

Sept. 17, 1940.

E. B. THOMPSON

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COMBINED LIFTING AND VIBRATORY JACK

Filed Aug. 25, 1939

2 Sheets-Sheet 1

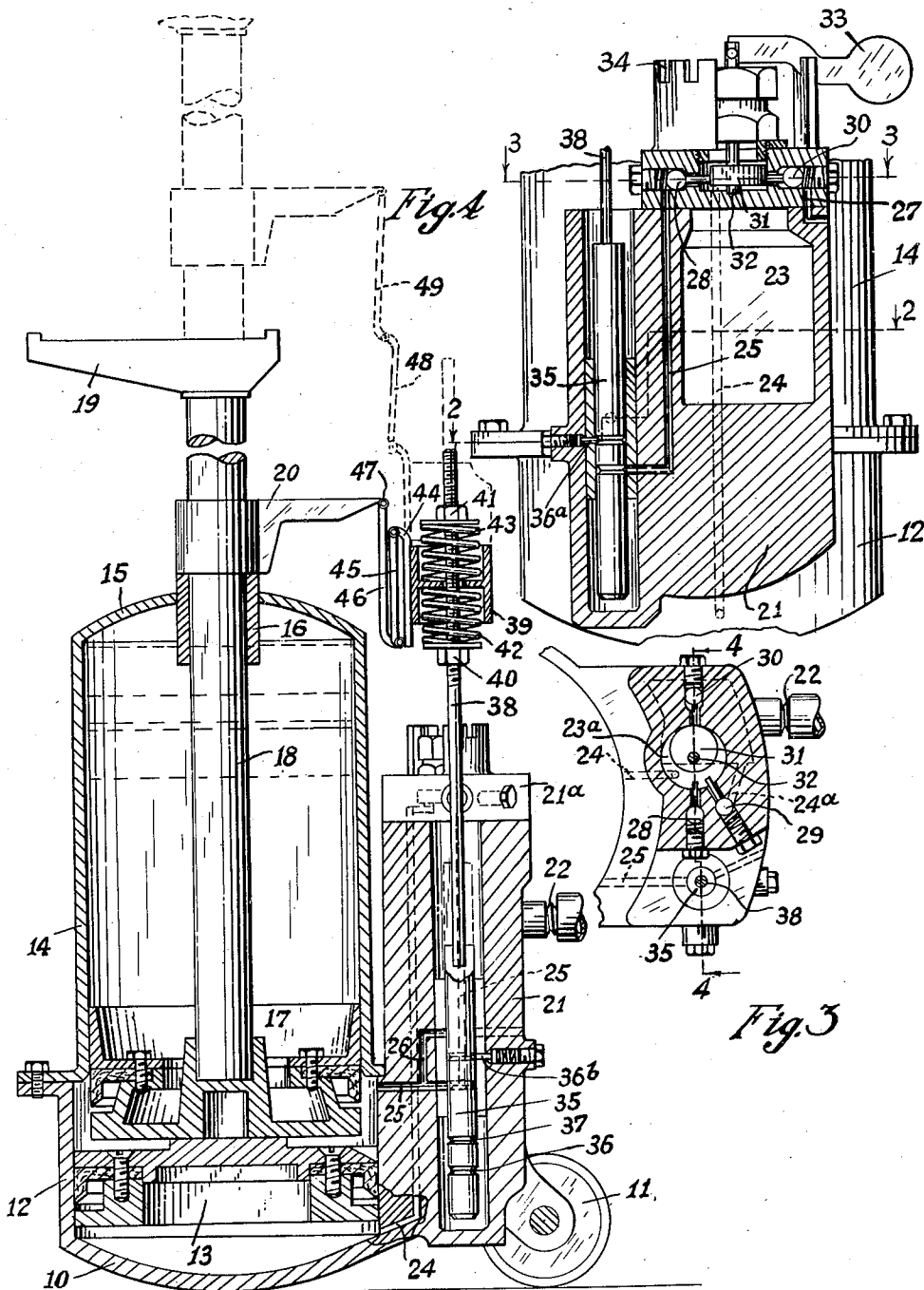


Fig. 1

Fig. 3

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2 Sheets-Sheet 2

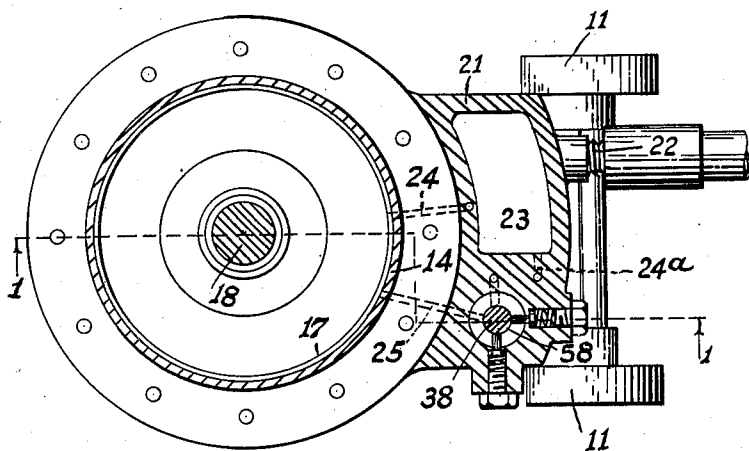


Fig. 2

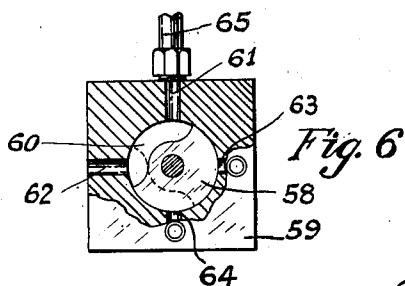


Fig. 6

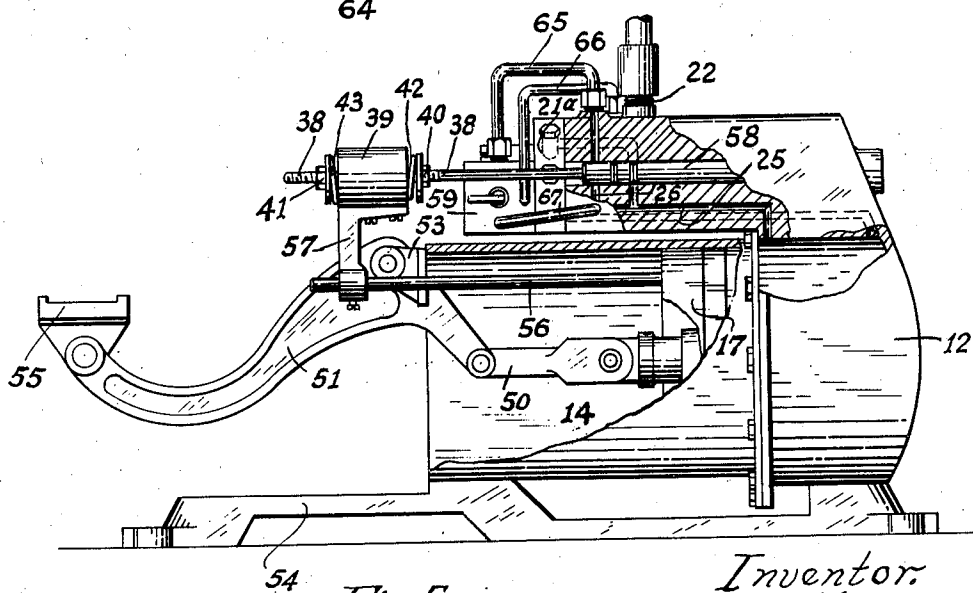


Fig. 5

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UNITED STATES PATENT OFFICE

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COMBINED LIFTING AND VIBRATORY
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poration of Iowa

Application August 25, 1939, Serial No. 291,875

7 Claims. (Cl. 121—164)

In the art of servicing automobiles, and particularly in the lubrication of automobile springs and the removal and replacement of tires, and especially when this work is being done on automobile hoists, there is now in general use so-called vibratory jacks operated by compressed air which first raise the axle a slight distance to take some of the weight of the automobile from the springs, and then the jack is operated automatically to move up and down to a short stroke for the purpose of rapidly moving the automobile body up and down to thereby operate the leaves of the springs in such manner as to facilitate the admission of lubricants between the leaves.

There is also in common use so-called lifting jacks, operated by compressed air which are used to elevate the automobile axle six or eight inches and hold it in said elevated position for purposes of removing and replacing tires and the like.

The object of my invention is to provide a combined lifting and vibratory jack capable of performing the functions of both jacks and being of such simple and inexpensive construction that it can be manufactured at substantially the same cost as a vibratory jack alone.

A further object is to provide a jack of this character in which the parts are so constructed and arranged that by a very easy and convenient manual operation the device may be adjusted to operate as a vibratory jack, or by another simple and convenient manual operation the jack may be adjusted to operate as a lifting jack.

In the accompanying drawings—

Figure 1 shows a vertical longitudinal sectional view of my improved jack. The dotted lines show the positions of the upper piston and the head, and the piston rod in raised position;

Figure 2 shows a transverse sectional view on the line 2—2 of Figure 4;

Figure 3 shows a sectional view on the line 3—3 of Figure 4;

Figure 4 shows a sectional view on the line 4—4 of Figure 3;

Figure 5 is a side elevation of a modified form of my improved jack showing the cylinder placed in a horizontal position, and a modified means for automatically operating the control valve; and

Figure 6 is an enlarged detail sectional view of the valve mechanism as used in connection with my modified form.

The reference numeral 10 indicates the base of the jack which preferably is provided with a supporting wheel 11. Within the base is a cylinder 12, and within this cylinder there is a piston 13. Above the cylinder 12 is a cylinder 14 of substantially the same length as that of the ordinary pneumatic lifting jack. At the top of the cylinder is a cylinder head 15, and the sleeve 16 extends downwardly into the interior of the

cylinder to function as a stop for the upper piston. Within the cylinder 14 is a piston 17, and carried by the piston 17 is a piston rod 18 which extends upwardly through the sleeve 16 and has a head 19 fixed to its upper end. Fixed to the piston rod 18 below the head 19 is an arm 20.

At one side of the cylinder there is a valve mechanism comprising a body portion 21 having at one side an air inlet pipe 22. This inlet pipe communicates with an air chamber 23. Supported on the casing 21 is a head 21a having an air chamber 23a. Communicating with this air chamber 23a are two air passageways, one of them, 24, leads to the space below the lower piston, and the other one, 25, leads to the space between the two pistons; and communicating with the passageway 25 is an exhaust passageway 26. There is also an exhaust passageway leading from the air chamber 23 to the chamber 23a. The passageways 24a, 25 and the exhaust passageway 27 are each controlled by a spring-actuated ball valve 28, 29 and 30, and these ball valves are controlled by a cam 31 on a shaft 32, which is provided with a hinged handle 33 at its top. This hinged handle may be held in any part of its rotary movement by being placed in one of the notches 34 in the head 21a.

Within the valve mechanism there is a slide valve 35 having grooves at 36 and 37 to register with the passageways 25 and 26. Spring actuated pins 35a and 35b are provided for yieldingly holding the grooves 36 and 37 in alignment with their respective passages 25 and 26, for controlling the valve movement in a manner hereinafter made clear. At the top of the slide valve there is an upwardly extended rod 38 having thereon a bracket 39 loosely mounted. This bracket is made adjustable on the rod 38 by means of the nuts 40 and 41, and between the bracket and each of said nuts is a cushioning spring 42 and 43.

The means for operatively connecting and disconnecting the slide valve with the piston rod comprises three arms, the first one, 44, being fixed to the bracket 39 and extended upwardly, the second one, 45, is hinged to the top of the arm 44 and extended downwardly, and the third one, 46, is hinged to the lower end of the arm 45 and extends upwardly where it is hinged at 47 to the arm 20 on the piston rod. When these arms are in the position shown by solid lines in Fig. 1, the piston rod is operatively connected with the bracket 39, and the bracket is yieldingly connected with the slide valve.

When, however, it is desired to operatively disconnect the piston from the slide valve, the operator simply grasps the lower portion of the arm 46 and swings it upwardly and toward the piston rod so that as the piston rod continues to move upwardly, the arms will move to position shown by the dotted lines 49.

In practical use, and assuming that it is desired to use the jack as a vibratory jack, the handle 33 is moved to position for admitting air to the chamber 23a, by causing the cam 31 to engage the stem of the valve 28, permitting air under pressure to pass from the air supply chamber 23 to said chamber 23a and through the passage 24. This elevates the lower piston 13, and with it the upper piston 17, to a point where the lower piston engages the under surface of the upper cylinder 14. The valve 35 will also be elevated until the groove 36 is in alignment with the passage 25. Then the operator moves the handle 33 to position to also engage the valve of the passageway 25, both of said valves 28 and 29 being at this time held open. This admits air between the pistons and raises the upper piston a short distance. When the upper piston has been moved to position for raising the piston rod and the arm 20, the member 39 will also be raised with strain applied to the upper spring 43, the valve 35 at this time being held down by the pins 36a until the tension of the spring of said pin is overcome. The valve 25 will then be rapidly elevated a short distance to position with the pin 36b entered in the groove 37 and said groove in alignment with the exhaust passage 26. The passage 25 will be closed by the valve body 35, and the air is exhausted and the weight on top of the piston rod moves the upper piston downwardly, and this operation is rapidly and automatically continued so long as the air supply is being delivered to the jack, and when the air is cut off by moving the cam 31 in contact with the valve 30, both pistons may move downwardly to their lower limit.

When it is desired to use the device as a lifting jack, then the operator first moves the lever 23 to cause the cam 31 to engage the valve 28 to admit air to the passage 24, causing the pistons 13 and 17 to be elevated until the piston 13 engages the wall 14 and at the same time the valve 35 to be elevated with the groove 36 in alignment with the passage 25. The arms 45 and 46 are then moved inwardly and upwardly, and then the handle 33 is moved to position for admitting air through the passageway 25, whereupon the upper piston is elevated to its limit and until it strikes the sleeve 16, and during this operation the arms 45 and 46 move to their straight line position, as shown by dotted lines 49, and do not operate the slide valve. By this means the same jack will perform the double function of a vibratory jack and a lifting jack, and the operator may conveniently and easily adjust the same to perform either of these functions.

In Figure 5 I have illustrated a modified form of my device wherein the cylinders are supported in a horizontal position instead of being mounted vertically whereby the height of the jack may be materially reduced. Instead of the piston rod 18 I have substituted a link, 50, having one end pivoted to the piston 17 and the other end pivoted to a bell crank lever 51 pivoted to a bracket 53 carried by the open end of the cylinder 14, said cylinder being mounted on a base 54. The free end of the lever 51 is provided with a pivoted load-bearing plate 55, the base member 12 being provided with a valve casing 21 and the valve stem 38. The piston 17 is provided with a rod 56 for actuating the valve stem 38 by means of an arm 57, said arm being fixed to both the valve stem 38 and the rod 56, the valve 58 being operated in unison with the movement of the piston, the valve 58 being

similar to the valve 35 with the exception that the grooves 36 and 37 are placed farther from the outer end of the valve.

Supported adjacent to the inner end of the head 21a I have provided a valve casing 59 having a valve 58 mounted therein, said valve being provided with a passage 60 adapted to connect the exhaust ports 61 and 62 when in one position of its movement, and to connect the inlet port 63 and outlet port 64 when in another position of its movement, the exhaust port being connected to the passage 26 by a pipe 65. The inlet port 63 is connected to the air chamber 23 by a pipe 67.

The operation of the modified form of my device is the same as in the preferred form, as to vibrating the piston. In my preferred form when it is desired to convert the vibratory jack to a lift jack, the handle 33 is operated to admit air to the discharge 25 to set the valve 35 to its position to produce rapid oscillations. The valve 58 is then operated to close the exhaust ports 61 and 62 with the passage 60 connected to the ports 63 and 64. Air is then admitted from the air chamber 23 to the pipe 25 66, and from there to the port 63 through the port 64, the pipe 67, and finally to the discharge 25. The piston is then moved to its outer limit of movement and is seated by engaging the bracket 53. When it is desired to lower the load 30 the valve 58 may again be actuated to move the discharge 60 to connect the ports 64 and 62, permitting air from back of the piston 17 to be exhausted and the piston to be returned to its inner limit of movement by the weight applied 35 to the member 53, to the bell crank 51 and the link 50, thus providing means wherein the piston 17 may be permanently and operatively connected to the valve stem 38.

I claim as my invention:

1. A combined lifting and vibratory jack, comprising an upright cylinder, a lower piston in the cylinder, an upper piston within the cylinder, the lower portion of the cylinder being adapted to permit the upper piston to move up and down through a path of movement required for vibrating operations, and the upper portion of the cylinder being free and unobstructed to permit the upper piston to travel upwardly to the extent of a full lifting-jack stroke, a piston rod for said upper piston extended above the cylinder, a valve mechanism on the exterior of the cylinder having a valve stem extended to position adjacent the piston rod, means for connecting the valve stem to the piston rod and for operatively disconnecting them, said valve mechanism including means for admitting to and exhausting air from the space between the pistons to vibrate the upper piston through a short path of movement in the lower portion of the cylinder when the valve stem is operatively connected to the piston rod, and said valve mechanism including means for admitting air to the cylinder to raise the upper piston to the full height of a lifting-jack movement when the valve stem is operatively disconnected from the piston rod.

2. A combined lifting and vibratory jack, comprising an upright cylinder, an upper piston within the cylinder, the lower portion of the cylinder being adapted to permit the piston to move up and down through a path of movement required for vibrating operations, and the upper portion of the cylinder being free and unobstructed to permit the piston to travel upwardly to the extent of a full lifting-jack stroke, a piston rod

for said piston extended above the cylinder, a valve mechanism having a valve stem extended to position adjacent the piston rod, means for connecting the valve stem to the piston rod and for operatively disconnecting them, said valve mechanism including means for admitting to and exhausting air from the space below the piston to vibrate the piston through a short path of movement in the lower portion of the cylinder when the valve stem is operatively connected to the piston rod, and said valve mechanism including means for admitting air to the cylinder to raise the piston to the full height of a lifting-jack movement when the valve stem is operatively disconnected from the piston rod.

3. A combined lift and vibratory jack, comprising an upright cylinder closed at its lower end, a piston within said cylinder, a piston rod therefor projecting upwardly through the upper end of said cylinder, inlet and exhaust passages for conveying fluid under pressure into and out of said cylinder and below said piston, a valve for controlling the flow of fluid into and out of said inlet and outlet passages, said valve being supported normally in position to permit free flow of fluid through said inlet passage, means controlled by the movement of said piston for actuating said valve to cause said piston to be reciprocated in short and rapid strokes, means for conveying fluid under pressure to said inlet passage, manually controlled means for adjusting the flow of said fluid, and manually controlled means for causing said valve-actuating means to become inoperative whereby fluid may be admitted through said manually controlled valve to the under side of said piston to cause the piston to be elevated a greater distance than permitted by the piston-actuated valve mechanism.

4. A combined lift and vibratory jack, comprising an upright cylinder, a piston within said cylinder the lower portion of the cylinder being adapted to permit the piston to move up and down through a path of movement required for vibrating operations, the upper portion of the cylinder being free and unobstructed to permit the piston to travel upwardly to the extent of a full lifting-jack stroke, a piston rod for said piston extended above the cylinder, a load-supporting device carried by the upper end of said piston rod, a valve mechanism, means for connecting the valve mechanism to the piston rod whereby the valve mechanism will be automatically operated by the movement of said rod, said valve mechanism including means for admitting to and exhausting fluid from the space below the piston to vibrate the piston through a short path of movement in the lower portion of the cylinder, means for causing said valve mechanism to become inoperatively connected to said piston rod, and means for admitting fluid under pressure to the under side of said piston when said valve mechanism is disconnected from said piston rod.

5. A combined lift and vibratory jack, comprising a cylinder, a piston within said cylinder, one portion of the cylinder being adapted to permit the piston to reciprocate therein through a path of movement required for vibration operations, another portion of said cylinder being free and unobstructed to permit the piston to travel to the extent of a full lift jack stroke, a load-supporting device, means operatively connecting said piston and said load-supporting device, a

valve mechanism, means operatively connecting the valve mechanism to the piston whereby the valve mechanism will be automatically operated, said valve mechanism including means for admitting the exhausting fluid to and from the space between the piston and the closed end of said cylinder to vibrate the piston through a short path of movement in the first mentioned portion of the cylinder, and means manually adjusted to control the valve mechanism to permit the piston to move throughout its full stroke in the second mentioned portion of the cylinder.

6. A combined lift and vibratory jack, comprising a cylinder, a piston within said cylinder, one portion of the cylinder being adapted to permit the piston to reciprocate therein through a path of movement required for vibration operations, another portion of said cylinder being free and unobstructed to permit the piston to travel to the extent of a full lift jack stroke, a load-supporting device, means operatively connecting said piston and said load-supporting device, means for delivering fluid to said cylinder under pressure to operate said piston, and means controlled by the movement of said piston for automatically controlling the air delivered to said cylinder to cause said piston to vibrate in the first mentioned portion of said cylinder, and manually operated means for controlling the delivery of fluid to said cylinder for causing said piston to travel through said second portion of the said cylinder to deliver a long lifting stroke.

7. A combined lifting and vibratory jack, comprising an upright cylinder, a lower piston in the cylinder, an upper piston within the cylinder, the lower portion of the cylinder being adapted to permit the upper piston to move up and down through a path of movement required for vibrating operations, and the upper portion of the cylinder being free and unobstructed to permit the upper piston to travel upwardly to the extent of a full lifting-jack stroke, a piston rod for said upper piston extended above the cylinder, a valve mechanism on the exterior of the cylinder having a valve stem extended to position adjacent the piston rod, means for connecting the valve stem to the piston rod and for operatively disconnecting them, said valve mechanism including means for admitting to and exhausting air from the space between the pistons to vibrate the upper piston through a short path of movement in the lower portion of the cylinder when the valve stem is operatively connected to the piston rod, and said valve mechanism including means for admitting air to the cylinder to raise the upper piston to the full height of a lifting-jack movement when the valve stem is operatively disconnected from the piston rod, said means for connecting the piston rod to the valve stem comprising three arms hinged together at opposite ends, the free end of one arm being attached to the piston rod and the free end of the opposite arm being attached to the valve stem, said arms, when in substantially parallel position, serving to move the valve stem up and down with the piston rod, and the arm which is attached to the piston rod and the central arm being free to be manually swung toward the piston rod and upwardly, whereby the movements of the piston rod will not move the valve stem.