W. H. FOWKES AND M. J. HARKLESS.

LIFTING JACK.

APPLICATION FILED OCT. 27, 1919.

1,396,952.

Patented Nov. 15, 1921.

3 SHEETS—SHEET 1.

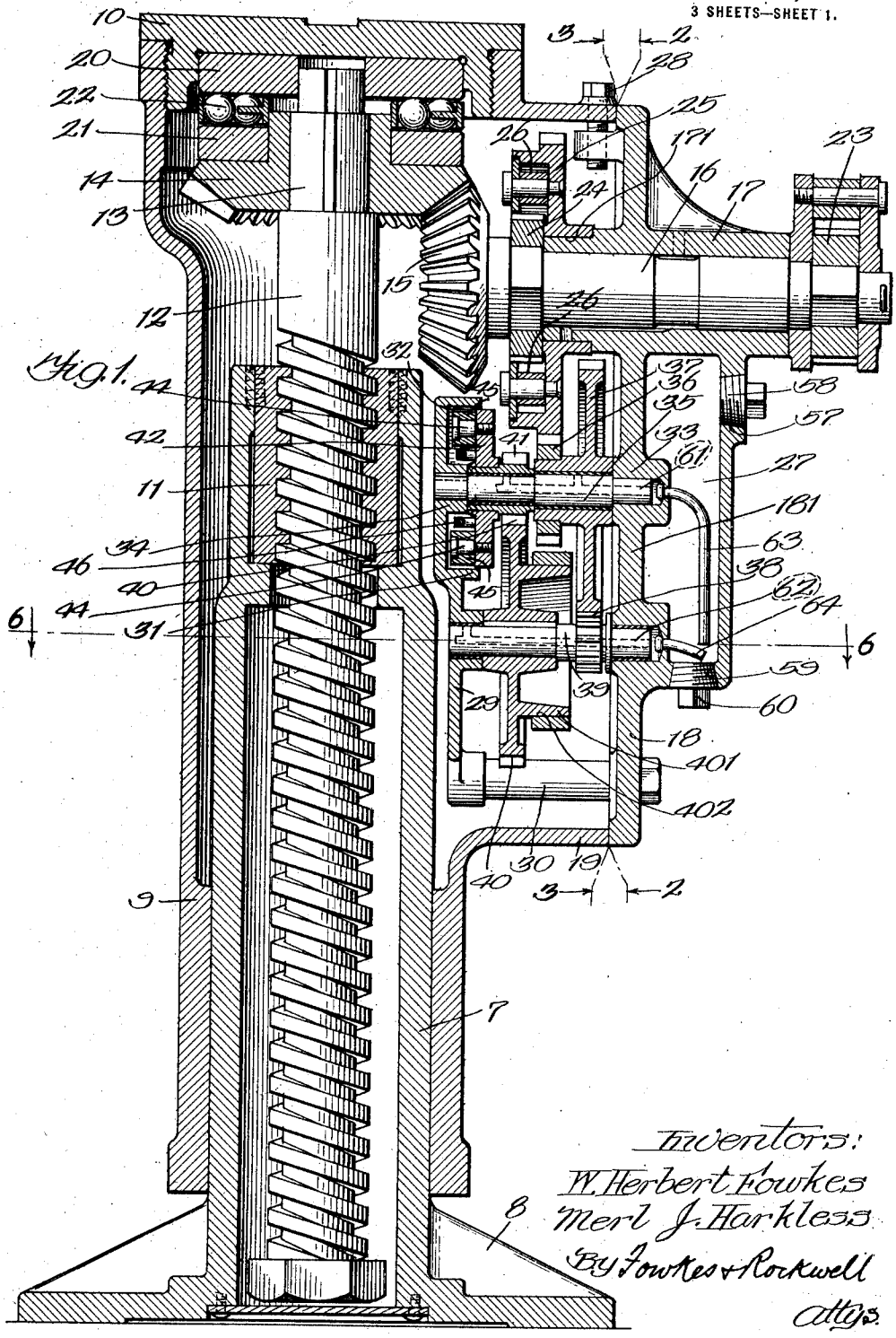

Fig. 1.

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Fig. 3.

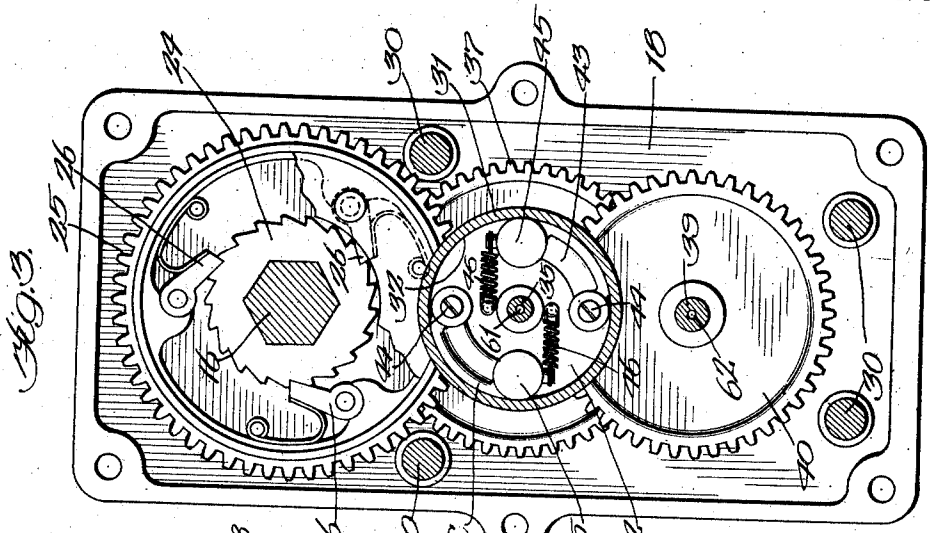


Fig. 5.

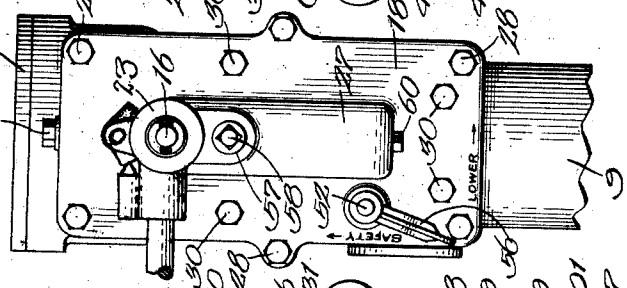
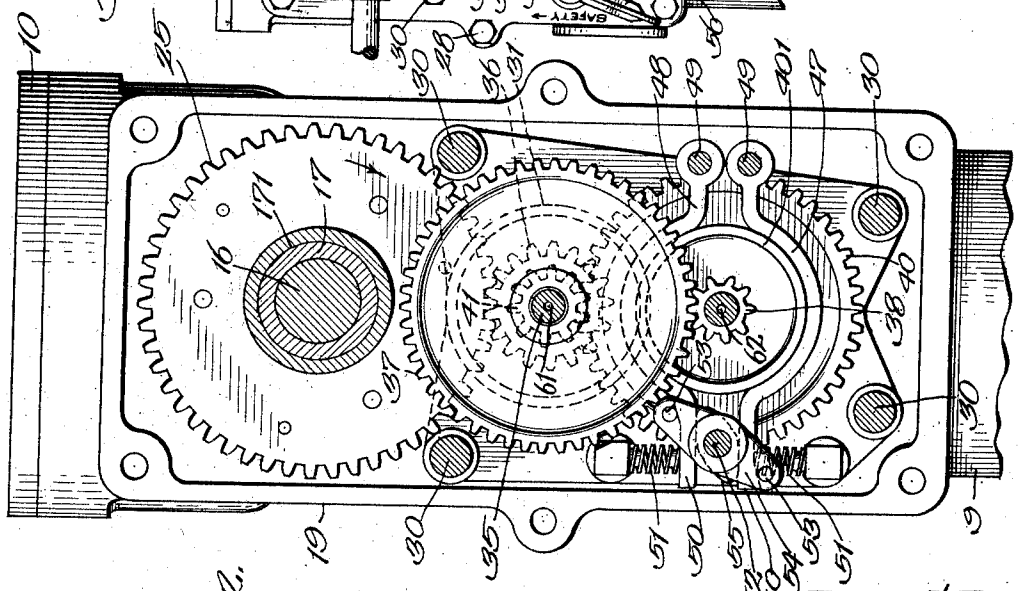


Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 4.

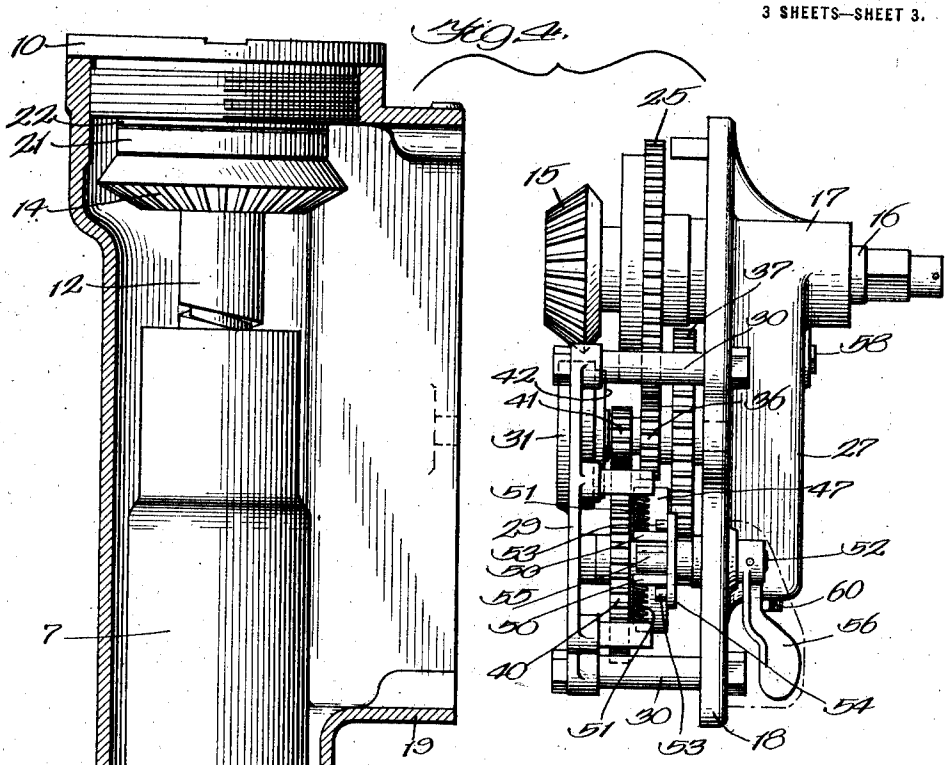
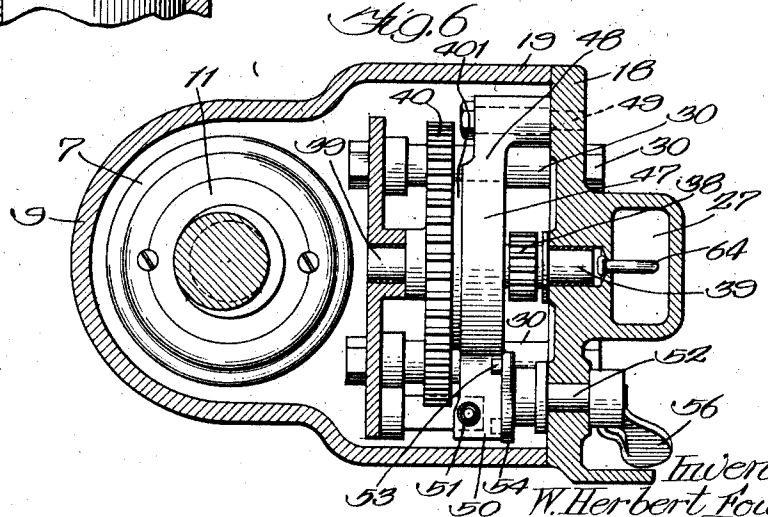


Fig. 6.



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UNITED STATES PATENT OFFICE.

WILLIAM HERBERT FOWKES, OF CHICAGO, AND MERL J. HARKLESS, OF HARVEY, ILLINOIS, ASSIGNORS TO THE BUDA COMPANY, A CORPORATION OF ILLINOIS.

LIFTING-JACK.

1,396,952. Specification of Letters Patent. Patented Nov. 15, 1921.

Application filed October 27, 1919. Serial No. 333,486.

To all whom it may concern:

Be it known that we, WILLIAM HERBERT FOWKES, residing at Chicago, and MERL J. HARKLESS, residing at Harvey, in the county of Cook and State of Illinois, and both citizens of the United States, have invented certain new and useful Improvements in Lifting-Jacks, of which the following is a specification.

Our invention relates to lifting jacks. It has reference more particularly to ratchet screw jacks of the quick-raising, self-lowering type, and is in the nature of an improvement upon the construction described and claimed in a co-pending application for United States Letters Patent, Serial Number 281,388, one object of the invention being to further improve the construction and increase the efficiency and utility of devices of this type, more especially with reference to the mechanism for automatically governing and controlling the lowering of the jack under load. A further object resides in so arranging the parts as to provide for a compact mechanism, and one capable of being easily lubricated. Economy in manufacture, ease in assemblage of the parts, correct functioning of such mechanism and its absolute safety in operation, are still further objects of the invention.

The invention further objectively contemplates the provision of novel details of construction, combination and arrangement of parts of the device whereby certain advantages are attained, as will be hereinafter more fully described.

These, together with such other objects and advantages as are incident to our invention, we attain by means of a construction illustrated in preferred form in the accompanying drawings, wherein:

Figure 1 is a vertical sectional view of a ratchet screw jack to which our improved mechanism is shown applied;

Figs. 2 and 3 are sections taken respectively on the lines 2—2 and 3—3 of Fig. 1;

Fig. 4 represents a view in side elevation of the mechanism and its casing or supporting frame work detached from the main body of the jack;

Fig. 5 is a front elevation, on a reduced scale, of the mechanism casing; and

Fig. 6 represents a section on the line 6—6 of Fig. 1.

In the drawings, 7 denotes a stationary standard provided with a base 8 and having thereon a movable lifting sleeve 9 in the upper end of which is a head cap 10. The reference character 11 designates the usual operating nut which carries a lifting screw 12 preferably pitched for a quick action lift. Keyed to the upper reduced end 13 of the screw is a bevel gear 14 meshed with a bevel pinion 15 whose operating stub shaft 16 is journaled in an extended hub 17 formed in the outer plate 18 of the gear casing 19. Within the head of the sleeve and positioned between the opposed faces of the cap 10 and bevel gear 14 is a pair of superimposed bearing plates 20 and 21 provided therebetween with a series of anti-friction elements 22.

The outer end of the stub shaft 16 is provided with any suitable and well-known hand-operated actuating device for imparting rotation to said shaft in one direction, to thereby lift the jack under its load; such device being indicated generally by the numeral 23. Obviously in the lowering of the jack the shaft has rotary movement in the opposite direction, and during this opposed directional movement the mechanism comprised within the casing 19 is brought into action to automatically control or retard the lowering movement of the jack, though during the lifting action such mechanism is idle and involuntary lowering movement is prohibited by means of a positive brake interposed in said mechanism, release of which, as will be seen, permits of such lowering movement and the governing of the same by such automatic control.

Secured to the shaft 16 to rotate with it is a ratchet 24 and loosely mounted to have a bearing at 171 on a reduced portion of the hub 17 is a spur gear 25 provided with spring pressed pawls 26 adapted to idle over the teeth of the ratchet during the lifting of the jack and to engage said teeth in the lowering of the jack whereby to rotate said gear during such movement.

The closure plate 18 is provided with a lubricant containing chamber 27 which depends from the hub 17 to inclose a portion 181 of the plate 18, the marginal portions thereof being secured against the outwardly projecting portion of the gear casing 19 by means of the detachable securing elements 28.

A fixed inner plate 29, coöperating with

the closure plate 18, as a means of support for the gearing composing the control mechanism, is detachably mounted on said plate by means of the headed bolts 30, the upper end of said plate 29 being chambered to form an annulus 31 presenting an annular braking surface 32 with which the automatic speed retarding governor, indicated generally at —C—, is designed to co-act during reverse rotation of the shaft 16 in the lowering of the jack under the impetus of its load. Disposed axially of the annulus 31, and having its ends fixed in the hubs 33, 34, respectively, of the plate portion 18′ and the plate 29, is a stationary pin 35 about whose larger diametered portion loosely rotates a spur gear 37 fixedly related with a pinion 36 which engages the spur gear 25 to receive motion therefrom. The spur gear 37 is, in turn, meshed with a pinion 38 so as to impart rotary movement to a shaft 39. To the latter also is keyed, or otherwise fixed, a spur gear 40 which drives a pinion 41 having a disk 42 rigid with it, constituting the ultimate driven rotary member of the automatic control mechanism. In other words, the pinion 41 drives the disk 42 and both are loosely carried as a unit on the smaller diametered portion of the fixed pin 35 for rotary movement about it.

The reference numeral 43 denotes weight carrying arms pivotally secured to the disk, and near the periphery thereof, by means of pivot pins 44, the other ends being provided with weights 45 adapted to frictionally engage the braking surface 32 of the fixed annulus 31 during the lowering movement of the jack. Each weight is provided with a very light coil spring 46 having just enough tension to normally withhold it from contact with said surface, and thereby permit the jack to gain a start in such movement.

As herein shown, the train of gearing multiplies many times the rate of speed of the disk over that of the stub-shaft 16. The lowering movement once begun, the governor weights under the influence of centrifugal force, move or fly circumferentially outward and engage the annulus to frictionally retard the lowering of the jack, and permit its descent under full control. Just as there is a multiplied rate of speed at the disk over the stub-shaft, so is the braking power or leverage at the disk multiplied at the shaft to check the screw. This frictional co-action between the governor weights and the annulus though variable to meet load conditions reduces the speed of jack descent to a constant or unvarying speed rate, no matter what the load may be so long as it is, of course, within or approximates the load capacity of the particular jack.

A positive stop means interposed between the automatic governor disk and the shaft 16 is provided to hold the jack against involuntary lowering movement during the lifting operation and to hold the jack at rest when lifted under a load. Such a means in the present instance takes the form of a normally set brake device positioned midway in the train of speed and leverage multiplying gearing, and a brake device manually releasable to set the automatic governor disk in motion to change what would, in the absence of such gevernor disk, be an uncontrolled descent at a high undetermined speed, to a fully controlled descent at a retarded and constant speed rate. In other words, in releasing this positive stop device to its inoperative position such release permits of the functioning of the governor disk, and being located between the shaft and the ultimate disk end of the gearing the device will, regardless of any failure of the disk, by reason of any inherent defect in its material or that of its associated parts, or any other adventitious reason, still act as a stop to hold the jack and thus prevent accident.

With these aims in view, we provide the large gear 40 with an annular flange 401 whose outer cylindrical surface 402 is normally engaged by the opposed curved portions 47 of the brake arm members 48 which are pivoted at their ends to the casing by means of the pivots 49. The other ends 50 are disposed in parallelism, and opposed springs 51 are provided to press against said ends so that the curved portions 47 normally grip the surface 402 to hold the jack against lowering and the governor disk in its inoperative relation with reference to the annular surface 32. The reference character 52 designates a spindle bearing in the plate 18 and provided with an arm 54 having pins 53 acting to maintain the braking members in operative relation in the event of any failure of the springs 51. This spindle carries at its inner end a cam 55 interposed between the arms 50 and at its outer and exposed end a lever 56 which on being actuated in the direction indicated in Fig. 5 oscillates the cam to spread the arms and thus release the brake.

Referring now more particularly to the oil chamber 27 of Fig. 1, it will be seen that I provide an oil inlet 57 and a closure plug 58 for said inlet, and at the bottom of said chamber is also located a clean out opening 59 and a plug 60 to close it. It should be observed that the pin 35 and shaft 39 are respectively formed with oil conducting channels 61 and 62, and at their outer ends the wall portion 181 is apertured to receive and hold the inner ends of wicks 63 and 64 which serve to conduct oil, by capillary attraction, to these channels and from thence to parts requiring lubrication.

From the foregoing, it will be seen that the governor disk 42 is the high speed member of the speed multiplying mechanism.

The centrifugal force present during disk rotation operates to throw the governor weights outwardly against the brake band or inner face of the annulus 31 to thereupon frictionally retard the descent of the jack sleeve, the frictional braking effect being flexible to counteract and check any tendency, under load, to increase the rate of descent over that of a constant speed, which never varies. We have found this to be the case after repeated test; obviously therefore, two jacks constructed in accordance with our invention, under load and simultaneously released, will have similar rates of lowering speed, and this altogether represents a very noteworthy advance in this art. With the uncoupling of the securing elements 28, the plate together with all of the parts of the mechanism and the stub-shaft may be quickly detached and removed for purposes of inspection or replacement. These parts are compactly arranged, but capable of ready assemblage and ease in installing them in a jack body when assembled. Other advantages will be apparent to those skilled in the art.

We claim:

1. In a lifting jack, the combination with a standard, a sleeve movable thereon, and lifting mechanism for said sleeve including an actuating shaft rotatable in one direction during the lifting movement of the sleeve and in the reverse direction during the lowering of the sleeve, of mechanism for automatically controlling the lowering of the sleeve comprising a pair of fixed inner and outer vertically disposed plates, the upper end of the inner plate positioned adjacent the shaft and provided with an annular braking, surface, a train of speed multiplying gearing carried by said plates and said shaft and operable during reverse rotation of the shaft, and a revoluble disk driven by the high speed member of said gearing and provided with a plurality of pivoted arms having weights at their free ends adapted to frictionally engage said braking surface during disk revolution.

2. In a lifting jack, the combination with a standard, a sleeve movable thereon, and lifting mechanism for said sleeve including an actuating shaft rotatable in one direction during the lifting movement of the sleeve and in the reverse direction during the lowering of the sleeve, of mechanism for automatically controlling the lowering of the sleeve comprising a pair of fixed inner and outer vertically disposed plates, the upper end of the inner plate posititioned adjacent the shaft and provided with an annular braking surface, a train of speed multiplying gearing carried by said plates and said shaft and operable during reverse rotation of the shaft, and a revoluble disk driven by the high speed member of said gearing and provided with a plurality of pivoted arms having weights at their free ends adapted to frictionally engage said braking surface during disk revolution, and a positive stop device interposed in said gearing between the shaft and said disk.

3. In a lifting jack, the combination with a standard, a sleeve movable thereon, and lifting mechanism for said sleeve including an actuating shaft rotatable in one direction during the lifting movement of the sleeve and in the reverse direction during the lowering of the sleeve, of mechanism for automatically controlling the lowering of the sleeve comprising a pair of fixed inner and outer vertically disposed plates, the upper end of the inner plate positioned adjacent the shaft and provided with an annular braking surface, a train of speed multiplying gearing carried by said plates and said shaft and operable during reverse rotation of the shaft, a revoluble disk driven by the high speed member of said gearing and provided with a plurality of pivoted arms having weights at their free ends adapted to frictionally engage said braking surface during disk revolution, and a positive stop device carried by the outer plate and interposed to co-act with a member of said gearing between the disk and said shaft.

4. In a lifting jack, the combination with a standard, a sleeve movable thereon, and lifting mechanism for said sleeve including an actuating shaft rotatable in one direction during the lifting movement of the sleeve and in the reverse direction during the lowering of the sleeve, of mechanism for automatically controlling the lowering of the sleeve comprising a pair of fixed inner and outer vertically disposed plates, the upper end of the inner plate positioned adjacent the shaft and provided with an annular braking surface, a train of speed multiplying gearing carried by said plates and said shaft and operable during reverse rotation of the shaft, a revoluble disk driven by the high speed member of said gearing and provided with a plurality of pivoted arms having weights at their free ends adapted to frictionally engage said braking surface during disk revolution, and a positive stop device carried by the outer plate and interposed to co-act with a member of said gearing between the disk and said shaft, the last mentioned member of said gearing positioned between and carried by the lower portions of said plates.

5. In a lifting jack, the combination with a standard, a sleeve movable thereon, and lifting mechanism for said sleeve including an actuating shaft rotatable in one direction during the lifting movement of the sleeve and in the reverse direction during the lowering of the sleeve, of mechanism for automatically controlling the lowering

of the sleeve comprising a pair of fixed inner and outer vertically disposed plates, the upper end of the inner plate positioned adjacent the shaft and provided with an annular braking surface, a train of speed multiplying gearing carried by said plates and said shaft and operable during reverse rotation of the shaft, a revoluble disk driven by the high speed member of said gearing and provided with a plurality of pivoted arms having weights at their free ends adapted to frictionally engage said braking surface during disk revolution, a positive stop device carried by the outer plate and interposed to co-act with a member of said gearing between the disk and said shaft, the last mentioned member of said gearing positioned between and carried by the lower portions of said plates, and means for detachably connecting said plates together and for removably associating them as a unit to the sleeve.

6. In a lifting jack, the combination with a shaft rotatable in one direction in the lifting movement of the jack and in the reverse direction during the lowering movement thereof, of mechanism for automatically controlling the lowering of the jack comprising a pair of fixed supports one of which is provided with an annular brake member, speed multiplying gearing actuated by said shaft during reverse rotation thereof, an intermediate member of said gearing provided with a second annular brake member, manually releasable brake members carried by the other of said fixed supports and normally gripping the outer surface of said second annular brake member, and a disk driven by the high speed member of said gearing and provided with centrifugal governor means adapted to frictionally engage the inner surface of said first mentioned annular brake member.

7. In a lifting jack, the combination with a shaft rotatable in one direction in the lifting movement of the jack and in the reverse direction during the lowering movement thereof, of mechanism for automatically controlling the lowering of the jack comprising a pair of fixed supports one of which is provided with an annular brake member, speed multiplying gearing actuated by said shaft during reverse rotation thereof, an intermediate member of said gearing provided with a second annular brake member, manually releasable brake members carried by the other of said fixed supports and normally gripping the outer surface of said second annular brake member, and a disk driven by the high speed member of said gearing and peripherally provided with a plurality of pivoted arms having weighted ends adapted to frictionally engage the inner surface of said first mentioned annular brake member, said intermediate member revoluble at a rate of speed less than that of said high speed member.

8. In a lifting jack, the combination with a shaft rotatable in one direction in the lifting movement of the jack and in the reverse direction during the lowering movement thereof, of mechanism for automatically controlling the lowering of the jack comprising a pair of fixed supports one of which is provided with an annular brake member, speed multiplying gearing actuated by said shaft during reverse rotation thereof, an intermediate member of said gearing provided with a second annular brake member, manually releasable brake members carried by the other of said fixed supports and normally gripping the outer surface of said second annular brake member, a disk driven by the high speed member of said gearing and peripherally provided with a plurality of pivoted arms having weighted ends adapted to frictionally engage the inner surface of said first mentioned annular brake member, said intermediate member revoluble at a rate of speed less than that of said high speed member, and means for detachably connecting said supports, said gearing carried by said supports.

9. In a self-lowering lifting jack, the combination of a shaft rotatable in one direction in the lifting of the jack and in the reverse direction during its descent, of means for automatically controlling the descent of the jack comprising a pair of supports, a fixed annular brake member in one of said supports, a revoluble disk carried by said supports and provided with centrifugal governor means adapted to frictionally engage said brake member during disk revolution, and gearing for actuating said disk driven by said shaft during reverse rotation thereof and carried by said supports, a positive stop device for said gearing, manually controlled means for positively applying said stop device and for releasing the same, and means for normally yieldingly actuating said stop device.

10. In a self-lowering lifting jack, the combination of a shaft rotatable in one direction in the lifting of the jack and in the reverse direction during its descent, of means for automatically controlling the descent of the jack comprising a pair of supports, a fixed annular brake member in one of said supports, a revoluble disk carried by said supports and provided with centrifugal governor means adapted to frictionally engage said brake member during disk revolution, and speed multiplying gearing mounted in said supports and driven at the low speed end thereof by said shaft during reverse rotation thereof, said disk being driven by the high speed end of said gearing, and a positive braking device op-

eratively interposed in said gearing to normally co-act with a member thereof intermediate the high and low speed ends of said gearing.

11. In a self-lowering lifting jack, the combination of a shaft rotatable in one direction in the lifting of the jack and in the reverse direction during its descent, of means for automatically controlling the descent of the jack comprising a pair of supports, a fixed annular brake member in one of said supports, a revoluble disk carried by said supports and provided with centrifugal governor means adapted to frictionally engage said brake member during disk revolution, and speed multiplying gearing mounted in said supports and driven at the low speed end thereof by said shaft during reverse rotation thereof, said disk being driven by the high speed end of said gearing, and a positive braking device operatively interposed in said gearing to normally co-act with a member thereof intermediate the high and low speed ends of said gearing, said positive braking device provided with a manually releasable lever mounted in one of said supports, and connections between said supports.

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