Jan. 2, 1934. E. F. GREEN ET AL 1,942,244

MECHANICAL JACK

Filed Sept. 30, 1930 2 Sheets-Sheet 1

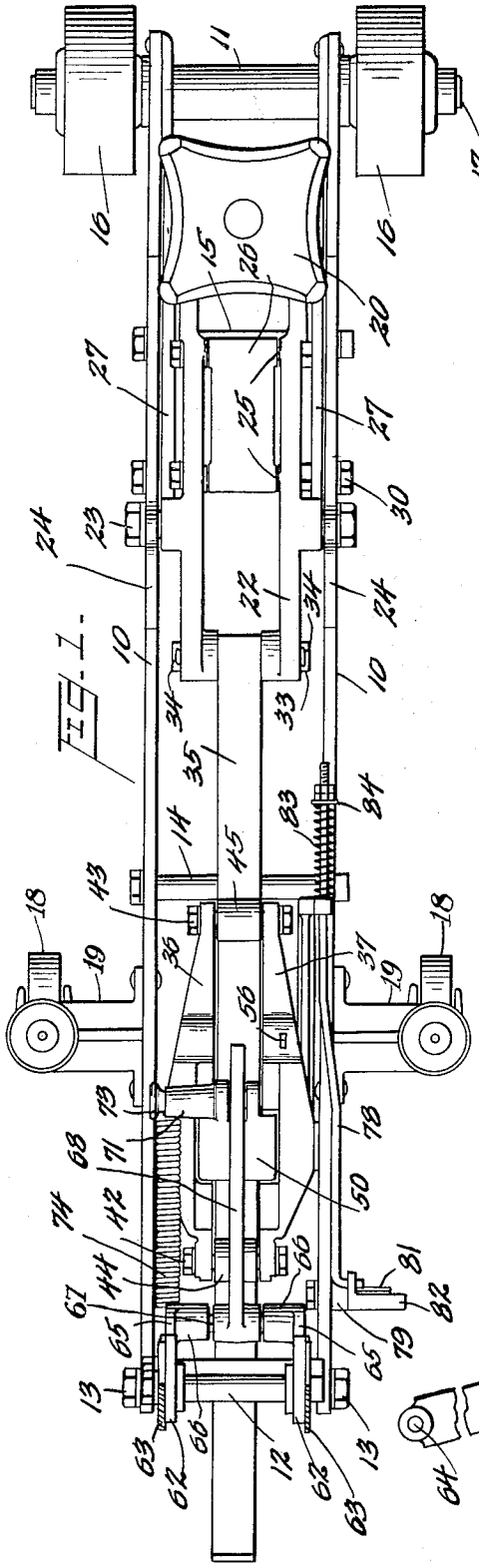


FIG. 1.

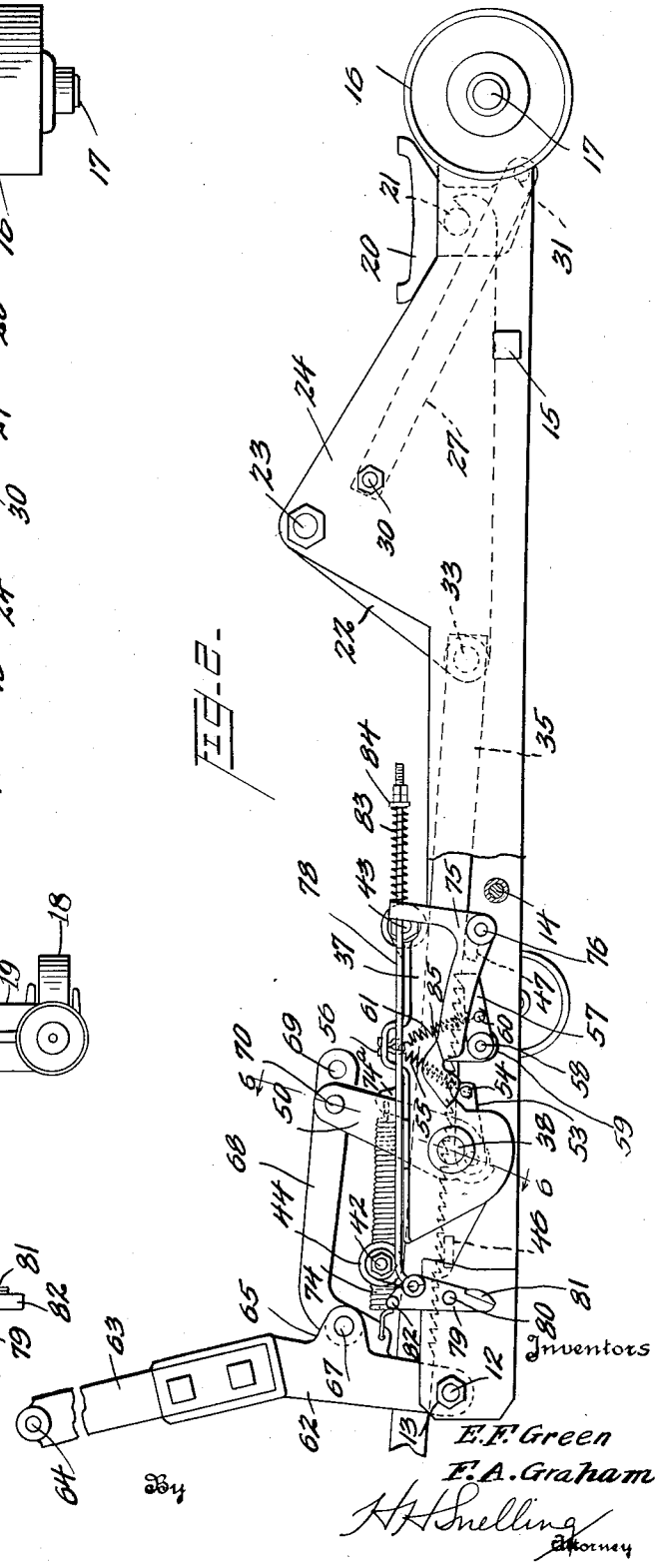


FIG. 2.

Inventors
E. F. Green
F. A. Graham
By H. H. Snelling
Attorney

Jan. 2, 1934. E. F. GREEN ET AL 1,942,244

MECHANICAL JACK

Filed Sept. 30, 1930 2 Sheets-Sheet 2

FIG. 3.

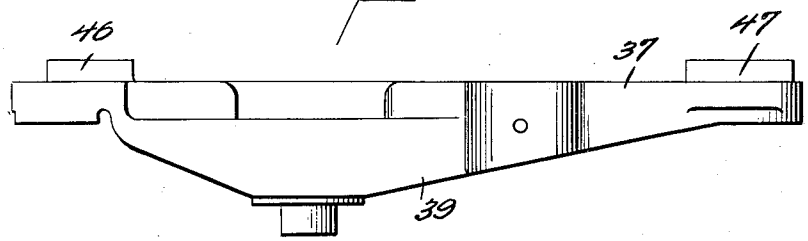


FIG. 4.

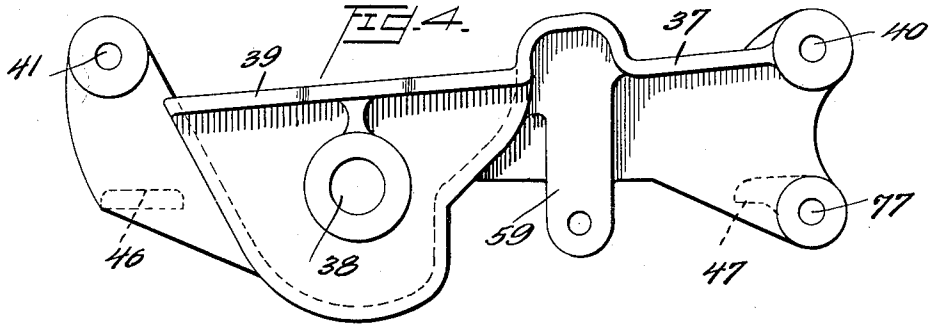


FIG. 5.

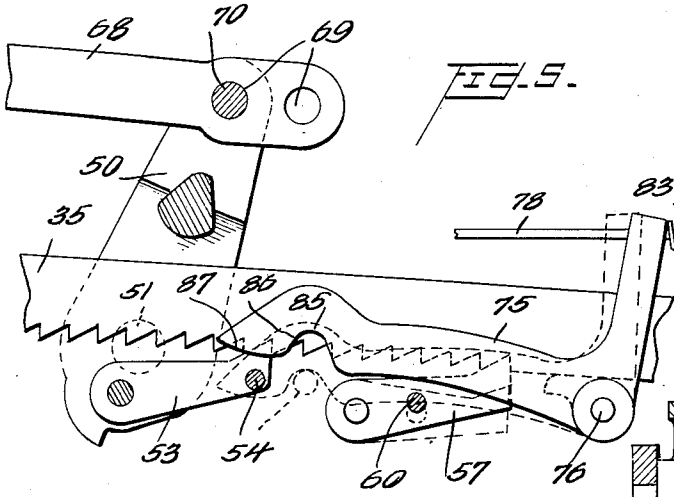
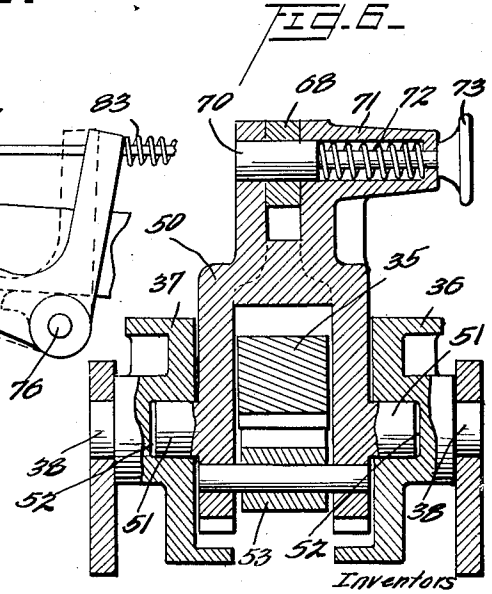


FIG. 6.



Inventors
E. F. Green
F. A. Graham
By H. H. Snelling Attorney

Patented Jan. 2, 1934 1,942,244

UNITED STATES PATENT OFFICE

1,942,244

MECHANICAL JACK

Earl F. Green and Frank A. Graham, York, Pa., assignors to The Manley Manufacturing Company, York, Pa., a corporation of Delaware

Application September 30, 1930
Serial No. 485,497

18 Claims. (Cl. 254—2)

This invention relates to lifting jacks, particularly those of the truck type commonly used in garages and repair shops for lifting automobiles, and has for its general object the provision of an improved jack of this type which is entirely mechanical, of simple and compact construction, easy to handle and not likely to get out of order, and in which the load may be lowered in step-by-step manner.

With this object in view we provide a jack having an elongated four-wheeled frame which carries at its rear end a load supporting table or saddle, and adjacent its front end a hand lever or tongue and a pawl and ratchet mechanism operably connected thereto and adapted to actuate a rack bar connected to the main lever, which is of bell crank type, reversing mechanism being associated with said pawl and ratchet mechanism, whereby an oscillation of the handle causes a step-by-step movement of the rack bar in either direction, as desired, to raise or lower the table.

In the accompanying drawings we have illustrated a jack embodying our invention, and we will hereinafter describe the construction and operation of this form of jack with particularity, with the understanding, however, that we do not intend to restrict the scope of our invention to the specific details shown and described for it will be obvious to those skilled in the art that changes and modifications in these details may be made without substantially varying the mode of operation of the invention or the basic principles of construction.

In the drawings:

Figure 1 is a plan view of the jack;

Figure 2 is a side elevation thereof;

Figure 3 is a plan view of one member of the rack bar support;

Figure 4 is a side elevation thereof;

Figure 5 is a detail view illustrating the pawl and ratchet mechanism and the reversing cam lever associated therewith.

Figure 6 is a section taken on line 6—6 of Figure 2.

The frame of the jack, as shown in Figures 1 and 2, comprises a pair of spaced parallel bars 10 secured together at their rear and front ends, respectively, by an axle sleeve 11 and a bolt 12 carrying a spacing sleeve against which the bars are clamped by nuts 13. Additional tie members for the side bars are provided by sleeved bolts 14 and 15. This frame is supported at its rear or load carrying end by rollers 16 having ball bearings on the projecting ends of an axle 17 supported in sleeve 11. Rearwardly of its front end the frame is supported by castors 18 carried by laterally projecting brackets 19 riveted to the outer sides of the frame bars 10.

The load supporting table 20, mounted adjacent the rear end of the frame for vertical raising and lowering movements, has an integral pedestal, or stem, formed with laterally projecting trunnions 21 which are carried in the forked ends of a pair of triangular lever castings 22, these castings being fulcrumed near their apexes on a bolt 23 secured in apertures of a pair of plate projections 24 made integral with the frame bars 10 preferably by welding. The two lever castings 22 are tied together and held in proper spaced relation, to form a rigid structure, by bolts 25 and a spacing plate 26, the bolts passing through the plate and castings and having nuts on their projecting ends for clamping the plate between the castings. The usual parallel motion of table 20 is effected by two drag links 27 pivoted at one end to the projections 24 on an axis 30 and pivoted at their other ends to the ends of a transverse rod 31 secured in forwardly extending lugs of the saddle stem. Supported in alined bearings formed in the rear base angles of casting 22 is a cross bolt 33 secured from displacement by cotter pins 34, and pivoted to this bolt is a rack bar 35 which extends centrally of the frame and is adapted to project forwardly of the front end thereof when the saddle is in its lowest position.

Rack bar 35 is slidably supported in a rack block formed of two similar castings 36 and 37 which are mounted in the frame to rock on a transverse axis, the castings for this purpose being formed with coaxial trunnions 38 adapted to pivot in bearings provided in the side bars 10. The right hand rack block casting 37 is clearly illustrated in Figures 3 and 4, the left hand casting, except for unimportant details, being of the same form and construction. It will be observed that the casting is formed with an outwardly projecting top flange 39 which has a maximum width directly above trunnion 38, and is provided at its rear and front corners with apertures 40 and 41, respectively. Extending through these apertures are bolts 42 and 43 and carried by these bolts are rollers 44 and 45 which engage the flat top side of the rack bar. The lower side of the rack bar, on which the teeth are formed, is supported by ledges 46 and 47 formed integrally with castings 36 and 37 and located substantially directly beneath the rollers. The rack bar is thus supported for free longitudinal sliding movement in the rack block, and the rack block itself being trunnioned on a transverse axis permits

the rack bar to assume different angular positions as necessitated in its longitudinal movement by reason of its connection with the main elevating levers 22.

The pawl and ratchet mechanism for operating the rack bar includes a pawl lever 50 located between the rack block castings 36 and 37 and fulcrumed thereto on an axis which is coincident with the trunnion axis of said castings, the lever 50 being formed with pivots 51 seated in bearings 52 provided in the inner faces of the castings. Lever 50 is forked so as to straddle the rack bar, and pivoted in the fork below the rack bar is a driving pawl 53 engaging the rack teeth on the under side of the rack bar. Pawl 53 carries adjacent its free end a laterally extending pin 54 which projects to the outside of the rack block casting 37 and has attached near its outer end the lower end of a contractile spring 55 the upper end of which is secured in the eye of a cotter pin 56 fixed to flange 39 of casting 37. A holding pawl 57 is pivoted to a pin 58 secured in an aperture of a depending lug 59 of the right rack block casting. This holding pawl carries a laterally projecting pin 60 extending to the outside of the casting corresponding to the pin 54 of elevating and lowering pawl 53 and connected to the lower end of a spring 61 having its upper end secured to cotter pin 56.

For manually oscillating the pawl lever 50 there is provided a hand lever composed of two spaced members 62 pivoted on the bolt 12, bars 63 bolted in sockets of said members, and a cross bar 64 connecting the upper ends of bars 63. Members 62 are formed with rearwardly projecting lugs 65 having inwardly projecting bosses 66 in which is supported a pin 67 pivotally carrying one end of a link 68, the other end of which is formed with one or more holes 69. Link 68 is received in the bifurcated upper end of lever 50 and is pivoted therein by a pin 70 which is adapted to pass through any one of the holes 69. Pin 70 passes through a laterally projecting barrel 71 formed integrally with lever 50 and housing a coil spring 72 which surrounds the pin and tends to hold it projected through the hole in link 68. Pin 70 extends from the housing and carries a knob 73 by means of which it may be retracted whenever it is desired to adjust the effective length of the link by passing the pin through another hole therein. The handle is held normally in the position shown in Fig. 2 by a coil spring 74 which connects the left hand member 62 of the handle to a small lug 74ª rising from the left hand rack block casting 36.

Mechanism for reversing the step-by-step movement of the rack bar upon oscillation of the hand lever includes a cam lever 75 which is pivoted on the outer end of a pin 76 carried in apertures 77 of the rack block castings. This lever consists of a forwardly projecting cam arm and an upwardly extending arm through which passes a rod 78. This rod has an angular forward extremity received in a hole formed in a foot lever 79 which is fulcrumed on a pin 80 secured to the right hand frame bar 10, this lever being provided with laterally extending projections, or pedals, 81 and 82 at its two ends by means of which it may be conveniently rotated in opposite directions by the foot of the operator. Rod 78 extends rearwardly past lever 75 and carries a coil spring 83 bearing at one end against the upright arm of lever 75 and at its other end against an adjustable seat 84 on the rod. It will be observed that the cam arm of lever 75 overlies pins 54 and 60 on the driving and holding pawls and is adapted to bear thereon with a yielding pressure governed by spring 83, for a purpose to be presently explained.

Assuming the operating elements of the jack to be in their normal positions, as shown in Figure 2, that is, the positions assumed when the table 20 is in its lowest position, and that the table 20 has been brought beneath the object to be raised by a mere quick rearward pressure on the front end of rack bar 35, the operation of the jack in raising the object is carried out in an obvious manner. The operator grasping the handle bar 64 pulls the hand lever forwardly, or to the left, against the tension of spring 74, causing the pawl lever 50 to be rotated counter-clockwise and pawl 53 to be projected rearwardly while engaging a tooth of the rack bar, whereby the rack bar is moved rearwardly and the table lever 22 rotated in a counter-clockwise direction through a small angle. At the completion of this movement the holding pawl 57 clicks over a tooth of the rack bar and upon return of the hand lever the rack bar and table will be held from retrograde movement. Thus by oscillating the hand lever the rack bar is moved rearwardly and the table is raised step-by-step. It will be observed that as the rack bar moves rearwardly, its pivot connection with main lever 22 moves along an arc centered at axis 23, that is, the movement of the rearward end of the rack bar has a vertical component which causes the bar to assume positions at various angles to a horizontal plane. When the table is in its lowest position, the rack bar, as shown in Figure 2, is inclined at a small angle to the horizontal. When the pivot connection is vertically below the fulcrum axis 23 the rack bar has its maximum inclination; and when the table is in fully raised position the rack bar is substantially horizontal, and extends only a fraction of an inch rearwardly of the roller 44 on the rack block. The trunnioned rack block freely permits the rack bar to assume any angular position within the range of its movement. It is to be noted that during the raising movement the cam lever 75 merely rests on the pins 54 and 60 of the driving and holding pawls without exerting any substantial pressure thereon, since the foot lever 79 is at this time in such position that spring 83 is not compressed against the upstanding arm of the cam lever 75.

The reverse operation, or the lowering of the load, is effected as follows:—The operator presses on the projection 82 of the foot lever causing rotation of the lever in a counter-clockwise direction and thereby drawing rod 78 forwardly, or to the left in Figure 2, thus compressing spring 83 against the upstanding arm of cam lever 75. The rotation of the foot lever is continued until the pivot connection of rod 78 therewith is brought slightly below the fulcrum of the lever, whereupon the parts will be yieldingly held in such position by the tendency of spring 83 to draw rod 78 to the right. There is thus applied to the cam lever a spring pressure tending to move the cam arm of the lever downwardly. If there is no load on the table this spring pressure is sufficient to overpower the springs 55 and 61 holding the driving and holding pawls engaged with the rack bar, and hence the rack bar will be released and the table will fall to its lowest position immediately upon application of pressure by spring 83. However, if the saddle is sustaining a load the spring pressed cam lever does not exert sufficient pressure to overcome the frictional resistance between

the pawls and the rack bar plus the strength of the springs 55 and 61, and under this condition the table can only be lowered with a step-by-step movement by oscillation of the handle. This step-by-step lowering movement is effected in the following manner:—Moving the hand lever to the left from the position shown in Figure 2 will cause the driving pawl 53 to move the rack bar a step forward and will bring pin 54 on this lever under a recess 85 formed on the under face of the cam lever, see particularly Figure 5. This movement of course takes the load off the holding pawl 57 and therefore permits the cam lever to throw out the holding pawl as soon as the pin 54 has been brought into the recess 85, as shown in dotted lines in Figure 5. The hand lever is now moved to the right, moving pawl 53 to the left and with it the rack bar, pawl 53 now sustaining the load. As pawl 53 moves to the left, pin 54 engages the inclined surface 86 of the cam lever and cams said lever upwardly, permitting the holding pawl 57 to be drawn by its spring into engagement with the rack bar and when the holding pawl has fully engaged the rack bar tooth and taken the load from the driving pawl the pin 54 on the latter will have passed on to the end surface 87 of the cam lever and the driving pawl will therefore be forced down out of engagement with the rack bar, the movement of the cam lever being stopped by its engagement with pin 60 of the holding pawl. This downward movement of the cam lever places the cam surfaces thereof engaged by the pin 54 of the driving pawl in such position as to cause this pawl to move over the rack tooth it had just previously engaged and to come into engagement with an adjacent tooth when the pawl is again moved rearwardly, or to the right. Thus the oscillation of the hand lever effects a step-by-step reverse movement of the rack bar and a corresponding lowering of the load.

What we claim is:

1. A jack comprising a frame, a lever fulcrumed on the frame, a lifting table supported by an arm of said lever, a rack bar pivoted to another arm of the lever, a support on which said bar is slidable, said support being pivoted to the frame to permit the bar to assume inclined positions, and pawls cooperating with the bar for actuating said bar step-by-step in either direction.

2. A jack comprising a frame, a lever fulcrumed on the frame, a lifting table supported by an arm of said lever, a rack bar pivoted to another arm of the lever, a support on which said bar is slidable, said support being pivoted to the frame on an axis substantially parallel to the fulcrum axis of said lever, and actuating means for the bar, said means including a pawl carried by said support said means cooperating to advance the bar to raise the table and cooperating to retract the bar to lower the table.

3. A jack comprising a wheeled frame, a lever fulcrumed on the frame, a lifting table supported by an arm of said lever, a rack bar pivoted to another arm of the lever, a support in which said rack bar is slidable, said support being pivoted to the frame on an axis substantially parallel to the fulcrum axis of said lever, a pawl lever engaging said rack bar pivoted to said support on an axis substantially coincident with the pivot axis of said support, a hand lever fulcrumed to the frame, and a link connecting the hand lever to the pawl lever.

4. A jack comprising an elongated wheeled frame, a lever fulcrumed to the frame on a transverse axis, a lifting table supported by an arm of said lever, a rack bar pivoted to another arm of the lever and extending centrally of the frame, a support in which bar is slidably mounted, said support being trunnioned to the frame on an axis substantially parallel with the fulcrum axis of said lever, pawl and ratchet mechanism carried by said support and a hand lever fulcrumed to the frame and connected to said mechanism.

5. A jack comprising an elongated wheeled frame comprising spaced parallel side bars having transversely alined projections rising from their upper sides adjacent the forward ends thereof, a lever comprising triangular side members fulcrumed adjacent their apexes to said projections, a lifting table having trunnions supported in the forward ends of said lever members, a pin connecting the rear ends of said lever members, a bar pivoted to said pin, and means for moving said bar longitudinally to raise and lower said table.

6. A jack comprising an elongated wheeled frame including spaced parallel side bars having transversely alined projections rising from their upper sides adjacent the forward ends thereof, a lever comprising transversely spaced triangular members fulcrumed adjacent their apexes to said projections, a lifting table having trunnions supported in the forward ends of said triangular members, a pin connecting the rear ends of said members, a bar pivoted on said pin and extending centrally between said side bars, a support in which said bar is slidably mounted, said support having trunnions supported in said side bars, operating mechanism for said bar mounted on said support, and a hand lever connected to said mechanism and fulcrumed to said side bars adjacent the rear ends thereof.

7. A jack comprising an elongated wheeled frame including spaced parallel bars having transversely alined projections rising from their upper sides adjacent the forward ends thereof, a lever composed of spaced triangular members fulcrumed adjacent their apexes to said projections, means for rigidly securing said members together, a lifting table having trunnions supported in the forward ends of said members, a pair of links pivoted at one end to said projections and at their other ends to depending forwardly extending portions of said table to obtain parallel movement of the table, a pin connecting the rear ends of said triangular members, a bar pivoted to said pin, and means for actuating said bar to raise and lower the table.

8. A jack comprising a frame, a lever fulcrumed on the frame, a lifting table supported by an arm of said lever, a rack bar pivoted to another arm of the lever, means for slidably supporting said bar comprising two transversely spaced similar members having coaxial trunnions pivoted to said frame and having inwardly extending ledges on which said rack bar rests, transverse pins secured in the front and rear upper corners of said members and carrying rollers engaging the top side of said bar, a bifurcated pawl lever straddling said bar and pivotally supported by said members on an axis substantially coincident with the trunnion axis thereof, a driving pawl pivoted in the bifurcated lower end of said pawl lever, a holding pawl pivoted to one of said members, springs urging said pawls upwardly into engagement with rack teeth on the lower side of said bar, a hand lever fulcrumed to the frame and a link connecting said hand lever to said pawl lever.

9. A jack comprising a frame, a lever fulcrumed to the frame, a lifting table supported by an arm of said lever, a rack bar pivoted to another arm of the lever, means for slidably supporting said bar comprising two transversely spaced similar members having coaxial trunnions pivoted to said frame and having inwardly extending upper and lower guides engaging the upper and lower sides of said rack bar, a bifurcated pawl lever straddling said bar and pivoted to said members, a driving pawl pivoted in the bifurcated lower end of said pawl lever and positioned to engage rack teeth on the lower side of said rack bar, a hand lever fulcrumed to the frame and a link connecting said hand lever to the upper end of said pawl lever.

10. The combination in a jack having a lifting table supporting lever at one end and a rack operably connected therewith and extending beyond the other end, of a driving pawl and a holding pawl at said other end engaging teeth of said rack, springs urging said pawls into engagement with said teeth, each of said pawls having a laterally projecting pin, a lever having a cam arm overlying said pins, and means for applying a spring pressure to said lever to cause said cam arm to press against said pins and move said pawls out of engagement with said rack, said spring pressure being insufficient to move either pawl when it is holding the rack against a load on the table but being sufficient to throw out the pawls when there is no load, said cam lever being so formed that when the table is loaded, operation of the driving pawl in a direction to raise the table and release the load on the holding pawl will permit said cam lever to throw out the holding pawl, whereupon reverse operation of the driving pawl will permit lowering movement of the rack and will move the cam lever out of engagement with the holding pawl to permit the latter to engage the rack and relieve the driving pawl of the load, the driving pawl being thereupon thrown out of engagement with the rack by the cam lever.

11. The combination in a jack having a lifting table adjacent one end, a lifting lever for raising and lowering said table and a rack operably connected to said lever and extending beyond the other end, of driving and holding pawls at said other end spring pressed into engagement with said rack, a lever having a cam arm adapted to engage said pawls, and means for applying spring pressure to said lever to cause said cam arm to press on said pawls and throw them out of engagement with the rack, said pressure being insufficient to move either pawl when it is holding the rack against a load on the table but being sufficient to throw out the pawls when the table is unloaded, said cam lever being so formed that when said spring pressure is applied thereto and the table is sustaining a load in raised position, operation of the driving pawl in a direction to raise the table and release the load on the holding pawl will permit said cam lever to throw out the holding pawl, whereupon reverse operation of the driving pawl will cause a corresponding lowering movement of the rack and simultaneously move said cam lever out of engagement with said holding pawl permitting the latter to reengage the rack and relieve the driving pawl of the load, said cam arm thereupon throwing the driving pawl out of engagement with the rack.

12. The combination in a jack having a wheeled frame and a lifting table at one end of the frame and a rack adjacent the other end, said rack being operably connected to raise and to lower said table, of driving and holding pawls positioned to engage said rack, a lever having a cam arm adapted to engage said pawls, and means for applying spring pressure to said lever to cause said cam arm to press on said pawls and throw them out of engagement with the rack, said pressure being insufficient to move either pawl when it is holding the rack against a load on the table, but being sufficient to throw out the pawls when the table is unloaded, said cam arm being so shaped that when spring pressure is applied to said lever and the table is loaded, the holding pawl will be thrown out of engagement with the rack bar when the driving pawl approaches the limit of its table raising movement and will be permitted to reengage the rack bar at an intermediate point in the reverse movement of the driving pawl and the driving pawl will be thrown out of engagement at the end of said reverse movement.

13. A jack comprising a frame, a lifting table mounted for parallel vertical movement adjacent one end of the frame, a rack bar extending beyond the other end of the frame and operably connected to said table, driving and holding pawls for actuating said rack bar, a hand lever fulcrumed adjacent said other end of the frame and adjustably linked to said driving pawl, a lever having cam surfaces engaging said driving and holding pawls, a foot lever fulcrumed to the frame adjacent said hand lever, and spring means connecting said foot and cam levers, whereby when the foot lever is operated in one direction the cam lever will bear on said pawls with a predetermined yielding pressure, which pressure is sufficient to disengage said pawls from said rack bar if there is no load on the table but insufficient to disengage either pawl if it is holding the rack bar against a load on the table, said cam surfaces being adapted to disengage the pawls successively on oscillation of the driving pawl when the table is loaded, to effect retrograde, or table lowering movement of the rack bar.

14. In a jack, a pair of parallel side members, a wheel supporting axle connecting the members at one end, a shaft connecting the members at the other end, brackets rising from the side members, a pair of bell crank rocking levers pivoted in the brackets, a load support connecting the free ends of the lever at one side, a raising bar mounted for rocking movement between the side members and pivotally connected to the other free ends of the rocking lever, a jack handle pivoted on said shaft, means operated by said handle for moving the raising bar in one direction to rock the levers to raise the load, and reversing means for effecting a step-by-step lowering of the load by oscillation of the handle about the shaft.

15. In a jack of the type in which the load support is pivoted to a rocking lever, a substantially horizontal rack bar connected to operate the lever, a pluraliy of spring held pawls each engaging the rack to prevent reverse movement of the rack bar while permitting quick advance movement of the rack bar to bring the load support into contact with the load, means for rocking one pawl to advance the rack bar to position to be held by the other pawl, and means for holding said last mentioned pawl against the urge of its spring so the load may be taken by the first mentioned pawl for lowering movement said means being effective to move both

pawls simultaneously only when no load is on the support.

16. In a jack, a rack bar, an inverted horizontal holding pawl on a stationary axis below said bar, a rocker having a bifurcated lower end forking said bar and extending below the same, a pawl pivoted in the lower end of the rocker, means for resiliently holding the pawls in contact with the teeth of the rack to permit advance movement of the rack while preventing reverse movement, means for rocking the rocker to advance the rack bar by the rocker pawl to position when the holding pawl will engage the next tooth, and spring pressed means to hold the holding pawl out of rack bar engaging position when the load is taken by the rocker pawl so the rack bar may be retracted step-by-step when loaded, and for holding both pawls out of rack bar engaging position when not loaded, whereby when the rack bar is operatively connected to a lever supported load engaging member or saddle, the saddle may be brought quickly into position, the load raised and lowered slowly, and the saddle will drop to lowest position when entirely freed of the load.

17. A jack comprising an elongated wheeled frame, a lifting table mounted for parallel vertical movement adjacent the forward end of the frame, a lever having a forwardly extending arm supporting said table and having a downwardly extending arm, a rack bar pivoted to said downwardly extending arm, a support slidably supporting said rack bar and pivoted to said frame on an axis substantially parallel to the fulcrum axis of said lever, a driving pawl lever pivoted to said support and carrying a spring pressed pivoted pawl engaging said rack bar, a spring pressed holding pawl pivoted to said support, a hand lever fulcrumed to the frame and connected to said driving pawl lever, a lever having cam surfaces engaging said driving and holding pawls, a foot lever fulcrumed to the frame adjacent said hand lever, and spring means connecting said cam and foot levers, whereby when the foot lever is operated in one direction the cam lever will bear on said pawls with a predetermined yielding pressure, which pressure is insufficient to disengage said pawls if there is no load on the table but insufficient to disengage either pawl if it is holding the rack bar against a load on the table, said cam surfaces being adapted to disengage said pawls successively on oscillation of the driving pawl, when the table is loaded, to effect lowering movement of the rack bar.

18. In a jack, a toothed member having downwardly extending teeth, a holding pawl on a stationary axis, a rocker, a pawl pivoted to the rocker, means for resiliently holding the pawls upward into engagement with said teeth to permit advance movement of the member while preventing reverse movement thereof, means for rocking the rocker to advance the member by the rocker pawl to position when the holding pawl will engage the next tooth, a horizontal cam arm, and spring pressed means adapted to urge said cam into engagement with said pawls to hold the holding pawl out of tooth engaging position when the load is taken by the rocker pawl so the toothed member may be retracted step by step when loaded, and for holding both pawls out of tooth engaging position when unloaded, whereby when the toothed member is operatively connected to a load supporting member or saddle, the saddle may be brought quickly into position by manually shifting said toothed member, the load raised and lowered slowly, and the saddle will drop to lowest position when entirely freed of the load.

EARL F. GREEN.
FRANK A. GRAHAM.