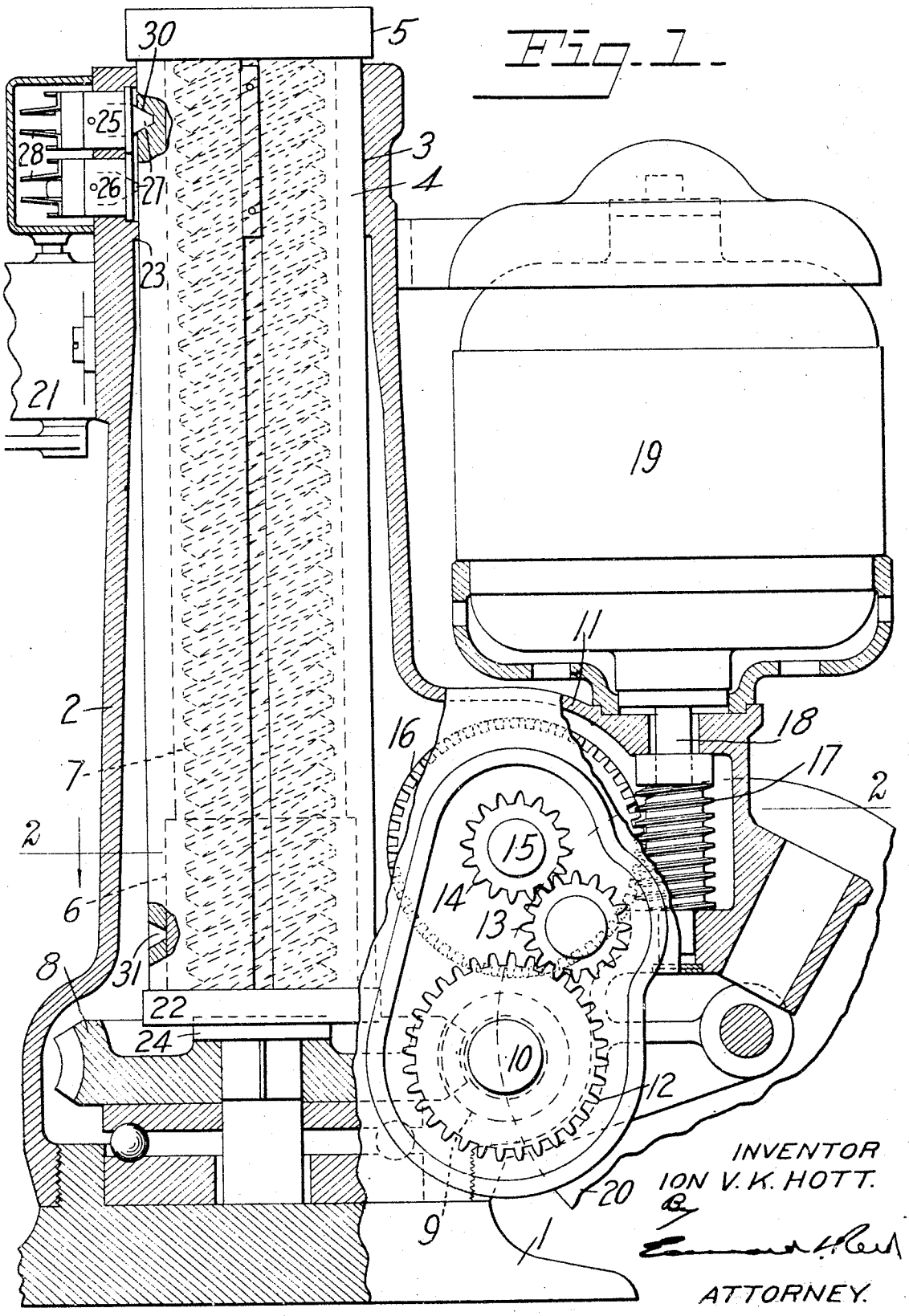
June 23, 1931. I. V. K. HOTT 1,811,629

ELECTRICALLY OPERATED LIFTING JACK

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ELECTRICALLY OPERATED LIFTING JACK

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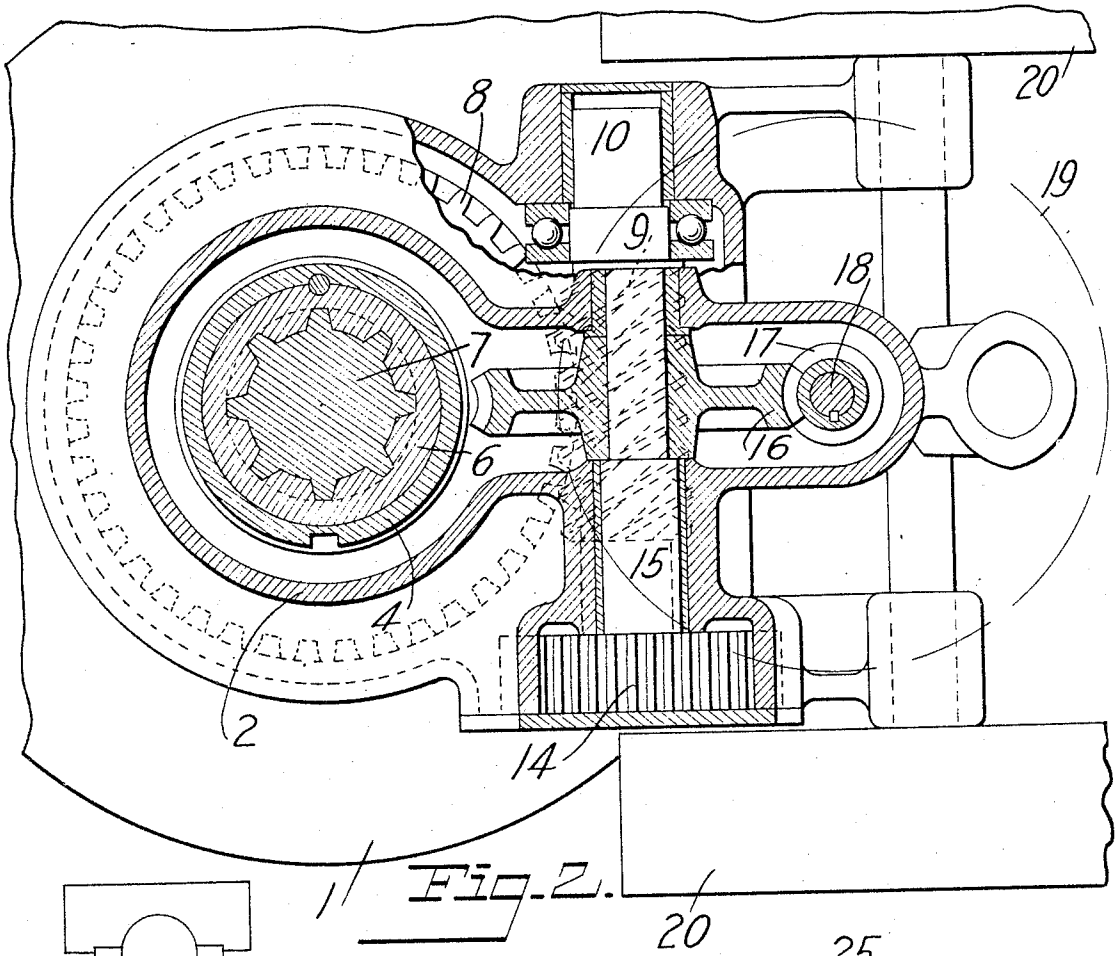


Fig. 2.

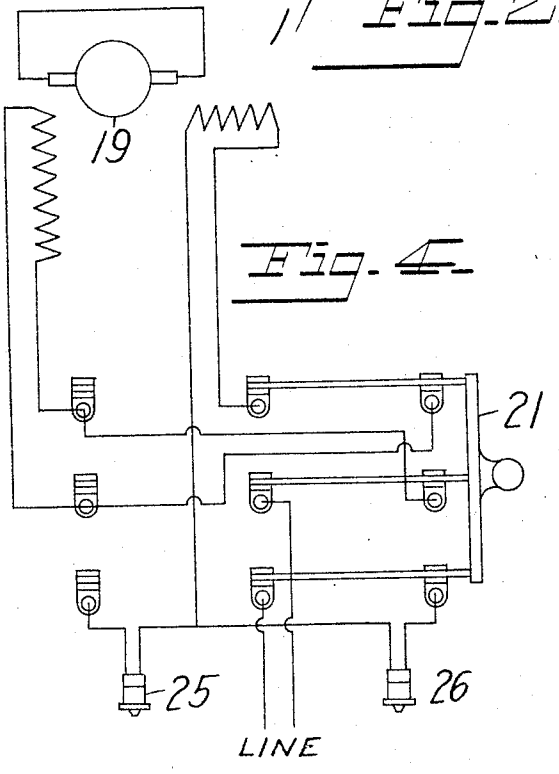


Fig. 4.

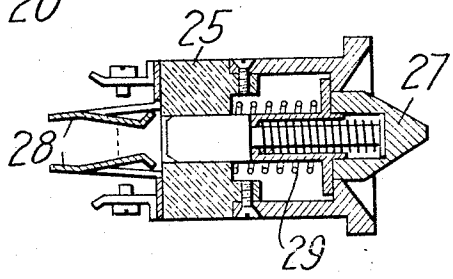


Fig. 3.

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UNITED STATES PATENT OFFICE

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ELECTRICALLY OPERATED LIFTING JACK

Application filed August 29, 1927. Serial No. 216,127.

This invention relates to power operated lifting mechanism and more particularly to an electrically operated jack.

One object of the invention is to provide an electrically operated jack which will be simple in its construction and operation and in which the motor and its connecting parts will be arranged in a compact and convenient manner and the weight of the jack as a whole may be well balanced.

A further object of the invention is to provide an electrically operated jack which will be reversible in its operation and which will be provided with means for automatically interrupting the operation of the motor, when the lifting element reaches the limit of its movement, thus preventing injury to the mechanism.

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

In the accompanying drawings Fig. 1 is a vertical sectional view, partly in elevation, of a jack embodying my invention; Fig. 2 is a transverse sectional view taken on the line 2—2 of Fig. 1; Fig. 3 is a sectional detail view of one of the circuit breakers and closers; and Fig. 4 is a circuit diagram.

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 purposes of illustration only and that the mechanism may take various forms and may be applied to lifting mechanisms of various kinds without departing from the spirit of the invention.

As here shown, the jack comprises a base 1 having mounted thereon an upright hollow standard 2. The standard has at its upper end a bearing 3 and slidably mounted in this bearing is a hollow lifting element or ram 4 provided at its upper end with a load engaging member or cap 5 and having in the lower portion thereof a nut 6. A screw 7 is mounted in engagement with the nut 6 and is rotatably supported on the base 1. Rigidly secured to the lower end of the screw is a worm wheel 8 which meshes with a worm 9 mounted on a transverse shaft 10 journaled in side walls of a lateral extension 11 of the standard. Rigidly secured to the shaft 10 is a gear 12 which meshes with an idle pinion 13 which in turn meshes with a pinion 14 secured to a shaft 15 also mounted in the walls of the extension 11. Rigidly secured to the shaft 15 is a worm wheel 16 which meshes with a worm 17 mounted for rotation about a vertical axis and here shown as carried by a shaft 18 mounted in vertical bearings on the extension 11 of the standard. This shaft 18 is directly connected with an electric motor 19 which is supported on the extension of the housing and comprises an extension of the motor shaft, the arrangement being such that the motor is mounted close to the side of the standard 2 and its weight is carried by the extension 11. Wheels 20 are mounted on the extension 11 of the housing and so arranged that when the jack is in an upright position the wheels are out of contact with the floor, or other supporting surface, but by tilting the jack rearwardly the weight may be thrown upon the wheels to enable the jack to be trundled from one position to another. The arrangement of the motor and the operating mechanism is such that a slight tilting movement of the jack will throw the center of gravity directly above the wheels. The screw 7 is of a quick pitch type so that when unrestrained the lifting element will run down under the weight of a load thereon and the worm wheel 8 and worm 9 are of such pitch that the worm wheel will drive the worm. The worm wheel 16 and worm 17 are of such pitch that the worm will lock the worm wheel against rotation, that is, the worm wheel will not drive the worm. Consequently when the motor is idle the lifting element will be locked against downward movement but when the motor is operated in a reverse direction the worm 17 will rotate the worm 16 and thus permit the lifting element to run down under the weight of a load thereon or if it does not run down under the weight of the load the worm 17 will drive it down. It will be noted that the high speed worm 17, which is directly connected with the motor, is of low pitch and the low speed worm 9 is of high pitch, the two worms be-

ing connected by spur reducing gearing, thereby securing a highly efficient operation due to the fact that high speed increases efficiency and a high helix angle also increases efficiency. By making the high speed worm of low pitch and utilizing it as the locking member I am enabled to make the low speed worm 9 of high pitch and to secure high efficiency in both worms. If the high speed worm 17 were of high pitch it would be necessary to make the high pitch worm 9 of low pitch in order to secure the desired locking action and this would more than offset the gain in efficiency in the high speed worm. A reversing switch 21 is provided to control the operation of the motor and, as here shown, this switch is mounted on the side of the standard 2. Means are provided for automatically interrupting the operation of the motor when the lifting element has been moved to a predetermined position, or to the limit of its movement, in either direction, thereby preventing injury to the mechanism. The lifting element or ram has at its lower end a flange 22 forming a stop to engage the cooperating stop 23 at the upper end of the standard and thus limit the upward movement of the lifting element. The downward movement of the lifting element may be limited by the contact of the nut with a collar 24 rigidly secured to the screw near the base thereof, or by the contact of the cap 5 with the upper end of the standard. However, should any of these stops be brought violently into contact by the continued operation of the motor the mechanism might be injured. The automatic controlling means may take various forms but preferably it consists of two circuit breakers and closers having movable parts which cooperate with the lifting element and which serve to interrupt the circuit when the lifting element reaches the limit of its movement in either direction. The circuit for the motor may be of any suitable character, one arrangement being shown in Fig. 4, and, as is usual with reversing motors, the circuit comprises two parts, one of which is closed when the motor is operating in one direction and the other of which is closed when the motor is operating in the other direction. The circuit breakers and closers are connected in the respective parts of this circuit, as shown at 25 and 26. In the present arrangement the two circuit breakers and closers are carried by the standard 2 and are mounted in the bearing portion 3 thereof. They may be of any suitable character and are here shown as of a known type comprising a movable part or plunger 27 adapted to engage resilient contact members 28, each connected in the circuit, and acted upon by a spring 29 which tends to move the plunger outwardly and interrupt the circuit. These plungers 27 extend into the interior of the standard and are adapted to engage and to have sliding contact with the surface of the lifting element or ram 4, which contact holds the plungers or movable parts of the circuit breakers and closers in their retracted positions with the circuits closed. The lifting element is provided near its respective ends with recesses 30 and 31 which are so arranged that when the lifting element is in its lowermost position the plunger of the upper circuit breaker and closer, 25, will enter the recess 30 thus breaking the circuit, but the plunger of the lower circuit breaker and closer, 26, will be held in its retracted position by its contact with the lifting element, thus maintaining the other branch of the circuit closed and enabling the motor to be operated in a forward direction by the manipulation of the reversing switch 21. When the lifting element is moved to the upper limit of its movement the plunger of the lower circuit breaker and closer, 26, will enter the recess 31 at the lower end of the lifting element, thus interrupting the circuit and checking the forward movement of the motor but the upper circuit breaker and closer will remain closed and by manipulating the reversing switch the motor may be operated in a reverse direction to lower the load. Thus the operation of the motor is automatically interrupted when the lifting element reaches the limit of its movement in either direction and the mechanism is protected from injury which might otherwise result should the operator fail to operate the controlling switch at the proper time.

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 mechanism comprising a nut and a screw engaging said nut, one of said elements being rotatable to impart axial movement to the other element, said nut and said screw having high pitch threads to permit said axially movable element to move downwardly under the weight of a load thereon, a worm wheel connected with said rotatable element, a high pitch worm meshing with said worm wheel, a second worm wheel, reducing gearing connecting said second worm wheel with said worm, a second worm having a low pitch thread engaging said second worm wheel and serving to lock the same against reverse movement, a motor connected with said second worm to operate the same at high speed, and means to control the operation of said motor.

2. In a lifting mechanism, a standard, a lifting element mounted in said standard, a nut carried by said lifting element, a high pitch screw rotatably mounted in said stand-

ard and engaging said nut, whereby said lifting element may move downwardly under the weight of a load thereon, a worm wheel secured to said screw, a high pitch worm meshing with said worm wheel and adapted to be rotated thereby, a second worm wheel, reducing gearing connecting said second worm wheel with said worm, a second worm mounted for rotation about a vertical axis, having a low pitch thread meshing with said second worm wheel and adapted to lock said second worm wheel against reverse movement, a high speed motor directly connected with said second worm, and means for controlling the operation of said motor.

3. In a lifting mechanism, a standard, a lifting element mounted in said standard, a nut carried by said lifting element, a high pitch screw rotatably mounted in said standard and engaging said nut, whereby said lifting element may move downwardly under the weight of a load thereon, a worm wheel secured to said screw, a high pitch worm meshing with said worm wheel and adapted to be rotated thereby, a second worm wheel, reducing gearing connecting said second worm wheel with said worm, a second worm mounted for rotation about a vertical axis, having a low pitch thread meshing with said second worm wheel and adapted to lock said second worm wheel against reverse movement, an electric motor directly connected with said second worm, a circuit breaker and closer to control the operation of said electric motor, and means controlled by the movement of said lifting element to actuate said circuit breaker and closer.

4. In a lifting mechanism comprising a hollow standard, a tubular lifting element mounted for vertical movement in said standard and held against rotation therein, a nut connected with said lifting element, a screw rotatably mounted in said standard, engaging said nut and held against axial movement, operating mechanism for rotating said screw, and an electric motor connected with said operating mechanism, said lifting element having a recess in its outer surface near one end thereof, and a circuit breaker and closer carried by said standard and having a movable part extending into said standard and arranged to normally engage said lifting element and maintain said circuit breaker and closer closed and to enter said recess and open said circuit breaker and closer when said lifting element nears the limit of its movement in one direction.

5. In a lifting mechanism comprising a hollow standard, a tubular lifting element mounted for vertical movement in said standard and held against rotation therein, a nut carried by said lifting element, a screw rotatably mounted in said standard, engaging said nut and held against axial movement, operating mechanism for rotating said screw, and an electric motor connected with said operating mechanism, said lifting element having recesses in its outer surface near the respective ends thereof, and circuit breakers and closers mounted on said standard near the upper end thereof, and each comprising a movable part extending into said standard and so arranged that when said lifting element is in an intermediate position both parts will engage the surface of said lifting element and when said standard reaches the limit of its movement in either direction the movable part of one of said circuit breakers and closers will enter one of said recesses and cause said circuit breaker and closer to be actuated.

In testimony whereof, I affix my signature hereto.

ION V. K. HOTT.