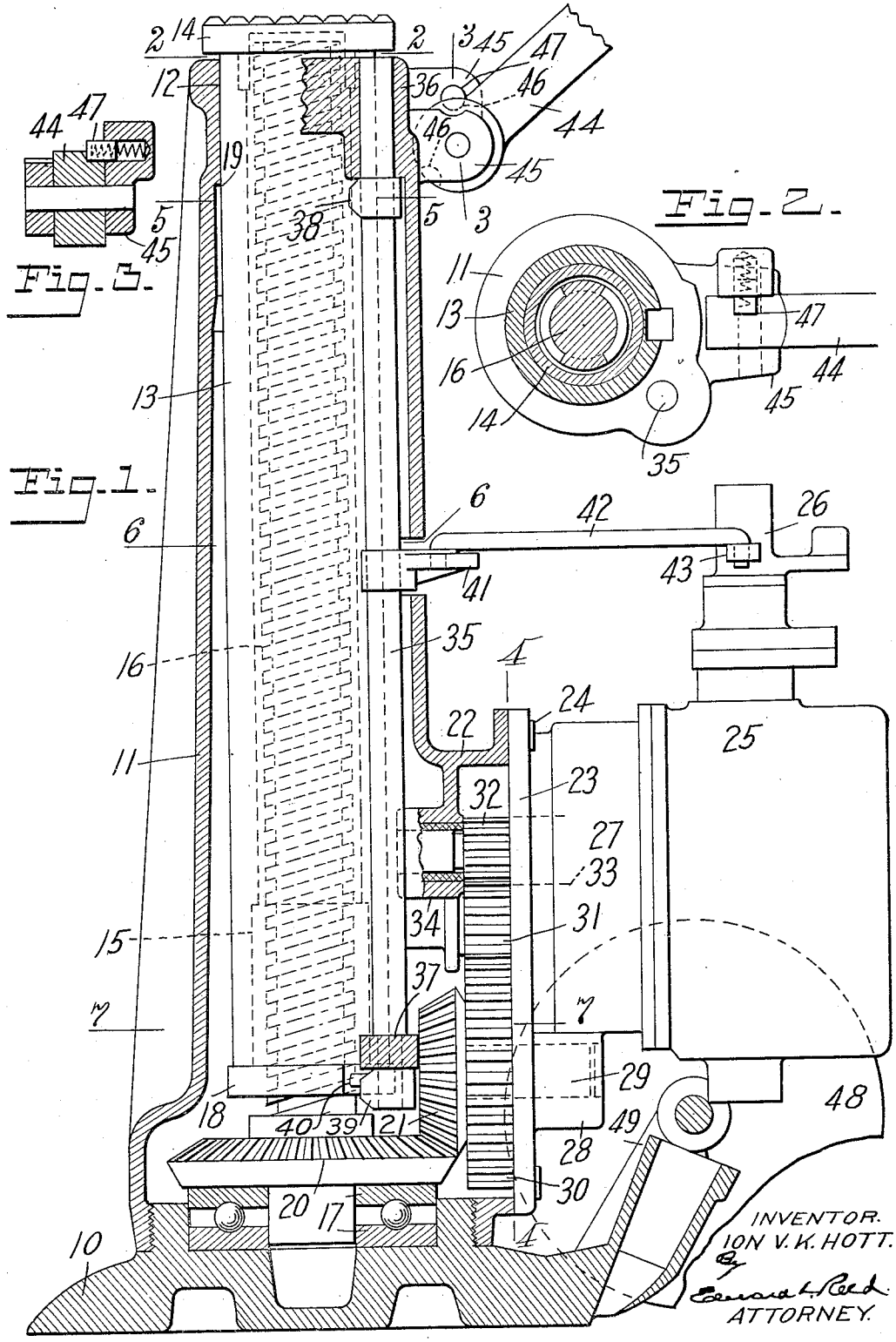
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LIFTING MECHANISM

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LIFTING MECHANISM

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Fig. 6.

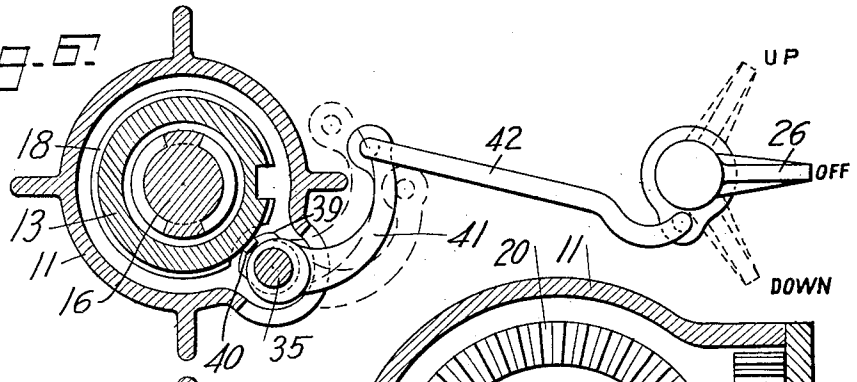


Fig. 5.

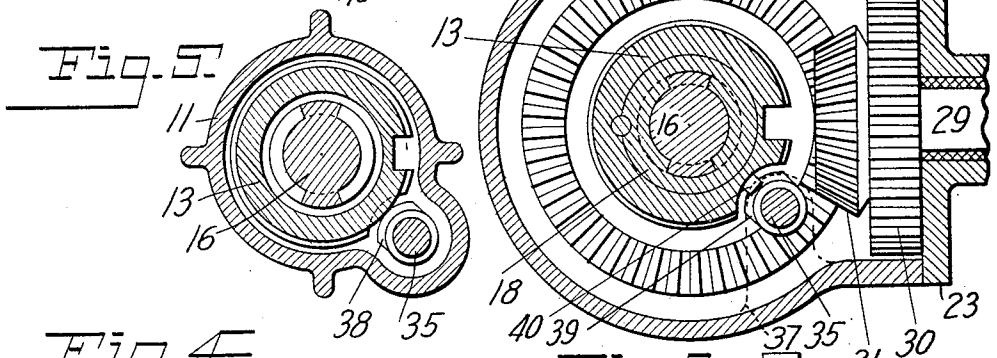


Fig. 4.

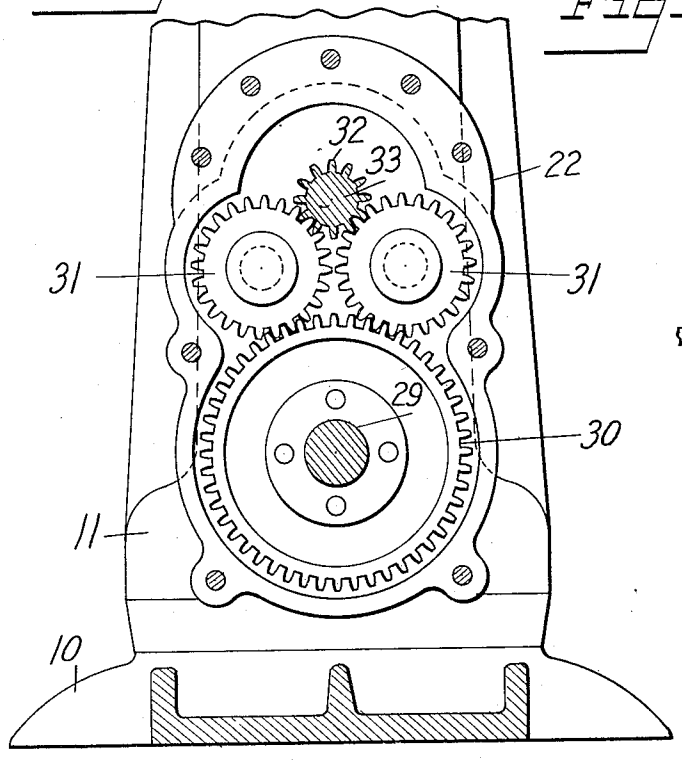


Fig. 7.



Fig. 8.

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UNITED STATES PATENT OFFICE

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LIFTING MECHANISM

Application filed August 1, 1927. Serial No. 209,711.

This invention relates to lifting mechanisms and more particularly to a lifting jack designed for heavy duty. Lifting jacks are usually hand operated and to this end are provided with an operating lever. When operating under a heavy load it requires the services of two men to actuate the jack and the operation is slow. It is therefore desirable that the jack be provided with power operated means for actuating the same, thus eliminating the services of one man and securing a much more rapid operation.

One object of the present invention is to provide a lifting jack with an air motor permanently attached thereto and adapted to be connected by a flexible conduit with any suitable source of supply of air under pressure, such as is usually found in shops and other locations in which heavy duty jacks are used.

A further object of the invention is to provide a self-lowering jack with an air motor so connected therewith that it will operate both to impart lifting movement to the lifting element and to retard the lowering movement of the lifting element.

A further object of the invention is to provide a lifting jack with an air motor and means for automatically controlling the motor to interrupt the movement of the lifting element when the latter reaches the limit of its movement.

A further object of the invention is to provide means whereby such a jack may be easily transported from place to place.

Other objects of the invention will appear as the device is described in detail.

In the accompanying drawings Fig. 1 is a vertical sectional view taken centrally through a jack embodying my invention, showing the motor in elevation; Fig. 2 is a transverse section taken on the line 2—2 of Fig. 1; Fig. 3 is a section taken on the line 3—3 of Fig. 1; Fig. 4 is a sectional view taken on the line 4—4 of Fig. 1, showing the driving gearing in elevation; Fig. 5 is a transverse section taken on the line 5—5 of Fig. 1; Fig. 6 is a transverse section taken on the line 6—6 of Fig. 1; Fig. 7 is a transverse section taken on the line 7—7 of Fig. 1; and Fig. 8 is a detail view, partly broken away, of the cam shaft.

In these drawings I have illustrated one embodiment of my invention and have shown the same as applied to a screw jack of a well known type but it will be understood that this particular embodiment has been chosen for the purpose of illustration only and that the invention may be applied to jacks of various kinds and that the manner of mounting the motor, connecting the same with a lifting element and controlling its operation, may take various forms.

The jack here illustrated comprises an upright standard consisting of a base 10 and a vertical housing 11 rigidly secured to said base, extending upwardly therefrom and having at its upper end a bearing 12. Slidably mounted in the bearing 12, for vertical movement in the housing, is a ram or hollow lifting element 13 having at its upper end a cap or load engaging member 14. A nut 15 is mounted in the lower end of the lifting element or ram and threaded in this nut is a lifting screw 16 which is rotatably mounted on the base 10. In the present instance, a ball bearing 17 supports the screw on the base. The nut 15 has a flange 18 which projects beyond the side of the ram and is arranged to engage a shoulder or stop 19 provided on the inner wall of the housing near the upper end thereof, and thus limit the upward movement of the lifting element or ram. Rigidly secured to the lower portion of the screw is a beveled gear 20 which rests upon the ball bearing 17 and which meshes with a second beveled gear 21, the beveled gears and the screw constituting the actuating device for the lifting element. The housing is provided at its lower portion with a lateral extension 22, the outer side of which is closed by a plate 23 rigidly secured thereto by means of bolts 24 or otherwise.

Permanently connected with the housing 11 is an air motor 25. This motor may be of any suitable character and as the motor in itself forms no part of the invention, except as it enters into combination with other parts of the mechanism, it is unnecessary to illustrate or describe the same in detail. Suf-

fice it to say that it is of the reversible rotary type and is provided with a controlling device or valve actuating lever 26. In the present instance, the motor is permanently attached to the plate 23 and I have interposed between the motor and the plate 23 a supplemetal casing 27 in which may be arranged such reducing gearing as may be necessary to reduce the speed of the motor to that required for the operation of the jack. The plate 23 has near its lower end a bearing 28 in which is journaled a shaft 29 carrying the beveled gear 21 and rigidly secured to this shaft between the beveled gear and the plate is a spur gear 30. Meshing with this spur gear are two intermediate gears 31 which mesh with a pinion 32 rigidly secured to a driving shaft 33 forming part of the motor mechansm, extending through the plate 23 and having its inner end journaled in a bearing 34 carried by the housing 11. Obviously the gear train between the shaft 33 and the beveled pinion 22 may take any suitable form but I use two intermediate gears for the purpose of dividing the load and thus relieving the individual teeth of the several gears of a part of the load. It will be apparent that by the manipulation of the controlling device 26 the motor may be caused to rotate the screw 16 in a direction to impart either upward or downward movement to the lifting element. If the screw is of the low pitch type the motor will be operated in a reverse direction to drive the lifting element downward but where, as in the present instance, the screw is of the high pitch type the load will run down under its own weight and the jack will be self-lowering. The permanent gear connection between the screw and the motor causes the latter to act as a retarding device or compression brake to control the lowering of the load. If the resistance offered by the motor to the downward movement of the load when the controlling device is in its neutral position is not sufficient to properly retard the movement of the load, the controlling device may be manipulated to admit to the motor sufficient air to provide the necessary retardation of the movement of the load. It will be obvious that the amount of resistance which is necessary to properly control the load will depend upon the weight of the load and upon the pitch of the screw.

To prevent injury to the mechanism, which might result if the ram or lifting element were moved violently into contact with the stops at either limit of its movement, I have provided means for automatically interrupting the operation of the motor when the lifting element reaches the limit of its movement. In the present instance, I have arranged within the housing 11, alongside of the lifting element, a vertical rod or shaft 35 which is here shown as journaled in bearings 36 and 37 near the upper and lower ends of the housing. Rigidly secured to this shaft near its respective ends are cams 38 and 39 which are arranged in the path of a part connected with and movable with the lifting element, this part being here shown as a stud or pin 40 mounted in the flange 18 of the nut. The shaft 35 has rigidly secured thereto an operating arm 41 which extends through the housing 11 and is connected by a link 42 with an arm 43 rigidly connected with the controlling device or valve actuating lever 26. The connection between the shaft and the controlling device is such that when the arm 41 is in an intermediate or neutral position the controlling device for the valve actuating lever will be in an intermediate position and the valve which controls the admission of air to the motor will be closed. When the controlling device is actuated to admit air to the motor, to rotate the same in either direction, the shaft 35 will be rotated and the position of the cams 38 and 39 shifted with relation to the pin 40 which is carried by the lifting element. The cams 38 and 39 are so arranged with relation to the pin that the contact of the pin with either cam will rotate the shaft in a direction to move the controlling device 26 to its neutral position and thereby interrupt the operation of the motor.

When a load is to be elevated the valve actuating device is manually operated in a direction to cause the motor to move the lifting element upwardly. This upward movement of the lifting element continues, unless manually interrupted, until the stud 40 engages the cam 38, thus rotating the shaft 35 to close the valve and stop the motor. Inasmuch as the motor is stopped and the movement of the lifting element interrupted while the stud is in engagement with the cam the shaft will be held against return movement and the valve cannot be moved to a position to again cause upward movement to be imparted to the lifting element until the stud has moved downwardly out of engagement with the cam. However, the valve actuating device is free to move to a position to cause downward movement to be imparted to the lifting element. When the lifting element reaches its lower position the stud 40 will actuate the cam 39 to stop the motor and the valve will be held against return movement until upward movement has been imparted to the lifting element. When the lifting element is moved from its uppermost position or from its lowermost position far enough to carry the stud out of engagement with the cam the shaft 35 is free to rotate in either direction and the valve actuating device may be manually operated to stop the motor or to cause it to move the lifting element in either direction.

Jacks of this type must, of course, be moved from place to place and as they are quite heavy, I have provided special means

for transporting same. As here shown I have provided the jack with wheels 48 mounted on brackets 49 arranged beneath the motor. The arrangement of these wheels is such as when the jack is in an upright position the wheels will be out of contact with the floor or other supporting surface, but when the jack is tilted the wheels will contact with the supporting surface and the weight of the jack may be supported thereon while it is moved from place to place. The jack is also provided with a handle 44 by means of which it may be tilted on to the wheels and moved from one place to another. In the present construction this handle is pivotally mounted between lugs 45, which are secured to the housing near the upper end thereof, so that it can be moved either into an elevated or operative position, as shown in Fig. 1, or into an inoperative position, in which it will lie close to the housing. The hub of the lever is provided with two peripheral recesses 46 adapted to receive a spring pressed plunger or detent 47, which is slidably mounted in a recess in one of the lugs 45 and which serves to hold the handle in its adjusted position. The position of the detent 47 with relation to the hub of the handle is such that the detent will project above the peripheral surface of the hub so that it may be engaged by the finger of the operator and retracted to permit the movement of the handle from one place to another. The detent serves to lock the handle rigidly in its adjusted position and when the handle is so locked in its elevated position it may be grasped by the operator and the jack tilted rearwardly onto the wheels and balanced thereon so that it can be easily moved from place to place.

While I have shown and described one embodiment of my invention I wish it to be understood that I do not desire to be limited to the details thereof as various modifications may occur to a person skilled in the art.

Having now fully described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a lifting jack, a standard, lifting mechanism carried by said standard and comprising a quick pitch screw adapted to permit the load to move downwardly under its own weight, an air motor mounted on said standard, having permanent geared connection with said screw and serving both to rotate said screw in a direction to lift the load and as a retarding device to control the lowering of the load.

2. In a lifting jack, a hollow standard, a lifting element slidably mounted in said standard, a nut carried by said lifting element, a screw rotatably mounted in said standard and threaded through said nut, a beveled gear rigidly secured to said screw, said standard having a lateral extension, a plate to close the outer end of said extension, a bearing carried by said plate, a shaft journaled in said bearing, a beveled gear secured to said shaft and meshing with the first mentioned gear, a spur gear rigidly secured to said shaft, an air motor permanently mounted on said plate and comprising a shaft extending through said plate, said standard having a bearing to receive the inner end of said shaft, and gears for connecting the last mentioned shaft with the first mentioned shaft.

3. In a lifting jack, a standard, lifting mechanism comprising a screw carried by said standard, an air motor rigidly secured to said standard and operatively connected with said screw, a valve to control the operation of said motor, a cam movably supported by said standard, means for operatively connecting said cam with said valve, and a part movable with said lifting mechanism to engage said cam and impart movement to said valve.

4. In a lifting jack, a standard, a lifting element mounted in said standard, a screw for operating said lifting element, an air motor mounted on said standard, means for operatively connecting said air motor with said screw, a controlling device for said air motor, a shaft rotatably mounted on said standard, an operative connection between said shaft and said controlling device, a cam carried by said shaft, and a part carried by said lifting element and arranged to engage said cam and actuate said controlling device when said lifting element reaches the limit of its movement in one direction.

5. In a lifting jack, a standard, a lifting element mounted in said standard, a screw for operating said lifting element, an air motor mounted on said standard, means for operatively connecting said air motor with said screw, a controlling device for said air motor, a vertical shaft rotatably mounted within said standard, a cam rigidly secured to said shaft near each end thereof, a part carried by said lifting element and arranged to engage one of said cams when said lifting element approaches either limit of its movement and to impart rotatory movement to said shaft, and an operative connection between said shaft and said controlling device.

6. In a lifting jack, a hollow standard, a lifting element mounted in said standard, a screw for operating said lifting element, a motor permanently mounted on said standard, a gear train for permanently connecting said motor with said screw, a controlling device for said motor, a shaft mounted within said standard and extending lengthwise of said screw, means for operatively connecting said shaft with said controlling device, and means controlled by the movement of said lifting element to impart rotatory movement to said shaft in a direction to move said controlling device to its neutral position when

said lifting element reaches the end of its movement in either direction.

7. In a lifting jack, a standard, lifting mechanism carried by said standard, a motor mounted on said standard, and extending laterally therefrom, wheels mounted on said standard beneath said motor and arranged normally out of contact with the supporting surface, and the handle connected with said standard above said motor, whereby said jack may be tilted onto said wheels and moved from place to place.

8. In a lifting jack comprising a standard, a lifting element carried by said standard and a motor mounted on said standard and operatively connected with said lifting element, a device to control the operation of said motor, a shaft rotatably mounted on said standard, means for operatively connecting said shaft with said controlling device, a cam connected with said shaft, and a part connected with said lifting element and arranged to engage said cam and actuate said controlling device to interrupt the operation of said motor when said lifting element is moved to a predetermined position.

9. In a lifting jack comprising a standard, a lifting element carried by said standard and a motor mounted on said standard and operatively connected with said lifting element, a device to control the operation of said motor, a shaft rotatably mounted on said standard, means for operatively connecting said shaft with said controlling device, two cams connected with said shaft and spaced one from the other, and a part connected with said lifting element and arranged to engage one or the other of said cams and actuate said controlling device when said lifting element is moved to the limit of its movement in either direction.

10. In a lifting jack comprising a standard, a lifting element carried by said standard and a motor mounted on said standard and operatively connected with said lifting element, a device to control the operation of said motor, a cam movably mounted near each end of said standard, means for operatively connecting said cams with said controlling device, and means connected with said lifting element to actuate one or the other of said cams when said lifting element is moved to the limit of its movement in either direction.

11. In a lifting jack, comprising a standard, a lifting element carried by said standard and a motor mounted on said standard and operatively connected with said lifting element, a device to control the operation of said motor, a shaft mounted within said standard and extending lengthwise thereof, means for operatively connecting said shaft with said controlling device, cams secured to said shaft near the respective ends thereof, and a part carried by said lifting element between said cams and arranged to engage and operate one of said cams when said lifting element is moved to the limit of its movement in one direction and to engage and operate the other of said cams when said lifting element is moved to the limit of its movement in the other direction.

12. In a lifting jack, a standard, a lifting element carried by said standard, an air motor mounted on said standard, operating mechanism to connect said air motor with said lifting element, a valve to control the operation of said air motor, a device to actuate said valve, and means controlled by said operating mechanism to so control said valve actuating device that said valve may remain in its open position during the travel of said lifting element and will be closed when said lifting element reaches the limit of its movement.

13. In a lifting jack, a standard, a lifting element carried by said standard, an air motor mounted on said standard, operating mechanism to connect said air motor with said lifting element, a valve to control the operation of said air motor, a device to actuate said valve, and means controlled by said operating mechanism to so control said valve actuating device that said valve may remain in its open position when said lifting element is in an intermediate position and will be closed when said lifting element is moved to the limit of its movement in either direction.

14. In a lifting jack, a standard, a lifting element carried by said standard, an air motor mounted on said standard, operating mechanism to connect said air motor with said lifting element, a valve to control the operation of said air motor, a shaft journaled on said standard and extending lengthwise of said lifting element, means for operatively connecting said shaft with said valve, and means actuated in accordance with the movement of said lifting element to impart rotatory movement to said shaft and close said valve when said lifting element is moved to the limit of its movement.

15. In a lifting jack, a standard, a lifting element carried by said standard, an air motor mounted on said standard, operating mechanism to connect said air motor with said lifting element, a valve to control the operation of said air motor, and a device to actuate said valve, said lifting element having a part to engage said valve actuating device and close said valve as said lifting element nears the limit of its movement in one direction.

16. In a lifting jack, a standard, a lifting element carried by said standard, operating mechanism to actuate said lifting element, an air motor to drive said operating mechanism, manually operable valve mechanism to control the operation of said air motor, said valve mechanism being movable in either direction from its closed position to control the direction in which said lifting element is

moved by said motor, and means actuated in accordance with the movement of said lifting element to move said valve mechanism to its closed position when said lifting element reaches the limit of its movement in one direction, said means being arranged to prevent the return of said valve mechanism to the position from which it has been moved until said lifting element has been moved in the opposite direction and to permit said valve mechanism to be manually moved in a direction to reverse the operation of said motor.

17. In a lifting jack, a standard, a lifting element carried by said standard, operating mechanism to actuate said lifting element, an air motor to drive said operating mechanism, a manually operable valve mechanism to control the operation of said air motor, said valve mechanism being movable in either direction from its closed position to control the direction in which said lifting element is moved by said motor, an automatically operated device for operating said valve mechanism, and means actuated in accordance with the movement of said lifting element to cause said operating device to move said valve mechanism to its closed position when said lifting element reaches the limit of its movement in either direction and to permit the further movement of said valve mechanism in the same direction to reverse the operation of said motor.

18. In a lifting jack, a standard, a lifting element carried by said standard, operating mechanism to actuate said lifting element, an air motor to drive said operating mechanism, a valve to control the operation of said motor, said valve having a neutral position and two operative positions, manually operable means to actuate said valve, an automatically operated device to actuate said valve, and means actuated in accordance with the movement of said lifting element to cause said automatically operable device to move said valve from one operative position to said neutral position when said lifting element reaches the limit of its movement in one direction, said automatically operable device being so arranged that it will prevent the return of said valve to said operative position but will permit the same to be manually moved to its other operative position.

19. In a lifting jack, a standard, a lifting element carried by said standard, operating mechanism for said lifting element, an air motor to actuate said operating mechanism, a valve to control said motor, a rock shaft extending lengthwise of said standard, means for operatively connecting said rock shaft with said valve, a laterally extending part secured to said rock shaft, and a part movable in accordance with the movement of said lifting element and arranged to engage the first mentioned part and impart operative movement to said rock shaft when said lifting element is moved to the limit of its movement in one direction.

In testimony whereof, I affix my signature hereto.

ION V. K. HOTT.