May 28, 1929. E. E. CLINE ET AL 1,714,548

LIFTING JACK

Filed Jan. 19, 1927 4 Sheets-Sheet 1

Fig. 1.

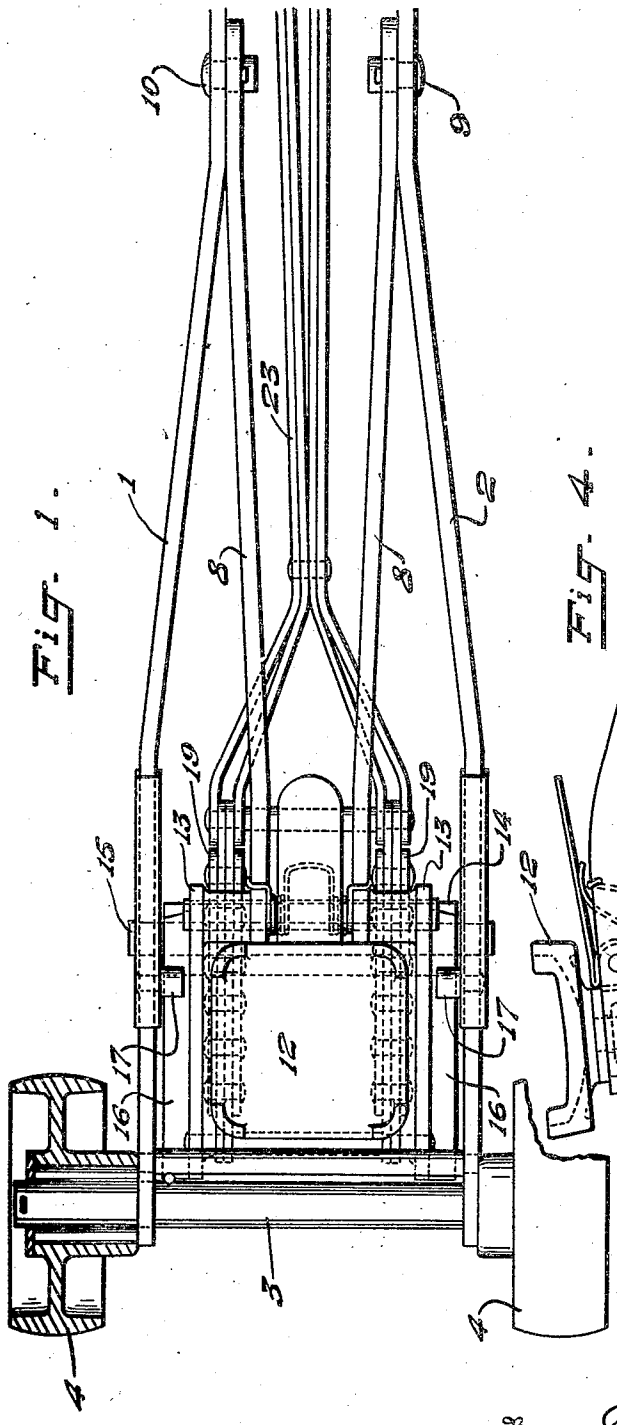
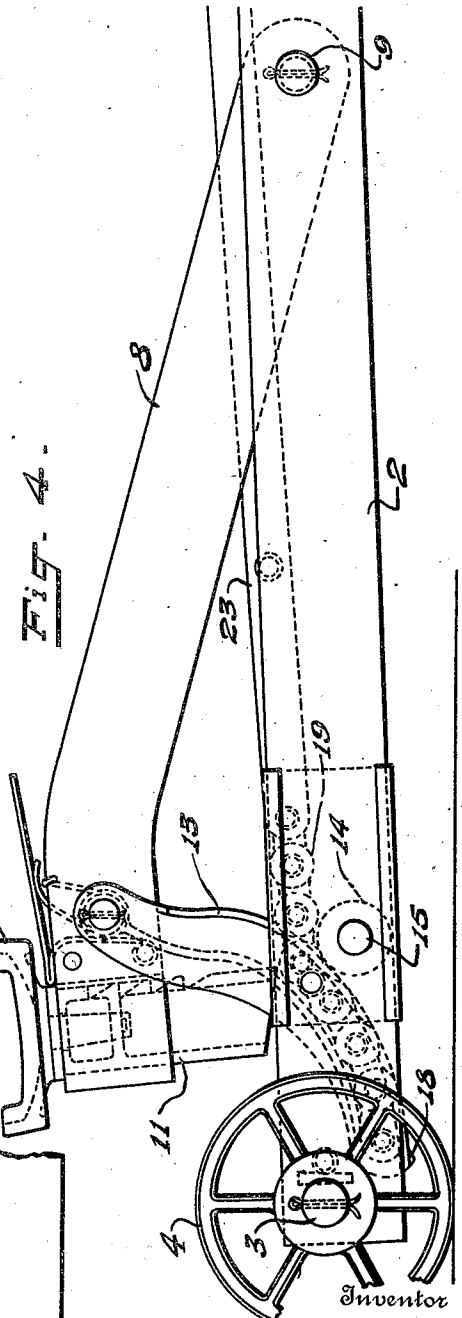


Fig. 4.



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May 28, 1929. E. E. CLINE ET AL 1,714,548

LIFTING JACK

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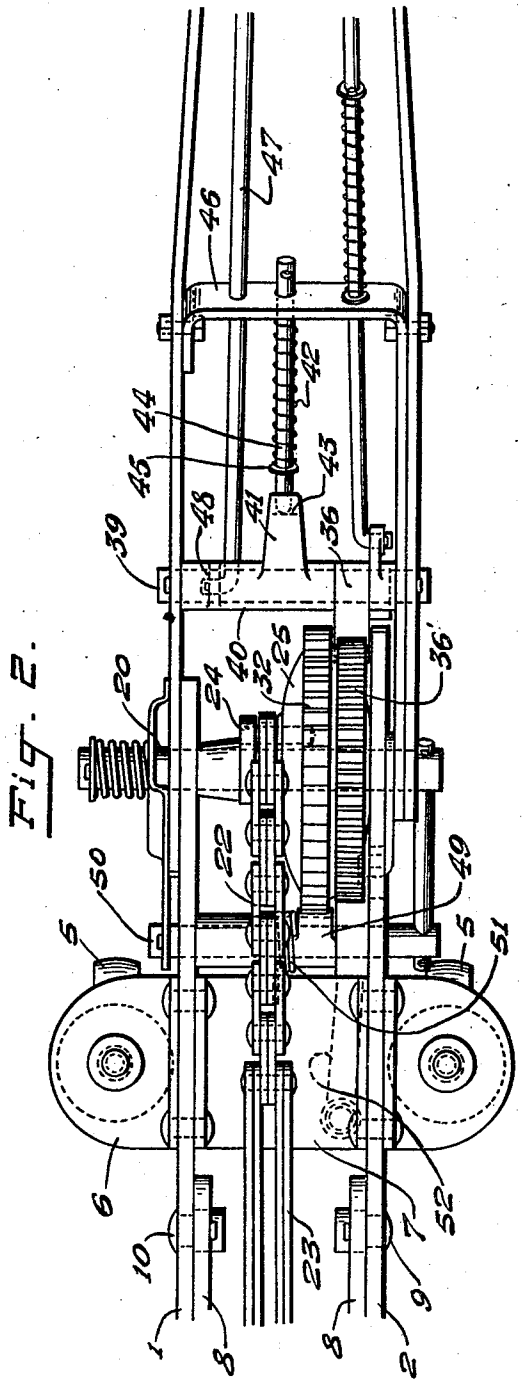

Fig. 2.

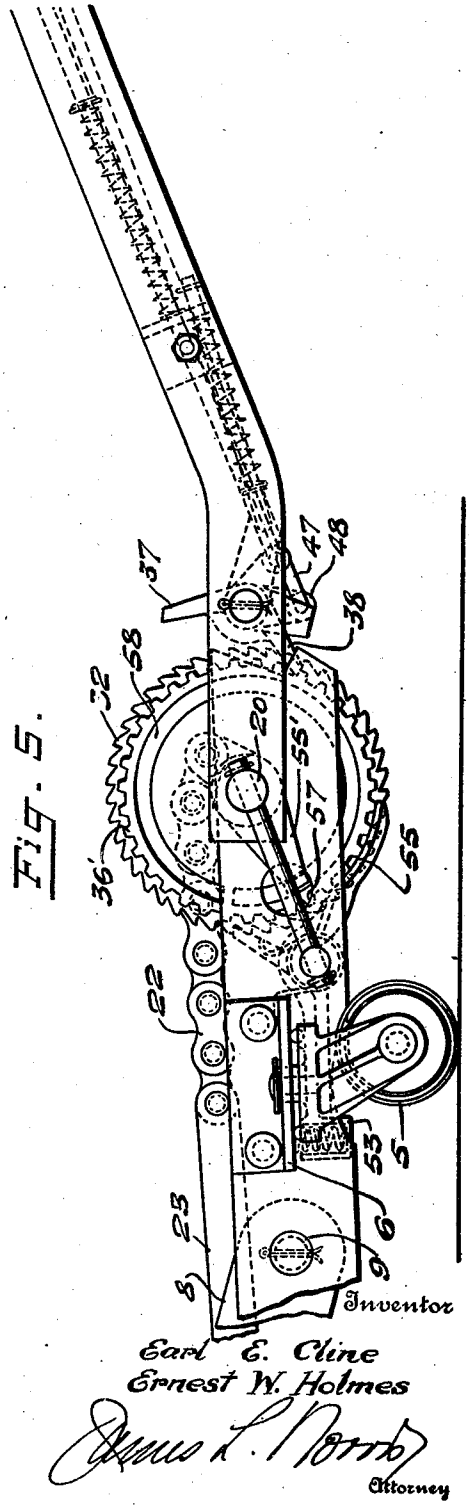

Fig. 5.

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LIFTING JACK

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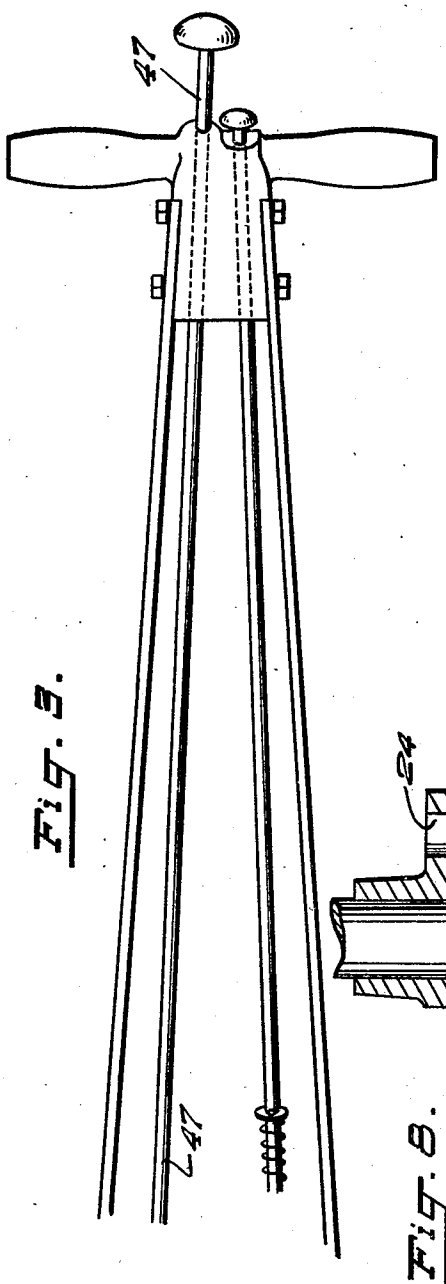

Fig. 9.

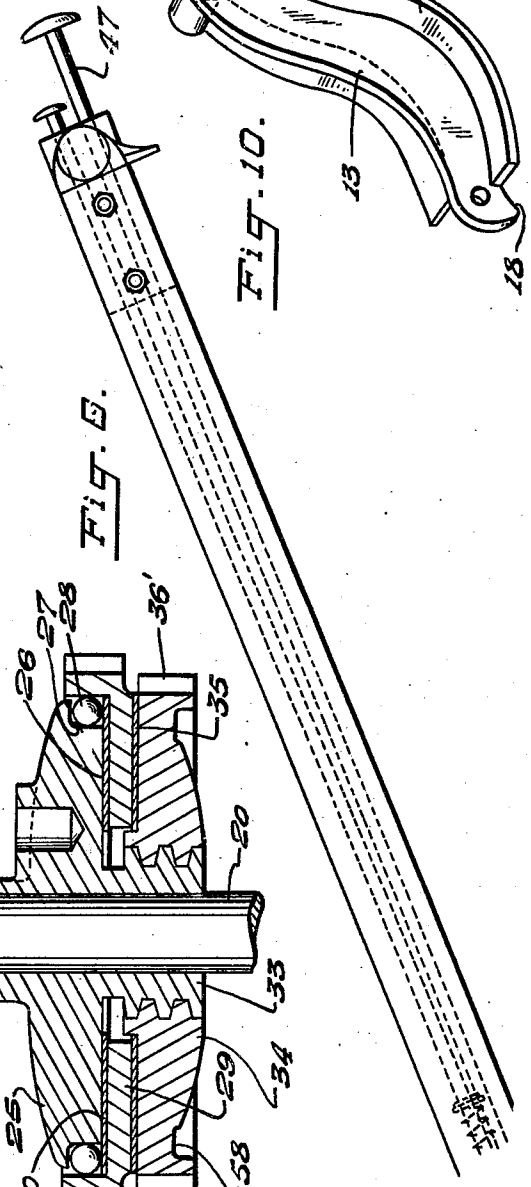

Fig. 6.

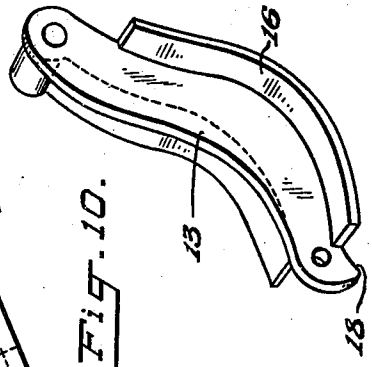

Fig. 10.

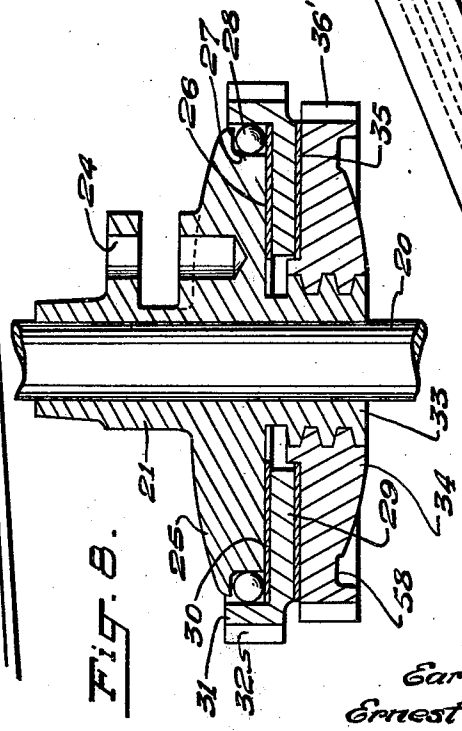

Fig. 8.

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LIFTING JACK

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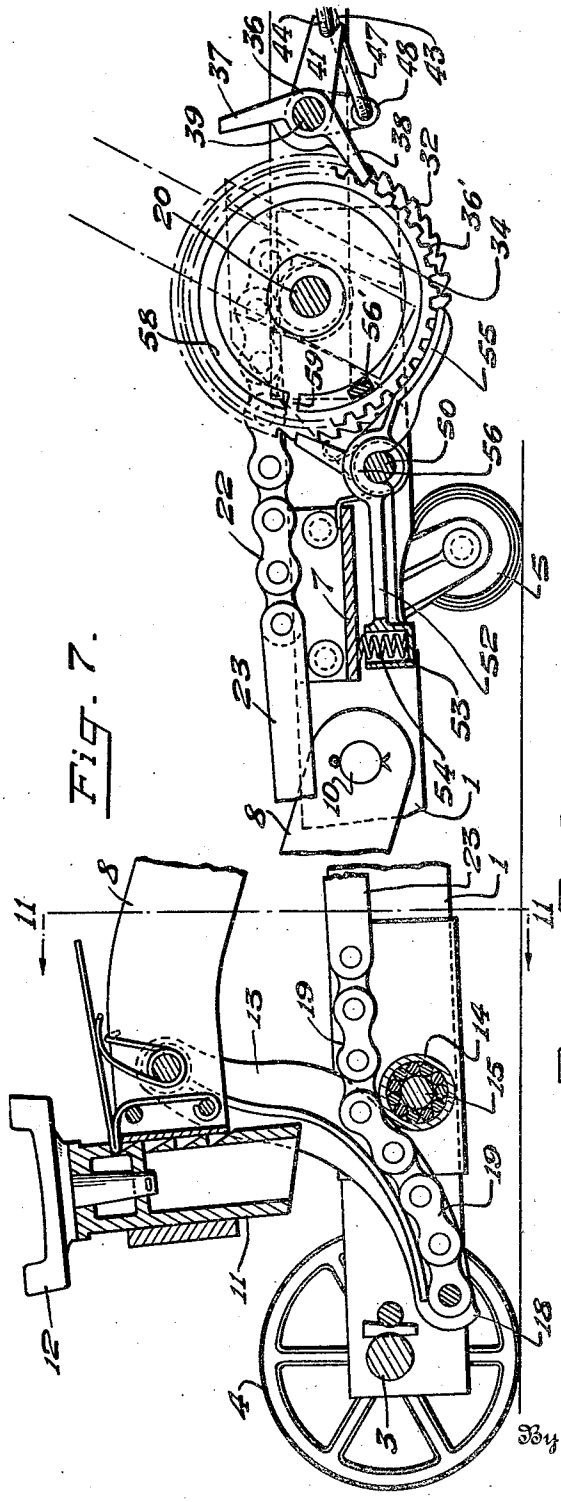

Fig. 7.

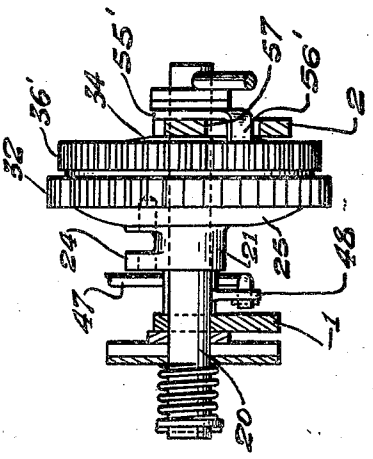

Fig. 9.

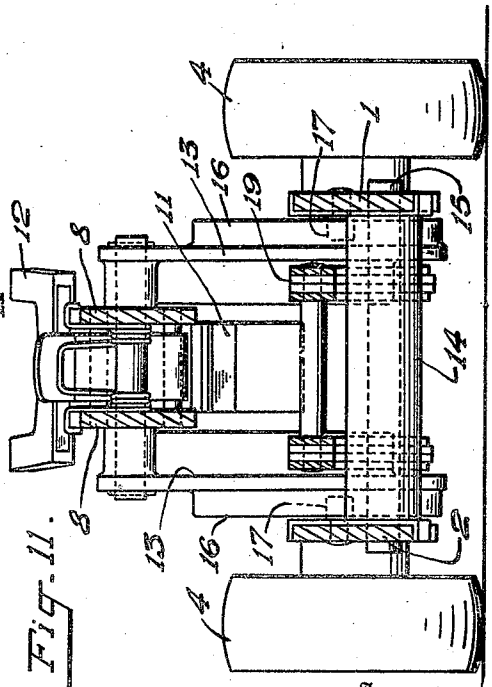

Fig. 11.

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Patented May 28, 1929. 1,714,548

UNITED STATES PATENT OFFICE.

EARL E. CLINE AND ERNEST W. HOLMES, OF CHATTANOOGA, TENNESSEE, ASSIGNORS TO ERNEST HOLMES COMPANY, OF CHATTANOOGA, TENNESSEE, A CORPORATION OF TENNESSEE.

LIFTING JACK.

Application filed January 19, 1927. Serial No. 162,107.

This invention relates to lifting jacks and particularly to jacks of the portable wheeled type used in lifting automobiles.

One of the objects of the invention is the provision of a jack in which the lifting force is transmitted to the load through frictional torque the value of which is automatically determined by the load and is in direct proportion to the load.

Another object of the invention is to construct a jack of the type described in which the load acts to check its own descent while being lowered so that it is impossible for the load to be dropped should the handle of the jack at any time get out of the control of the operator.

Still another object of the invention is the provision of a jack in which the lowering of the load is effected by reducing the frictional coefficient of the power transmitting means, said frictional coefficient being at once restored to the original value at which the load is sustained, when the speed of the descending movement of the power transmitting means exceeds that of the load lowering movement of the handle, so that the lowering of the load is accomplished by a number of successive load-releasing pulls upon the jack handle, depending in amplitude upon the relative angular speeds the handle movement and that of the power transmitting means.

Another object of the invention is to provide a jack in which the height of the lifting element may be at any time determined with precision without the lost motion inherently present in ratchet checked lifting devices.

Other objects of the invention will appear as the following description of a preferred embodiment thereof proceeds.

In the drawings, in which the same reference characters are used in the several views to designate identical parts:—

Figures 1, 2 and 3 represent, in sequence, sections constituting the plan view of a jack embracing the principles of the present invention;

Figures 4, 5 and 6 represent, in sequence, sections constituting a side elevation of the same jack;

Figure 7 is a broken side elevation, partly in section, of the jack, parts being omitted, showing the lifting means partly elevated;

Figure 8 is a sectional view of the friction transmission mechanism;

Figure 9 is a front elevation of the transmission mechanism and parts mounted adjacent thereto;

Figure 10 is a perspective view of one of the lifting rockers; and

Figure 11 is a section on the line 11—11, Figure 7, looking in the direction of the arrows.

The present invention is an improvement of the invention disclosed in the pending application of Ernest W. Holmes, Serial Number 66,284, filed Nov. 2, 1925, and the present disclosure follows, to some extent, the details of construction disclosed in connection with the invention of said pending application. Therefore, those features which are fully treated in said pending application will be but incidentally narrated in the present description, in the interest of brevity.

Referring now in detail to the several figures, the numerals 1 and 2 represent the side members of the jack which, together with the rear axle 3, constitute the frame of the jack, supported at the rear by wheels 4 journalled on the axle, and forwardly, that is to say, at an intermediate point in the jack, by casters 5 turning on substantially vertical axes and bearing against caster-plates 6 riveted or otherwise suitably secured to the frame members 1 and 2, with a spacing plate 7 therebetween. A lifting arm 8 is pivotally mounted upon the frame at axial points 9 and 10, said arm carrying adjacent its outer end the lifting post 11 upon which the load-engaging platform 12 is swivelly mounted.

A pair of curved lifting rockers 13 are pivotally mounted adjacent the outer end of the lifting arm, said rockers resting freely upon a roller 14 journalled upon a stationary rod 15 secured in the side of the frame members, the curvature at the lower ends of said lifting rockers preferably being such as to permit said rockers passing between the ground and the axle when the lifting arm is in its supine position The lifting rockers are flanged as shown at 16 in Figure 10, and the frame is provided with inwardly projecting pins 17 adjacent the rollers 14, which pins overlie the flanges 16, leaving a space between said pins and rollers through which the flanges may freely pass, but not the lower enlarged ends 18 of the lifting rockers, a stop being thus provided so that the lifting rockers cannot be elevated beyond their operative limit

Chains 19 or other suitable flexible connec-

tions are pivotally attached to the lower ends of the lifting rockers and pass over the roller 14 so that when the chains are pulled with sufficient tension the lifting rockers are elevated, raising the lifting arm 8 and with it the post 11 and platform 12.

The features which have just been enumerated are common to the jack described and claimed in the pending application to Holmes hereinbefore mentioned and no novelty is predicated of them alone, but only in combination with the device now to be described.

A bar 20 bridges the side frame members 1 and 2 preferably slightly forwardly of the casters 5, said bar being preferably non-rotatably supported by the frame members, and in turn, affording support for certain rotatable elements, the same being shown on an enlarged scale in Figure 8.

These members include a drum 21 upon which a chain 22 is windable, said chain being received by the single end 23 of a Y-shaped link, the divergent ends of which are secured to the chains 19. The chain 22 is preferably of such length as to wind completely around the drum once, and this length of chain determines the lifting range of the jack. It is, however, not essential to the invention to specify the exact length of the chain for it may be made of greater or less length than the circumference of the drum and still fulfill its purpose as an operative connection between the transmission means and lifting requirements without defeating the spirit of the invention. The drum 21 is provided with a recess transacted by a pin-way 24, said recess being adapted to receive the first link of the chain 22, a pin passing through said link and being enlarged or otherwise made fast in said pin-way.

The drum 21 is formed to one side with a disk 25 of relatively large diameter having a flat face 26. It is also formed preferably with a recess or rabbet 27 affording a seat for anti-friction bearings 28. An annular check-plate 29 is arranged in juxtaposed position to the face 26 of the disk 25, a friction facing 30 preferably intervening. The check-plate 29 is rotatable relatively to the drum and axially shiftable as well so that it may be said to float with respect thereto. The check-plate is formed with a peripheral flange 31, the interior wall of which rides upon the bearings 28, said flange being formed exteriorly with ratchet teeth 32 having the abrupt shoulders thereof directed against the direction of rotation of said check-plate.

The check or holding pawl 49 is rotatably mounted upon a bar 50 mounted transversely of the frame members to the rear of the check-plate 29. Said pawl presses with constant resilient pressure against the periphery of said check-plate through the tension of a spring 51. Said pawl is uni-directional in its effect upon the direction of rotation of the check-plate, permitting it to move forward under tension with the lifting movement of the jack and holding it against retrograde rotation when the load is held, or during the descent of said load.

The disk 25 is formed with a hub 33 surrounding the bar 20 and projecting through the central opening in the annular check-plate 29 upon which the latter may freely move endwise through a slight range of movement as will presently appear. This hub is externally provided with a thread of deep and gradual pitch. A nut 34 of relatively large diameter is secured upon said hub having a corresponding interengaging thread. A facing 35 of anti-friction material is preferably interleaved between the check-plate 29 and the nut 34. The effect of said nut when screwed upon said hub in one direction is to force the disk 35, check-plate 29 and disk 30 together, increasing the coefficient of friction between said members so that they move together as a unit. When the nut is screwed in the opposite direction its effect is to reduce the coefficient of friction between said members so that they may move independently.

The nut 34 is provided peripherally with teeth 36′ having faces equally abrupt on both sides so that the nut may be engaged by a reversible operating device, and moved in either direction.

The reversible nut operating device comprises a pawl 36 having oppositely directed arms 37 and 38, said pawl being part of a casting 40 which is mounted upon the transverse bar 39 carried by the jack handle. Since the latter is pivotally mounted upon the bar 20, as shown, when the jack handle is oscillated the arms 37 and 38 of the pawl will oscillate in arcs concentric to the bar 20 and, therefore, concentric to the nut 34. The casting 40 is provided at an intermediate point with an arm 41 affording means which, in cooperation with a spring 42 enables the pawl 36 to be selectively biased in either direction. When said pawl is so biased that the arm 38 is in contact with the teeth 36′ of the nut, the parts are in position for the lifting operation. When the pawl is biased so as to engage the arm 37 with the teeth 36′ the parts are in the load lowering position. The arm 41 is preferably formed with a socket 43 in its outer end within which the rounded end of a rod 44 freely seats, said rod having a fixed collar 45 against which one end of the spring 42 abuts, the outer end of said rod passing through a transverse strap member 46 between which and the collar 45 the spring is held in compressed relation keeping the end of the rod 44 seated in the socket of the arm 41 regardless of the position of said arm. It will be observed from Figure 5 that the arm 41 and rod 44 are normally maintained in an-

gular relation, but by swinging the casting 40 so as to cause the point of contact between said rod and arm 41 to pass to the other side of a straight line connecting the axis of rotation of the casting 40 and the point at which the rod 44 passes through the strip 46, the relation of angularity between said arm and rod will be reversed, the arm 41 and with it the casting and pawl being thus definitely maintained in biased position to one side or the other.

The casting 40 is rocked by means of a pull rod 47 pivotally connected to a lug 48 formed on said casting, said pull rod being preferably passed through an aperture in the strap member 46 and extending to a convenient position at the end of the jack handle.

In operation, with the pawl 36 in the position shown in Figure 7, downward movement of the handle of the jack will rotate the nut 34 in a clockwise direction as viewed in Figure 7, screw said nut inwardly against the check-plate 29 and in turn pushing the check-plate endwise into frictional engagement with the disk 25 of the drum, the parts being wedged into unitary relation, so that the drum 21 rotates with the nut 34, the chain 22 being wound upon the drum and the lifting means operated to elevate the load. In the lifting operation the jack handle may be moved through any convenient arc, providing it is great enough to move the check-plate through a distance equal to the circumferential length of one of the ratchet teeth 32, and the load will be elevated to that extent. The jack handle may be operated in any position, from one approaching the vertical, to a position close to the floor, rendering the jack adaptable for all contingencies met with in use, it being equally operable close to a wall or beneath a low hung trunk carrier or other obstruction on the automobile ordinarily giving but little room for operation of the jack.

The load is sustained through frictional contact between the check-plate 29 and the disk 25, the pawl 49 holding the check-plate from retrograde movement during relative movements of the jack handle The pitch of the thread between the nut and hub 33 is so designed that for the capacity load for which the jack is designed, the nut will stick when the jack handle is released so that there will be no frictional slippage between the check-plate and the disk 25.

When it is desired to lower the load, the push rod 47 is manipulated to bias the pawl 36 in the opposite direction so that the arm 37 comes into engagement with the teeth on the nut 34. Raising of the jack handle then has the effect of unscrewing the nut. When the nut begins to recede from the check-plate, the frictional coefficient between the check-plate 29 and disk 25 begins to decrease so that the drum turns in an unwinding direction letting the load down a little. However, just as soon as the angular speed of the device in winding begins to exceed the angular speed of the jack handle, the disk screws the hub 33 again into the nut so that the frictional coefficient between the parts increases again to the point where the load is held. A further lifting of the jack handle again reduces the coefficient of friction causing further lowering of the load, which may again cause an increase in the coefficient of friction between the disk and check-plate, again checking the descent of the load, and so on, the load descending operation being, in general, a succession of upward pulls of the jack handle against the resistance of the friction of the several parts engendered by the load. Of course, it is discretionary with the operator of the jack just how far he shall let the load down at one time. If the load is not heavy, he may lift the jack handle through a considerable arc and let the load down through a proportionally great distance. One of the characteristic advantages of the invention is that if the jack handle be inadvertently let go of by the operator, instead of it flying upward with great force, at the same time letting the load drop, the load will, in the manner just explained, immediately check itself without any inadvertent flying up of the jack handle.

Sometimes in lowering the load, the operator may continue working the jack handle after the load has reached the limit of its descent. This will simply unscrew the nut 34 still further until it becomes entirely separated from the check-plate.

Ordinarily, in the absence of preventing means, an attempt to work the jack with the nut screwed out away from the check-plate might result in a back and forth oscillatory movement of the nut with the handle due to the pressure of the pawl 36 against the teeth of said nut under the urge of the spring 42, so that the load would never be raised. In order to obviate this drawback, we have provided a light frictional brake for the nut 34, ensuring, when the jack handle is operated, relative movement between the pawl 36 and the nut. This brake consists of a lever 52 riding upon the bar 50 having one end preferably cupped as shown at 53 in Figure 7, the cupped end housing a spring 54 which bears against the spacing plate 7. The opposite end of the lever forms a brake shoe 55 which bears against the periphery of the nut with a pressure transmitted by the spring 54. One of the secondary objects of the invention is to have the lever 52 readily assembled or removed by constructing it with an open bearing formed by the yoke 56 which rests upon the upper face of the bar 50.

Although a safety stop 18 is provided on the rocking levers to prevent the jack being raised beyond a safe limit, yet said stop is subject to the strain of the entire power multiplication of which the jack is capable. In

order to avoid this undue strain, a normal working safety stop is provided so that the stop 18 acts only as an emergency or auxiliary stop in the event that the ordinary or service stop should become at any time inoperative. The service stop comprises a pawl 55′ which, for convenience, may be journalled upon the same rod 20 which carries the jack operating mechanism. Said pawl has an angular end 56′ which projects through an opening 57 in the jack frame of such size as to permit the pawl to have a limited range of movement about its axis. The angular end of the pawl 56′ lies within an annular groove 58 formed in the outer face of the nut 34, said groove being discontinuous at one point, shown in Figure 7, a projecting web 59 being formed at this point engageable by the pawl 55 in either direction of rotation of the nut to inhibit further rotation of the nut in that direction. The amount of lost motion between the aperture 57 and the angular end 56′ of the pawl is at least equal to the width of the web 59, so that the pawl may move through this distance when struck by the web in either direction of rotation of the nut, thus permitting the nut to rotate through a complete arc of 360 degrees. It is obvious that the stop afforded between the pawl 55 and web 59 is subject merely to the direct leverage of the jack handle and not to the power multiplication provided by the drum and its appurtenant parts.

The other features disclosed in the drawing, but not described in detail in the present specification, are common to my hereinbefore mentioned pending application, and no further reference to them appears necessary.

The operation of the jack according to the present invention is obvious from the preceding description of the several features. However, it should be understood that this jack combines the principles and advantages of a ratchet jack and screw jack. In the load-lifting operation it acts as a ratchet jack, lifting the load step by step through distances commensurate with the space between adjacent teeth on the check plate. In lowering the load, it acts as a screw jack, being adjusted to minute differences in elevation. Furthermore, it possesses the inherent function of a friction brake in the load-descending movement, the drum screwing into the check-plate and pushing the latter into frictional unity with the nut whenever the angular speed of the drum in the load-lowering movement exceeds the angular speed of the jack handle when the latter is operated to lower the load. It is thus apparent that the load cannot escape from the operator as is the case with ordinary jacks when the handle is inadvertently released, since immediately the pressure of the load gives the drum superior speed which screws it at once into the floating check-plate, forcing the latter into unitary contact with the nut, the uni-direction or bias of the check plate preventing further retrograde movement of the load.

While we have in the above description disclosed what we believe to be a perfect and practical embodiment of our invention, yet it is to be understood that the details of construction by means of which the inventive principle is illustrated are not to be considered as limitative in their effect upon the scope of the invention, but merely by way of example, the invention residing in the broader principles of operation except where restricted by the express terms of the appended claims.

We claim:—

1. In a jack of the type in which the lifting member is connected to the operating means by a flexible connection, a rotatable drum upon which said flexible connection is windable, and a nut screwable into frictional unity with said drum for transmitting power, applied to said nut, to said drum.

2. In a jack of the type in which the lifting member is connected to the operating means by a flexible connection, a rotatable drum upon which said flexible connection is windable, a nut screwable into frictional unity with said drum for transmitting power, applied to said nut, to said drum, and means for rotating said nut selectively in either direction.

3. In a jack of the type in which the lifting member is connected to the operating means by a flexible connection, a rotatable drum upon which said flexible connection is windable, a nut screwable into frictional unity with said drum for transmitting to said drum power applied to said nut, and means to prevent unwinding movement of said drum while said parts are in frictional unity.

4. In a jack of the type in which the lifting member is connected to the operating means by a flexible connection, a rod, a drum journalled upon said rod upon which said flexible connection is windable, and a nut rotatable relative to said rod screwable into frictional unity with said drum for transmitting power applied to said nut, to said drum.

5. In a jack of the type in which the lifting member is connected to the operating means by a flexible connection, a drum upon which said flexible connection is windable, and a nut interscrewing with said drum to bring said parts into frictional unity, for transmitting to said drum power applied to said nut.

6. In a jack of the type in which the lifting member is connected to the operating means by a flexible connection, a drum upon which said flexible connection is windable, a nut interscrewing with said drum to bring said parts into frictional unity, for transmitting to said drum power applied to said

nut, and a check plate interposed between said nut and drum for transmitting power from one to the other.

7. In a jack of the type in which the lifting member is connected to the operating means by a flexible connection, a drum upon which said flexible connection is windable, a nut interscrewing with said drum to bring said parts into frictional unity, for transmitting to said drum power applied to said nut, a check plate interposed between said nut and drum for transmitting power from one to the other, and means acting upon said check-plate to prevent unwinding movement of said frictional unit parts when said power applying means is released.

8. In a jack of that type in which the lifting member is connected to the operating member by a flexible connection, a drum on which said flexible connection is windable, a nut to which power is applied interscrewing into frictional unity with said drum, a check plate floatably mounted between said nut and drum for transmitting power from said nut to said drum, said nut acting to push said check plate against said drum to frictionally unite said parts when the nut is rotated in a load-lifting direction, and said drum acting to push said check-plate against said nut to frictionally unite said parts when the angular speed of said drum exceeds that of said nut, in a load-lowering direction.

9. In a jack of that type in which the lifting member is connected to the operating member by a flexible connection, a drum on which said flexible connection is windable, a nut to which power is applied interscrewing into frictional unity with said drum, a check plate floatably mounted between said nut and drum for transmitting power from said nut to said drum, said nut acting to push said check plate against said drum to frictionally unite said parts when the nut is rotated in a load-lifting direction, said drum acting to push said check-plate against said nut to frictionally unite said parts when the angular speed of said drum exceeds that of said nut, in a load-lowering direction, and means to prevent movement of said check-plate in a load-lowering direction.

10. In a jack, a rod functioning as a support, a winding drum journalled on said rod, having a friction face in a plane transverse to its axis of rotation, and an axially extended threaded portion, a check-plate freely journalled on said extension both for rotation and endwise movement, having friction faces on its opposite sides, a nut threaded on said extension having a friction face on the side adjacent said check-plate, said nut and drum being approachable to or recessible from said check-plate to make or break frictional contact therewith upon relative screwing movement between said nut and drum, and means to limit the rotary movement of said check plate to rotation in the load-lifting direction of said drum.

11. In a jack, a rod functioning as a support, a winding drum journalled on said rod, having a friction face in a plane transverse to its axis of rotation, and an axially extended threaded portion, a check-plate freely journalled on said extension, both for rotation and endwise movement, having friction faces on its opposite sides, a nut threaded on said extension, having a friction face on the side adjacent said check-plate, said nut and drum being approachable to, or recessible from said check-plate, to make or break frictional contact therewith, upon relative screwing movement between said nut and drum, teeth on said nut, an operating handle, and a reversible pawl, engageable with the teeth on said nut and actuatable by said handle for operating said nut in either direction.

12. In a jack, a rod functioning as a support, a winding drum journalled on said rod, having a friction face in a plane transverse to its axis of rotation, and an axially extended threaded portion, a check-plate freely journalled on said extension, both for rotation and endwise movement, having friction faces on its opposite sides, a nut threaded on said extension, having a friction face on the side adjacent said check-plate, said nut and drum being approachable to, or recessible from said check-plate, to make or break frictional contact therewith, upon relative screwing movement between said nut and drum, teeth on said nut, an operating handle, a reversible pawl, engageable with the teeth on said nut and actuatable by said handle for operating said nut in either direction, and means for biasing said pawl in either direction.

13. In a jack, a rod functioning as a support, a winding drum journalled on said rod, having a friction face in a plane transverse to its axis of rotation, and an axially extended threaded portion, a check-plate freely journalled on said extension, both for rotation and endwise movement, having friction faces on its opposite sides, a nut threaded on said extension, having a friction face on the side adjacent said check-plate, said nut and drum being approachable to, or recessible from said check-plate, to make or break frictional contact therewith, upon relative screwing movement between said nut and drum, teeth on said nut, an operating handle, a reversible pawl, engageable with the teeth on said nut, and actuatable by said handle for operating said nut in either direction, and a yielding toggle for biasing said pawl in either direction.

14. In a jack, a load-lifting train of mechanism including a holding ratchet, controlling ratchet and a cooperating screw, the holding ratchet acting to hold the load in

the step-by-step stages of its ascent, the controlling ratchet coacting with the screw to permit the progressive descent of the load.

15. In a jack, a load-lifting train of mechanism including a holding ratchet, a controlling ratchet and a screw having a load sustaining element, the holding ratchet acting to hold the load in the step-by-step stages of its ascent, the controlling ratchet coacting with the screw to permit the progressive descent of the load, and a friction brake between the holding ratchet and said load sustaining element and checking the descent of the load when the angular speed of the load-sustaining element of the screw exceeds that of the controlling ratchet.

16. In a jack, a load-lifting mechanism, a rotatable member operatively connected to said load-lifting mechanism, having a friction face in a plane transverse to its axis of rotation, and an axially extended threaded portion, a check-plate freely journalled on said extension, both for rotation and endwise movement, having friction faces on its opposite sides, said check-plate being toothed, a pawl engaging the teeth on said check-plate limiting it to unidirectional movement in a load-lifting direction, a nut threaded on said extension having a friction face on the side adjacent said check-plate, said nut and drum being approachable to or recessible from said check-plate to make or break frictional contact therewith, upon relative screwing movement between said nut and drum, said nut being toothed, a reversible pawl engageable with said nut and means for applying power to said nut to rotate it in either direction.

17. In a jack, a load-lifting mechanism, a rotatable member operatively connected to said load-lifting mechanism, having a friction face in a plane transverse to its axis of rotation, and an axially extended threaded portion, a check-plate freely journalled on said extension, both for rotation and endwise movement, having friction faces on its opposite sides, said check-plate being toothed, a pawl engaging the teeth on said check-plate limiting it to uni-directional movement in a load-lifting direction, a nut threaded on said extension having a friction face on the side adjacent said check-plate, said nut and drum being approachable to or recessible from said check-plate to make or break frictional contact therewith, upon relative screwing movement between said nut and drum, said nut being toothed, a reversible pawl engageable with said nut, means for applying power to said nut to rotate it in either direction, and a brake acting upon said nut with a friction superior to that of the reversible pawl.

18. In a jack, a load-lifting mechanism, a rotatable member operatively connected to said load-lifting mechanism, having a friction face in a plane transverse to its axis of rotation, and an axially extended threaded portion, a check-plate freely journalled on said extension, both for rotation and endwise movement, having friction faces on its opposite sides, said check-plate being toothed, a pawl engaging the teeth on said check-plate limiting it to uni-directional movement in a load-lifting direction, a nut threaded on said extension having a friction face on the side adjacent said check-plate, said nut and drum being approachable to or recessible from said check-plate to make or break frictional contact therewith, upon relative screwing movement between said nut and drum, said nut being toothed, a reversible pawl engageable with said nut, means for applying power to said nut to rotate it in either direction, said nut being formed with an annular groove transected by a projecting web, and a pawl on a relatively fixed part of the jack projecting into said groove and engageable by said web, forming therewith a stop to limit rotation of said nut in either direction.

In testimony whereof we have hereunto set our hands.

EARL E. CLINE.
ERNEST W. HOLMES.