide stabilizing means 37 located at each side of the frame, and consisting preferably of an arm of structural metal connected at its inner end by a pivot 38 to the outer side of its corresponding frame stringer 2. The outer end of each of these arms 37 is provided with an adjustable stem 39 which preferably consists of a threaded rod passing through a threaded opening at the end of the stabilizer arm, and the lower end of this stem 39 is provided with a foot 40 to rest upon the ground or upon cement on which

the jack should be employed where it is raising a heavy load. In the position of rest, these arms 37 are folded against the outer sides of the frame bars 2. When the apparatus is in use, they should be swung out to some such position as that illustrated in Fig. 3, in which they are more or less at right angles to the longitudinal axis of the frame. This lifting apparatus is preferably constructed so that it can be pushed around and up to the points where it is intended to be used by means of a handle lever 41. This lever is preferably bifurcated with its forks attached by pivot bolts 42 to the side stringers 2 of the frame.

In using this apparatus, of course the seat means or block 16 is shoved under the load at the point where the lifting force is to be applied, and at this time, of course the "pad" 28 (such as illustrated in Fig. 2), will be located on the upper end of the block 16 to apply the lifting force to the load. By reason of the fact that the real pad 30 will not, or should not, slip on the face of the "load," it will be evident that as the lever 6 swings up to its elevated position, the forces developed in the lever 6 will have a horizontal component at the cross pivot 9, and this will roll the frame 1 along on the cement so as to keep the frame under the load. This is one of the reasons why the frame should be mounted on wheels somewhat as illustrated.

In this connection attention is called to the use of the pivotal connections 38 for the side stabilizing arms 37 which permit the forward movement of the frame to be accompanied by only slight movement of the feet 40 on the cement. Of course, as the frame 1 advances, the feet 40 at the bottom of the stems, will be dragged along as the angular position of the arms 37 becomes changed.

Many other embodiments of the invention may be resorted to without departing from the spirit of the invention.

What I claim is:

1. In a lifting jack, the combination of an elongated frame, a pair of spaced lever-arms pivotally supported on said frame near the middle point thereof, a lifting block supported between said arms for supporting a load and raising the same to an intermediate level, said lever-arms capable of assuming a substantially horizontal position of rest with said block disposed near one end of the frame, means carried in said frame adjacent its other end and connected with said lever-arms for swinging the same to a vertical position thereby to raise the block and its load to an intermediate level; and a fluid operated plunger and cylinder means, the cylinder thereof located between and carried entirely by said lever-arms with its plunger at its outer end, and having a lifting head capable of moving up past the lifting block when in its elevated position to take the load therefrom and raise the same to a higher level.

2. In a lifting jack, the combination of a relatively narrow elongated frame having two side stringers spaced apart, a lever pivotally supported on said frame near the middle point thereof, a lifting block for supporting a load and raising the same to an intermediate level, supported adjacent the free end of said lever, said lever capable of assuming a low level position of rest with said block disposed near one end of the frame, a first power-operated cylinder supported at its outer end toward the other end of the frame and having a plunger pivotally connected

with said lever for swinging the same to a vertical position thereby to raise the block and its second load to an intermediate level; and a second power-operated cylinder supported on said lever and extending longitudinally thereof, said second cylinder having a plunger located toward the free end of the lever, said last-named plunger having a lifting head capable of moving up past the lifting block when in its elevated position to take the load therefrom and raise it to a higher level.

3. A lifting jack, comprising: a frame structure; a lifting lever journalled at the mid portion of said frame structure and movable between a lowered, forwardly directed position and a raised vertically directed position; a first hydraulic cylinder and piston unit anchored to said frame structure and engageable with said lifting lever to move said lever between its raised and lowered positions; a tubular lifting block pivotally connected to the extended end of said lever; a parallel link member pivotally connected to said frame structure and said lifting block to maintain the bore of said lifting block in a vertical axis throughout the travel of said lifting block; and a second hydraulic cylinder and piston means, the cylinder thereof rigidly secured to said lifting lever and the piston thereof adapted to register with and move through the bore of said lifting block when said lifting lever is in its vertical position.

4. A lifting jack, comprising: a frame structure including a pair of side beams, triangular bearing and reinforcing plates disposed at the central portions of said frame structure; a pair of lifting levers of obtuse triangular plates fulcrumed at their obtuse apices between the apices of said reinforcing plates, said lifting levers defining major lever arms movable between a lower or forwardly directed position and a raised or vertically directed position and defining minor lever arms depending between said reinforcing plates; a hydraulic cylinder and piston means anchored between said beams and connected with said minor lever arms for moving said lifting levers; a lifting block journalled between the extremities of said major lever arms; said lifting block having a vertical bore and a parallel link means connected with said lifiting block and reinforcing plates to maintain said lifting block oriented in a vertical plane for all positions of said lifting levers; a second hydraulic cylinder and plunger unit rigidly secured between said major lever arms in position for registry of its plunger with the bore of said lifting block when said lifting lever is in its vertical position, whereby said plunger may move through said lifting block and further elevate a load resting thereon.

5. A lifting jack, comprising: a frame structure; a lifting lever journalled on said frame structure and movable between a lowered substantially horizontal position and a raised substantially vertical position; means for moving said lifting lever between said positions; a tubular lifting block carried by said lifting lever; parallel link means cooperating with said lifting lever for maintaining the bore of said lifting block vertical; a fluid operated plunger and cylinder means, the cylinder of said means being supported by said lifting lever and movable therewith into registry with the bore of said lifting block as said lifting lever moves to its vertical position, the plunger of said plunger and cylinder means being vertically movable through the bore of said

lifting block to engage and further lift a load resting on said lifting block.

EDWARD P. GRIME.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
2,377,477	Bloch	June 5, 1945
1,945,910	Nelson	Feb. 6, 1934
1,900,528	Statz	Mar. 7, 1933
1,818,077	Manley et al.	Aug. 11, 1931
1,816,701	Sayers	July 28, 1931
1,805,588	Manley	May 19, 1931
1,767,470	Mitchell	June 24, 1930
1,650,810	Weaver	Nov. 29, 1927
1,555,842	Harris	Oct. 6, 1925
875,096	McGiffert	Dec. 31, 1907
776,797	Plant	Dec. 6, 1904

FOREIGN PATENTS

Number	Country	Date
382,998	Great Britain	Nov. 10, 1932