Jan. 2, 1940. C. M. ELLENBERGER 2,185,804

JACK

Filed Feb. 3, 1939 2 Sheets-Sheet 1

Fig. 1.

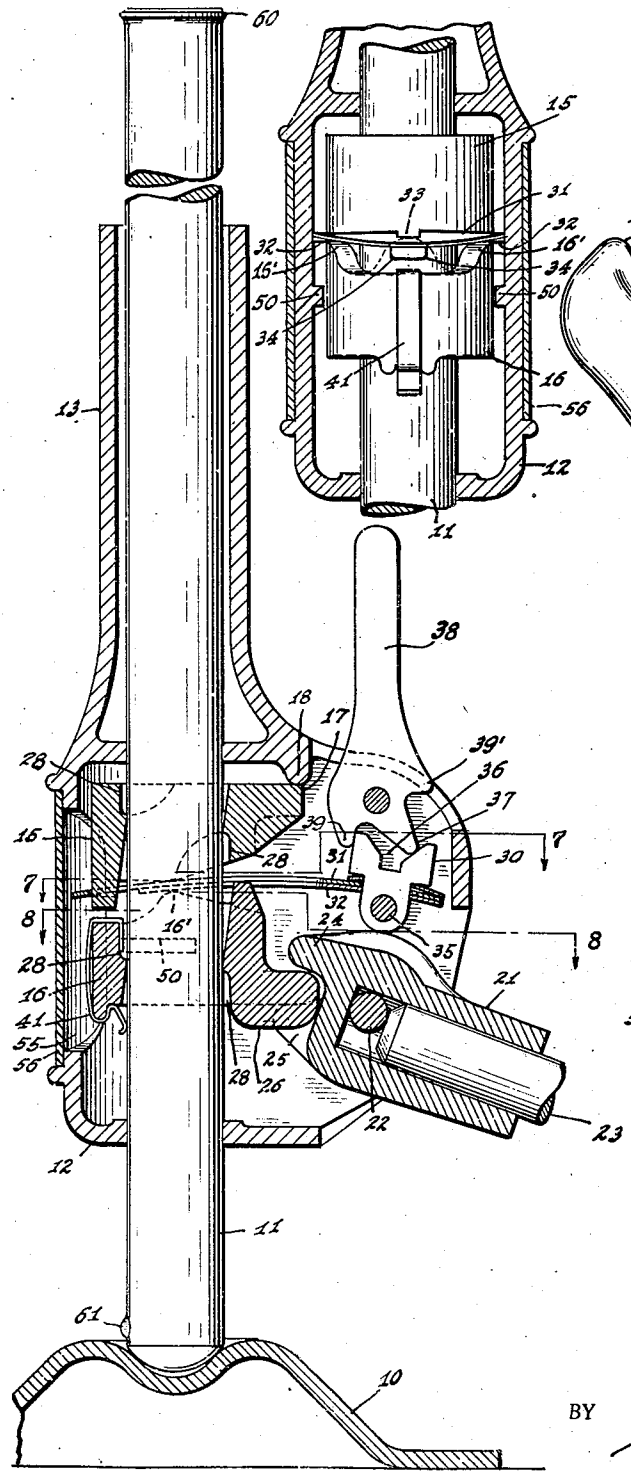
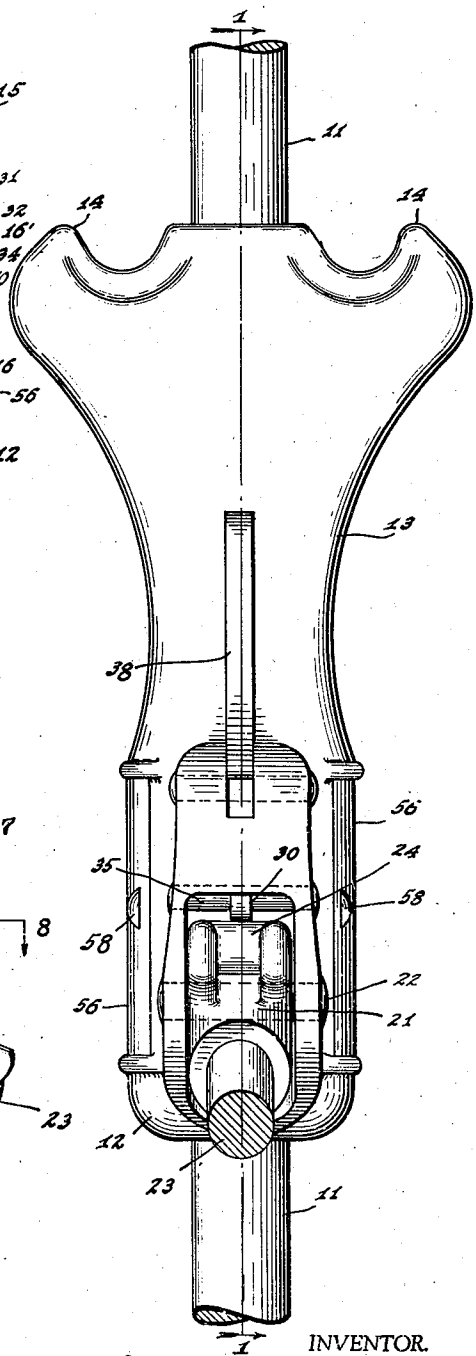


Fig. 2.



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Fig. 3.

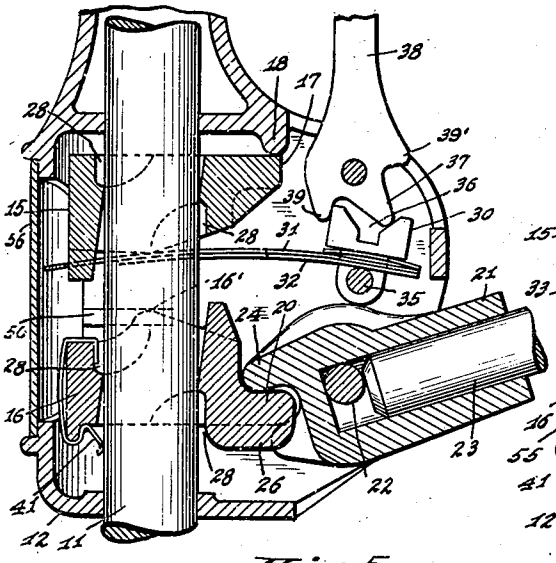


Fig. 4.

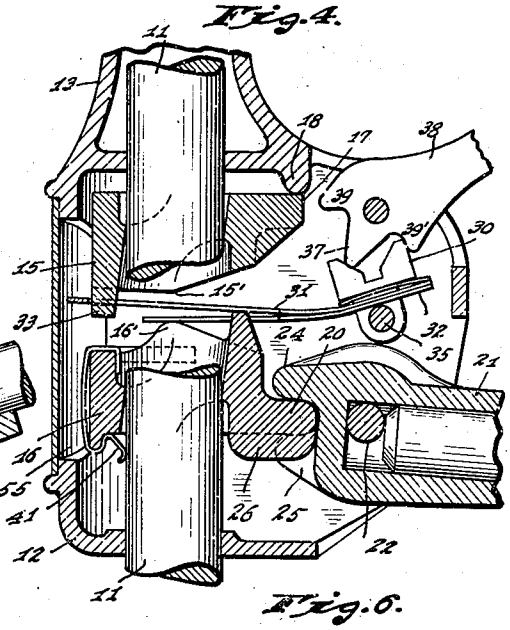


Fig. 5.

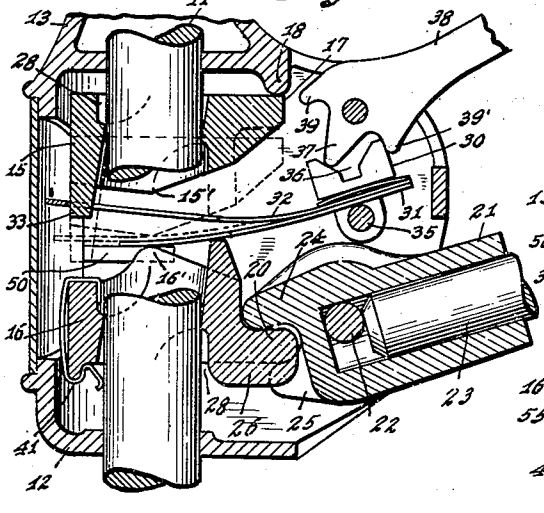


Fig. 6.

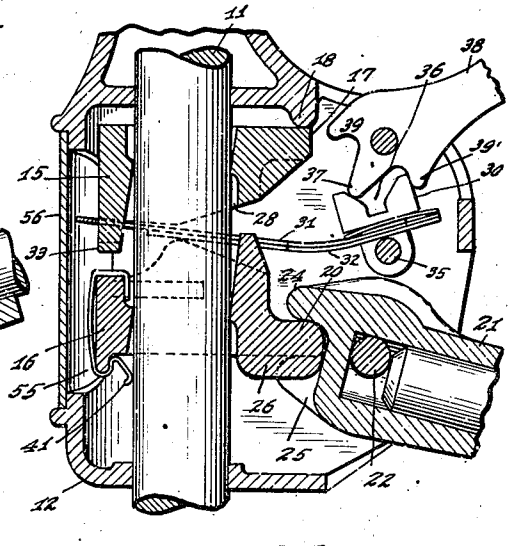


Fig. 7.

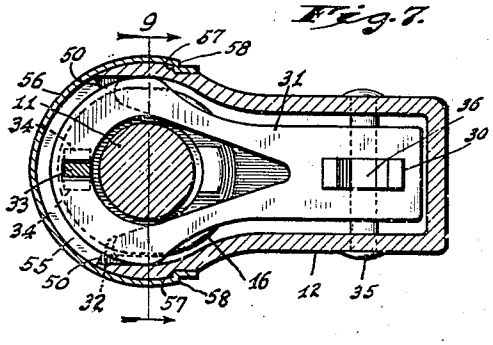
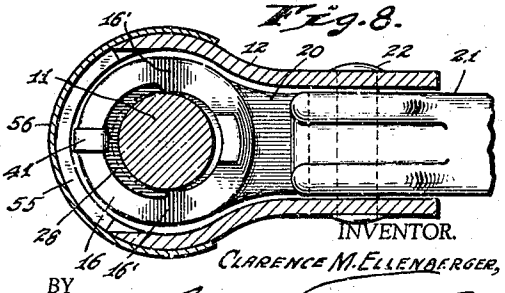


Fig. 8.



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UNITED STATES PATENT OFFICE

2,185,804

JACK

Clarence M. Ellenberger, Pendleton, Ind.

Application February 3, 1939, Serial No. 254,366

15 Claims. (Cl. 254—106)

My invention relates broadly to friction jacks and, in the specific embodiment herein illustrated and described, to automobile jacks of the so-called bumper type in which a head is adapted to travel vertically on a stationary rod and is formed to engage the bumper of an automobile.

A friction jack commonly comprises a body, a rod of uniform diameter slidably associated with said body, a pair of dogs mounted on said rod, and an operating lever. One of the dogs, which may for convenience be called the retaining dog, is directly associated with the body and is arranged to cant on the rod and grip it frictionally when the body and rod tend to move relatively under the load which the jack sustains. The operating lever acts between the body and the other dog, which may be called the fulcrum dog and which is arranged to cant on and grip the rod when the lever is operated to cause the body and rod to move relatively against the load. Upon movement of the lever in the opposite direction, the fulcrum dog moves along the rod to a new position thereon, the retaining dog meanwhile preventing relative movement of the rod and body under the influence of the load. To release such a jack while under load the only method heretofore available has involved forcibly moving one or both dogs to uncanted position to release their grip on the rod and permit uncontrolled relative movement of the head and rod under the influence of the load.

It is the primary object of my invention to produce a jack of this kind in which it is possible to control relative movement of the body and rod under the influence of the load. Another object of my invention is to produce a jack of this type which will be simple in construction and positive in operation, and which can be economically manufactured.

In embodying my invention in a friction jack, I provide releasable means capable of overcoming the normal tendency of the dogs to assume a canted position and operative only through a limited range of movement of each dog relative to the rod. Conveniently this means takes the form of leaf-springs mounted in the body and acting respectively upon the two dogs. The spring associated with the retaining dog acts, when that dog is relieved of the load, to move it for a limited distance away from engagement with the body and into a new position on the rod. The spring associated with the fulcrum dog may merely act to overcome the normal tendency of that dog to assume a canted position, so that such dog can be moved along the rod by the lever in the direction in which its movement is normally prevented. When the fulcrum dog has been moved through the range over which its associated spring is effective it cants and grips the rod, and a slight continued movement of the lever relieves the retaining dog of its load so that its spring can move it to a new position on the rod. The lever is then swung in the opposite direction to permit relative movement of the body and rod under the influence of the load until the body again engages the retaining dog in the latter's new position.

For purposes of explanation I have chosen to illustrate my invention as embodied in an automobile jack of the bumper type, but it is to be understood that my invention is not limited to such a device. In a bumper-type automobile jack the rod is usually the stationary element of the jack and is supported in vertical position from the ground. The body is in the form of a head adapted to engage an automobile bumper and to travel upwardly on the rod to raise the downwardly applied load.

The accompanying drawings illustrate a bumper jack embodying my invention: Fig. 1 is a longitudinal section through the jack on the line 1—1 of Fig. 2, showing the parts in the positions they occupy just prior to a head-lifting movement of the operating lever; Fig. 2 is a front elevation of the head of the jack; Fig. 3 is a fragmental view generally similar to Fig. 1 showing the condition existing at the conclusion of a head-lifting movement of the operating lever; Fig. 4 is a view similar to Fig. 1 but showing the jack arranged to lower the load under control; Fig. 5 is a view similar to Figs. 3 and 4, showing, in full lines, the condition existing as the operating lever just reaches its limit of upward movement in a head-lowering operation and, in dotted lines, the condition existing immediately thereafter; Fig. 6 is a view similar to Fig. 5, showing the condition existing at the end of a downward movement of the operating lever in a head-lowering operation; Figs. 7 and 8 are horizontal sections on the lines 7—7 and 8—8 of Fig. 1; and Fig. 9 is a vertical section on the line 9—9 of Fig. 7.

The jack illustrated in the drawings comprises a base plate 10 having at its center a hemispherical depression for the reception of the rounded lower end of the circular rod 11. The body of the jack, which is slidable relatively to the rod 11, is in the form of a head 12, conveniently made as a hollow casting the bottom and top walls of which have aligned openings slidably receiving the rod 11, all as is clear from Fig. 1. The head

is provided with an upward extension 13 formed at its top with one or more lateral projections 14 shaped to engage the bumper of an automobile.

Mounted within the head 12 and upon the rod 11 are the retaining dog 15 and the fulcrum dog 16, the former being above the latter in this particular construction. The retaining dog 15 is provided with a lateral extension 17 disposed beneath a downwardly extending abutment 18 provided interiorly of the head 12 and so arranged as to engage the extension 17 at a point spaced from the axis of the rod 11. As a result of this arrangement, any load applied to the dog 15 through the abutment 18 will tend to cant the dog upon the rod 11 and to cause it to grip the rod with a firm frictional engagement.

The fulcrum dog 16 is provided with a lateral extension 20 disposed beneath the extension 17 of the upper dog and adapted to co-operate with the inner end of a swinging lever 21 pivoted in the housing 12 as by means of a pivot pin 22. Desirably, the lever 21 is relatively short and is provided at its outer end with a socket adapted to receive a removable operating handle 23. The extension 20 and lever 21 are so formed that the lever may exert either an upwardly directed force or a downwardly directed force upon the dog 16. To this end, the lever 21 is shown as provided with an inwardly extending flange 24 overlying the dog-extension 20 and with two laterally spaced ears 25 disposed beneath the dog-extension 20. A lug 26 on the extension 20 is received between two ears 25 and both strengthens the extension and prevents rotation of the dog 16 relative to the head 12 about the axis of the rod 11.

Whenever a load is transmitted through one or the other of the dogs 15 and 16 from the head to the rod 11 such load, being eccentrically applied to the dog, will tend to cause the dog to cant and grip the rod frictionally. The downwardly directed force applied eccentrically to the retaining dog 15 through the abutment 18 and the upwardly directed force applied concentrically to the dog and representing friction between it and the rod 11 form a force couple tending to rotate the dog in a clockwise direction (Fig. 1). This vertical-force couple is opposed by a horizontal-force couple consisting of the oppositely directed reactions of the rod 11 upon the dog at the ends of the rod-bearing therein.

Obviously, the magnitude of the latter reactions, and consequently the magnitude of the frictional force opposing movement of the dog on the rod, can be increased by decreasing the arm of the horizontal-force couple—i. e., by decreasing the effective length of the rod-bearing in the dog. Again obviously, the dogs must be strong enough to sustain the forces which will be imposed upon them in use.

With these obvious considerations in mind, the dogs are designed as indicated in the drawings. They are conveniently formed as steel castings proportioned to sustain the stresses which they will have to bear in use. At its lower end on the side adjacent the extension (17 or 20) and at its upper end on the opposite side, the bore of each dog is relieved as indicated at 28 to shorten the effective length of the rod-bearing in the dog when the dog is canted under the downward load imposed upon its extension. The axial depths of these reliefs will depend upon the distance between the axis of the rod 11 and the point at which load is applied to the dog. Specifically, as will be apparent upon drawing a simple force diagram, the ratio of the effective length of the rod-bearing with the dog under load to the distance between the rod-axis and the point at which the load is applied to the dog should be less than twice the coefficient of friction between the rod and the dog at the points of interengagement thereof.

Pivotally mounted within the head 12 above the lever 21 is a spring-carrier 30 to which are secured a pair of leaf springs 31 and 32 that extend inwardly between the two dogs 15 and 16. The upper spring 31 completely embraces the rod 11, and on the remote side of such rod is provided with a slot receiving a lug 33 projecting downwardly from the dog 15. Beneath the spring 31, the lug 33 is provided with lateral projections 34 (see Fig. 9) which prevent the spring 31 from moving downwardly relatively to the dog 15. Engagement of the spring 31 with the lug 33 holds the dog 15 in fixed position about the axis of the rod 11. The lower spring 32 has its free end bifurcated, the bifurcations extending inwardly on opposite sides of the rod 11 sufficiently far to bear upon the lower dog 16 at diametrically opposite points. The lower surface of the dog 15 is formed, as indicated at 15' so that an upward force exerted upon it by the spring 31 will be applied substantially in alignment with the axis of the rod 11 and therefore will not tend to cause the dog to cant on the rod. For the same reason, the lower dog is formed to provide a raised spring-engaging portion 16'.

The spring carrier 30 is oscillatable so that the free ends of the springs 31 and 32 may exert either upward or downward forces on the dogs 15 and 16. To this end, the spring carrier 30 is pivoted in the head 12, as by means of a pivot pin 35, and its upper surface is provided with a groove 36 which receives a finger 37 on a control member 38. The control member 38 is pivotally mounted in the head 12 on an axis above the spring carrier 30 and, on opposite sides of the finger 37, is provided with ears 39 and 39'.

Associated with the lower dog 16 is some means, here shown as a spring 41, tending normally to cant the dog 16 into locking position on the rod 11. As is clear from Fig. 1, the spring 41 is formed of a bent strip of steel attached to the dog 15 and bearing against the side of the rod 11 at a point below the dog and opposite the dog-extension 20.

In Figs. 1, 2, and 3, the control lever 38 is in the position it occupies when the head 12 is being raised. In this position, the spring-carrier 30 is rocked about its axis of pivotal mounting to the limit of its movement in a clockwise direction, and the spring 31 bears upwardly on the dog 15 with an axially applied force. The reaction of the spring 31 upon the carrier 30 tends to rotate the carrier in a counterclockwise direction. The outer wall of the groove 36 in the spring-carrier 30 is so sloped that it exerts on the finger 37 a force tending to rotate the control element 38 in a clockwise direction about its axis of pivotal mounting in the head 12, such rotation of the control member being prevented by engagement of the ear 39 with the side of the spring-carrier 30. As a result, the spring-carrier 30 is firmly held in position and the spring 31, supported from below by the spring 32, exerts an upward force on the dog 15 and maintains the extension 17 thereof in engagement with the abutment 18 on the head.

In Fig. 1, the operating lever 21 and the dogs 15 and 16 are illustrated in the respective posi-

tions they occupy at the limit of a downward movement of the handle 23. When the handle 23 is swung upwardly, the flange 24 on the operating lever 21 engages the projection 20 on the dog 16 and applies to the dog an eccentrically disposed downward force which co-operates with that exerted by the spring 41 tending to cant the dog 16 upon the rod 11. Because this canting tendency causes the dog 16 to grip the rod 11 frictionally, the dog can not move downwardly on the rod. Instead, the lever 21 fulcrums at the point of engagement between the flange 24 and the dog-extension 20 and, operating as a lever of the second class, moves the head 12 upwardly. During this upward movement, the spring 31 acting on the dog 15 causes the projection 17 to remain in contact with the abutment 18 on the head, and the dog 15 therefore moves upwardly with the head as the handle 23 is raised. At the limit of upward movement of the handle 23, the parts occupy the respective positions illustrated in Fig. 3.

When the operating handle 23 is relieved of an upwardly directed force, the head 12 tends to drop; but downward pressure exerted by the abutment 18 upon the lateral extension 17 of the dog 15 cants the dog 15 upon the rod 11 and causes it to engage the rod frictionally. Thereafter, the handle 23 may be moved downwardly, the head 12 remaining stationary and the load being supported through the dog 15. As the operating handle 23 is moved downwardly, the inner end of the lever 21 moves upwardly; and the ears 25 thereon cause the lower dog 16 to move upwardly also until the dog 16 engages the lower leaf spring 32. When the operating handle 23 is again moved upwardly, the cycle of operations is repeated, upward movement of the operating handle first canting the dog 16 into gripping engagement with the rod 11 and subsequently raising the head.

When it is desired to lower the head, the control member 38 is swung in a clockwise direction to the position illustrated in Figs. 4 and 5, thus forcing the free ends of the springs 31 and 32 downwardly. As in the case when the control lever 38 is in its "up" position, the reaction of the inner side wall of the groove 36 upon the end of the finger 37 tends to rotate the control member 38, this time in a clcokwise direction, such rotation being limited by engagement of the ear 39' with the outer side of the spring carrier 30.

With the control lever 38 moved from its "up" to its "down" position, the parts will normally occupy the positions illustrated in Fig. 4. The upper leaf spring 31, acting on the head 34 of the lug 33, will exert a downwardly directed force on the upper dog 15 tending to release that dog and move it downwardly on the rod 11. This tendency is more than overcome, however, by the load on the abutment 17 which maintains the dog 15 in canted position. The lower leaf spring 32 acts on the raised portion 16' of the dog 16 with a force great enough to overcome the canting effect of the spring 41, and tends to move the dog 16 downwardly on the shaft, its effect being opposed by the weight of the handle 23.

If the handle 23 is now raised, the spring 32 forces the dog 16 downwardly on the rod until such spring engages the abutments 50 (see full-line position in Fig. 5), and the dog 16 is thereafter free to cant and grip the rod 11 upon a continued upward movement of the operating handle 23.

When upward movement of the handle 23 is continued, as from the full-line position to the dotted-line position in Fig. 5, the dog 16, being prevented in its canted position from moving downwardly on the rod, acts as a fulcrum for the lever 22 and the head 12 is raised. This raising of the head frees the extension 17 of the dog 15 from the load previously applied through the abutment 18 and consequently relieves the dog 15 of the force which was maintaining it in canted position against the releasing effort exerted upon it by the spring 31. Upon being relieved of force applied to its extension 17, the dog 15 is moved downwardly on the rod 11 until the spring 31 engages the spring 32, or into the dotted-line position indicated in Fig. 5.

The load is now being supported through the lever 21, which can be swung under control of the handle 23 to permit downward movement of the head 12 on the rod 11 under the influence of the load and at the rate desired. As the head moves downwardly on the rod the abutment 18 eventually engages the projection 17 on the upper dog 15 and cants such dog into its locking position; whereupon the parts will occupy the positions illustrated in Fig. 6. During descent of the head 12, the abutments 50 move downwardly with it and permit the spring 32 to exert its releasing effort on the lower dog 16. Since, during lowering movement of the head, the dog 16 is sustaining the load and is canted into locked position by the downwardly directed force applied to its extension 20 by the inner end of the lever 21 the downward pressure exerted upon it by the spring 32 can not release the dog. However, when the abutment 18 again engages the projection 17 (see Fig. 6) and transfers the load to the upper dog 15, the lower dog 16 is relieved of the load; and upon the ensuing upward movement of the handle 33 that dog moves downwardly under the influence of the spring 32 until the latter engages the abutments 50, whereupon the parts carried by the head are restored to the positions shown in full lines in Fig. 5 ready for another controlled downward movement of the head.

For purposes of assembly, the head 12 is shown as provided in its rear wall with an opening 55 large enough for the insertion of the dogs 15 and 16 and of other parts. In the completed jack, this opening is closed, as by a cover plate 56 conveniently formed of elastic sheet-metal and held in place by shoulders 57 on the head 12, the cover plate being provided at its edges with off-set portions 58 engaging behind said shoulders. (See Fig. 7.)

Since the dogs are held in place in the head only as the result of their bearing on the rod 11, it is advisable to provide means preventing the rod from being withdrawn from the dogs. For this purpose, the metal of the rod, at each end thereof, may be displaced to form an outward projection such as the flange 60 shown at the upper end of the rod or the boss 61 at the lower end of the rod. To increase the range of adjustment of the jack, the internal diameter of the head-extension 13 may be made larger enough to clear the flange 60.

I claim as my invention:

1. A jack, comprising a rod, a head slidable on said rod, an upper dog also slidable on said rod, an abutment carried by said head, said abutment being positioned to engage said upper dog at an eccentric point and cant it into gripping engagement with said rod when said head tends to move

downwardly, a lower dog slidable on said rod, an operating lever pivoted in said head, the inner end of said operating lever engaging said lower dog and being adapted to fulcrum thereon at an eccentric point to cant the lower dog into gripping engagement with said rod, the outer end of said lever being provided with a handle portion extending laterally from the head, spring means carried by said lower dog and engaging said rod to bias such dog toward canted position, two superposed leaf springs carried by said head and having their free ends disposed between said dogs, means associated with said leaf springs and selectively operable to cause their free ends to exert either upward or downward forces, the upper one of said leaf springs being connected to said upper dog at a point on the opposite side of said rod from the abutment on said head, and a second abutment on said head positioned to limit downward movement of the free end of the lower one of said leaf springs.

2. A jack comprising a rod, a head slidable on said rod, an upper dog also slidable on said rod, an abutment carried by said head, said abutment being positioned to engage said upper dog at an eccentric point and cant it into gripping engagement with said rod when said head tends to move downwardly, a lower dog slidable on said rod, an operating lever pivoted in said head, the inner end of said operating lever engaging said lower dog and being adapted to fulcrum thereon at an eccentric point to cant the lower dog into gripping engagement with said rod, the outer end of said lever being provided with a handle portion extending laterally from the head, two superposed leaf springs carried by said head and having their free ends disposed between said dogs, means associated with said leaf springs and selectively operable to cause their free ends to exert either upward or downward forces, the upper one of said leaf springs being connected to said upper dog at a point on the opposite side of said rod from the abutment on said head, and a second abutment on said head positioned to limit downward movement of the free end of the lower one of said leaf springs.

3. A jack, comprising a rod, a head slidable on said rod, an upper dog also slidable on said rod, an abutment carried by said head, said abutment being positioned to engage said upper dog at an eccentric point and cant it into gripping engagement with said rod when said head tends to move downwardly, a lower dog slidable on said rod, an operating lever pivoted in said head, the inner end of said operating lever engaging said lower dog and being adapted to fulcrum thereon at an eccentric point to cant the lower dog into gripping engagement with said rod, the outer end of said lever being provided with a handle portion extending laterally from the head, releasable means acting on said upper dog and tending to release it from canted position and to move it toward said lower dog, a second releasable means acting on said lower dog and tending to move it away from said upper dog, and provisions on said head for limiting such movement of said lower dog under the influence of its associated releasable means.

4. The invention set forth in claim 3 with the addition of common control mechanism for said two releasable means.

5. In a friction jack, a vertical rod, a head slidable thereon, a dog on said rod, said dog normally engaging said head at a point eccentric to said rod whereby said dog will cant and grip said rod frictionally when said head tends to move downwardly on said rod, an operating lever pivoted in said head, a second dog on said rod, said lever being operatively connected to said dog at an eccentric point thereon whereby said second dog will cant and grip said rod frictionally when subjected to a downward load applied by said lever, and means operable to move each of said dogs a predetermined distance downwardly on said rod when the dog is relieved of load.

6. In a friction jack having a body and a rod movable relatively to each other longitudinally of the rod, a pair of dogs on said rod, and means associated with one of said dogs and selectively controllable to bias such dog for movement in either direction longitudinally of said rod.

7. In a friction jack having a body and a rod movable relatively to each other longitudinally of the rod, a pair of dogs on said rod, a leaf spring carried by said body and having its free end connected to one of said dogs to bias the dog for movement longitudinally of said rod, and mechanism associated with said spring and spaced laterally from said rod for controlling the direction of the biasing effort it exerts on said body.

8. In a friction jack having a body and a rod movable relatively to each other longitudinally of the rod, a dog on said rod, and a leaf spring carried by said body and engaging said dog to bias it for movement on said rod, said spring and dog being provided with interengaging provisions preventing the dog from rotating relatively to the head about the axis of the rod.

9. In a friction jack having a body and a rod movable relatively to each other longitudinally of the rod, an operating lever pivoted in said body, a dog slidable on said rod and having an ececntric portion engaging said body, a second dog operatively associated with said lever and slidable on said rod, and spring means carried by said second dog and bearing yieldingly on said rod to bias said second dog toward canted position on the rod.

10. The invention set forth in claim 9 with the addition of releasable means carried by said body and acting on said second dog to overcome the dog-canting effort of said spring means.

11. In a friction jack having a body and a rod movable relatively to each other longitudinally of the rod, an operating lever pivoted in said body, a dog slidable on said rod and having an eccentric portion engaging said body, a second dog operatively associated with said lever and slidable on said rod, spring means carried by said body and exerting on said second dog a force directed longitudinally of said rod, an abutment on said body limiting the action of said spring means, and mechanism associated with said spring means for moving it out of engagement with said second dog.

12. In a friction jack having a body and a rod movable relatively to each other longitudinally of the rod, an operating lever pivoted in said body, a dog slidable on said rod and having an eccentric portion engaging said body, a second dog operatively associated with said lever and slidable on said rod, and means associated with said first dog for moving it toward said second dog.

13. In a friction jack having a body and a rod movable relatively to each other longitudinally of the rod, an operating lever pivoted in said body, a dog slidable on said rod and having an eccentric portion engaging said body, a second dog operatively associated with said lever and slidable on

said rod, and means carried by said body and selectively operable to bias said first dog for movement either toward or away from said second dog.

14. In a friction jack having a body and a rod movable relatively to each other longitudinally of the rod, an operating lever pivoted in said body, a dog slidable on said rod and having an eccentric portion engaging said body, a second dog operatively associated with said lever and slidable on said rod, and means carried by said body and selectively operable either to bias both dogs for movement in the same direction along said rod or to bias said first dog in the opposite direction away from said second dog.

15. In a friction jack having a body and a rod movable relatively to each other longitudinally of the rod, a pair of dogs on said rod, a spring-carrier pivotally mounted in said body on an axis displaced from said rod, a leaf-spring carried by said carrier and acting on one of said dogs, said carrier being provided with a V-groove, and a control member having a portion disposed in said groove and engageable with either of the walls thereof to rock said carrier and control the action of said spring on the associated dog.

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