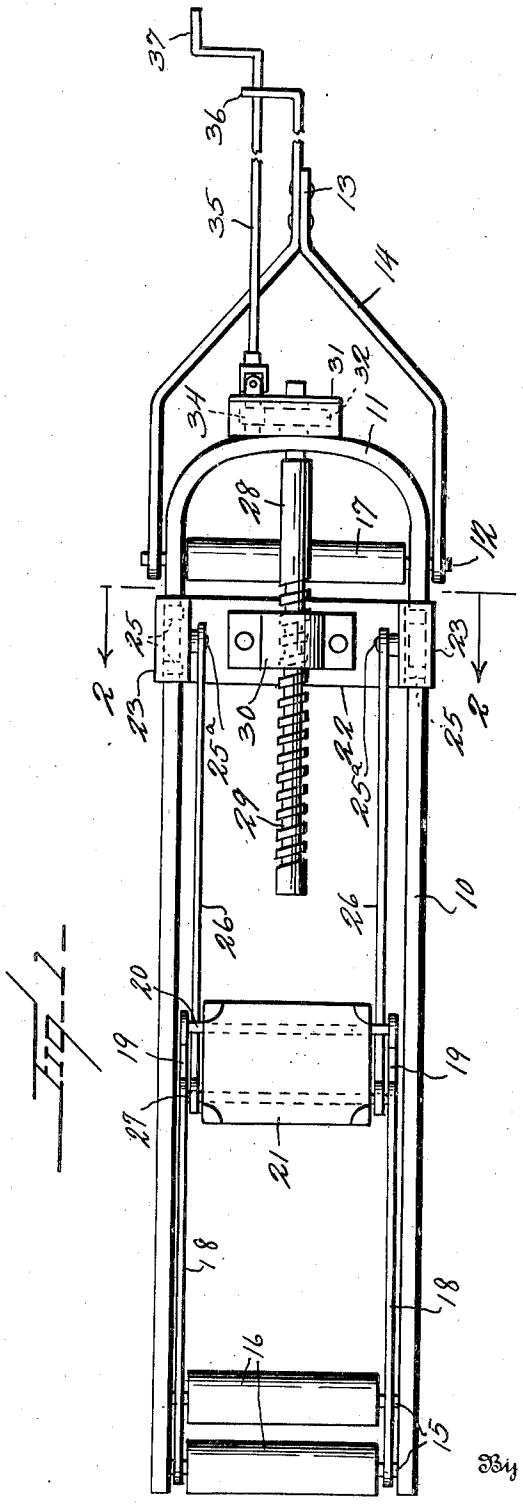
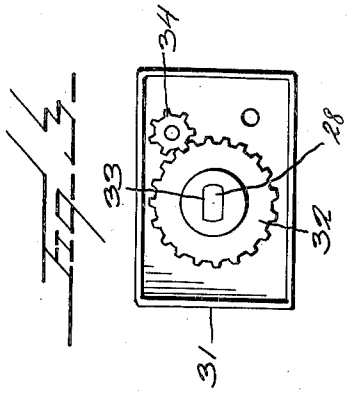
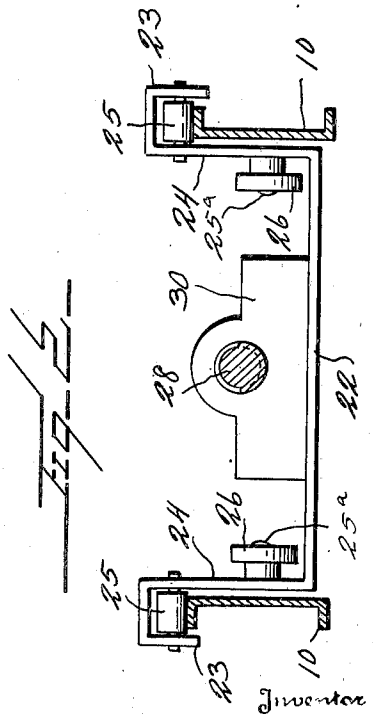
Feb. 21, 1939. E. E. GOTTMAN 2,147,837

AUTOMOBILE JACK

Filed April 22, 1937 3 Sheets-Sheet 1







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Feb. 21, 1939. E. E. GOTTMAN 2,147,837

AUTOMOBILE JACK

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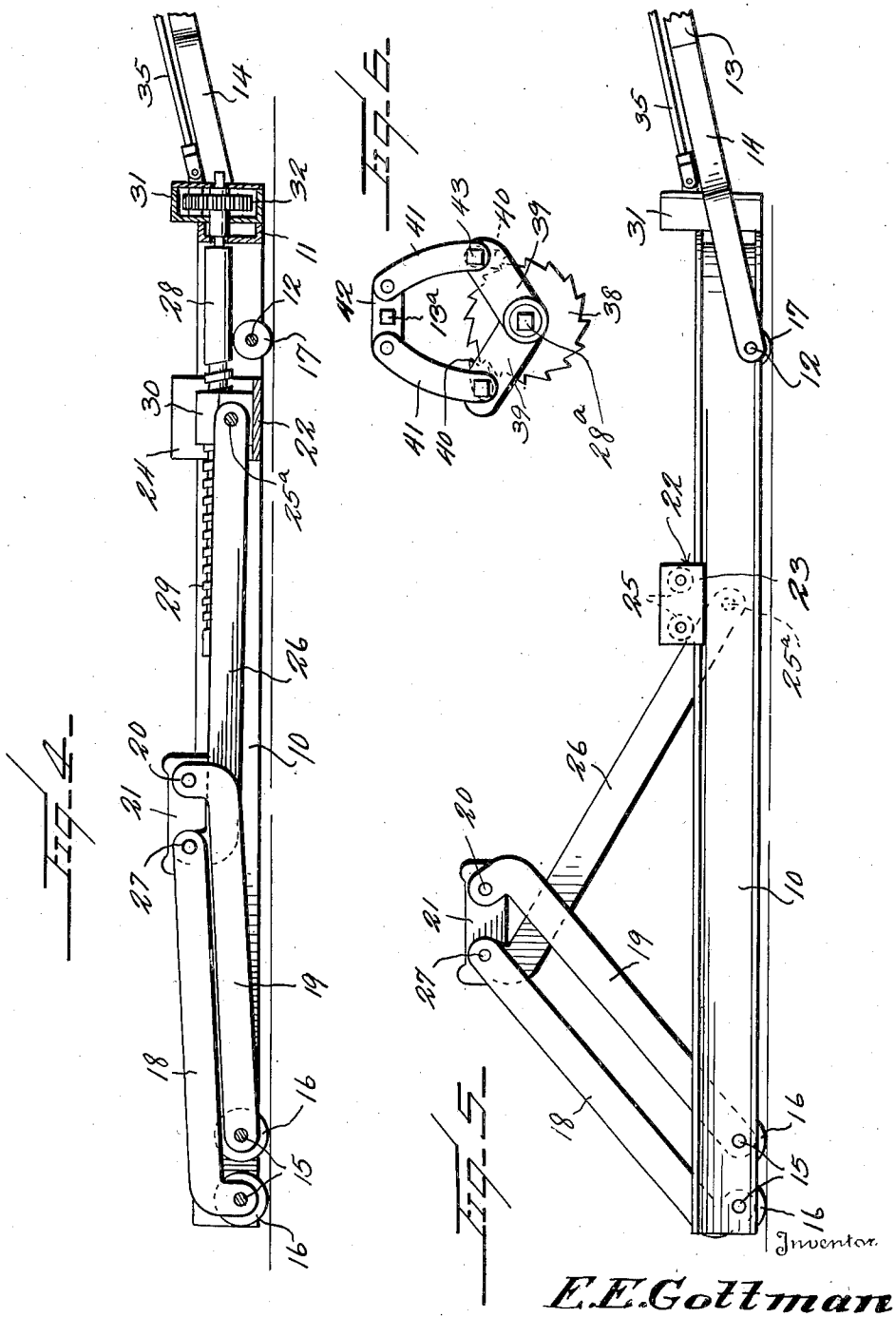

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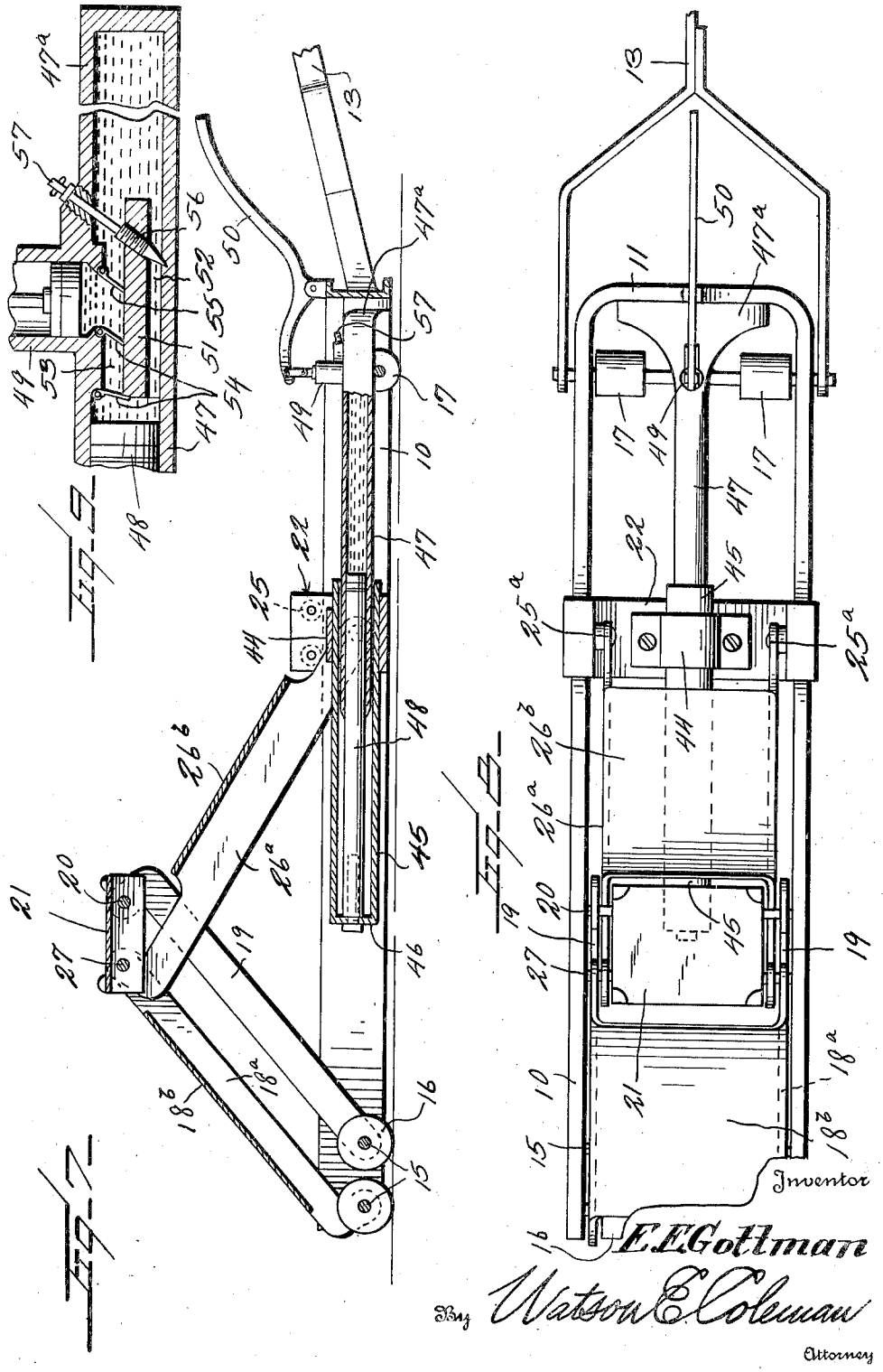
AUTOMOBILE JACK

Filed April 22, 1937 3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,147,837

AUTOMOBILE JACK

Edwin E. Gottman, San Diego, Calif.

Application April 22, 1937, Serial No. 138,421

4 Claims. (Cl. 254—9)

This invention relates to jacks and particularly to jacks designed for the purpose of lifting automobiles or other heavy objects.

The general object of the invention is to provide a jack which is so constructed that the saddle of the jack can be lowered to as low as 3" from the ground and lifted as high as 17" or more.

Another object is to provide a jack which is much more efficient than the average jack and which will secure about five times as much power as the average jack used in garages, in proportion to the power put into it.

A further object is to provide a lifting device or jack of this character which may be operated either manually, mechanically or hydraulically.

Still another object is to provide a jack of this character in which toggle links are used for the purpose of lifting the saddle so as to secure great leverage and lifting power.

A still further object is to provide a jack of this character in which the saddle will always be held in a horizontal position by parallel motion toggle levers.

Other objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawings wherein:

Figure 1 is a top plan view of a jack constructed in accordance with my invention.

Figure 2 is a transverse section on the line 2—2 of Figure 1.

Figure 3 is an end elevation of the gear case with the cover removed.

Figure 4 is a longitudinal sectional view through the base with the saddle lowered.

Figure 5 is a side elevation showing the saddle in its raised position.

Figure 6 is an elevation of a ratchet mechanism whereby the screw shaft may be rotated, the handle being shown in section.

Figure 7 is a longitudinal sectional view through an hydraulically operated jack constructed in accordance with my invention.

Figure 8 is a top plan view thereof.

Figure 9 is an enlarged longitudinal sectional view through the rear end of the cylinder and its conjoined reservoir and the pump.

Referring particularly to Figures 1 to 5, 10 designates two opposed channel irons constituting the base of the jack. These channel irons are held in spaced relation to each other by any suitable means and are shown as connected to each other by an integral cross-bar 11. Pivoted at 12 to the forward end of the frame formed of the connected members 10 is a handle 13 which is bifurcated or forked at its rear end, as at 14, to embrace the forward end of the frame and be pivoted thereto by the pivots 12, as before stated.

Extending through the rear end of the frame are the fixed shafts or pivots 15 which carry thereon the rollers 16 providing means whereby the frame may be readily rolled into position beneath the car. These rollers, it will be noted, are disposed between the channel irons 12 and are wide so as to secure a large area of tread surface bearing against the floor. The pivot 12 is also in the form of a shaft extending entirely through the frame and supporting the forward roller 17. Pivoted to the shafts 15 are the two upwardly extending rear, parallel toggle links or levers 18 and pivotally connected to the shaft or rod of the forward roller 16 is a like pair of levers or links 19. These links 19 at their forward ends are upwardly turned and pivotally connected at 20 to a saddle 21. The links or levers 18 are also pivotally connected to the rear end of this saddle, as will be later described. Inasmuch as the lower ends of links 18 are turned downward, these links may be disposed in the same plane as the links 19 so that when the links 18 and 19 are folded downward in the position shown in Fig. 4, the links 18 will lie immediately above and in the same plane as the links 19.

Slidably mounted upon the frame bars 10 is a transversely extending carriage 22 which extends between the frame bars, then extends upward at each end, then outward and then downward at 23. Mounted between these two opposed walls 23 and 24 are rollers 25, there being two of these rollers on each side of the carriage. Thus the carriage is slidably mounted upon the upper faces of the frame bars 10. Pivoted to this carriage as, for instance, by a pair of pins, trunnions or bolts 25a are a pair of upwardly and rearwardly extending toggle links 26. These at their rear ends are upwardly turned like the links 19 and are pivotally connected to the forward ends of the links 18 and to the saddle 21 by pivot pins or a transverse shaft designated 27. It will be seen that as the carriage is moved rearward, that is, toward the rollers 16, the toggle links will lift the saddle and as the carriage is moved forward, the saddle will be lowered. It is particularly important that the levers or links 19 and 26 shall be upwardly turned at their adjoining ends as this permits the saddle to be brought lower than would otherwise be possible and allows the saddle to be made shorter. Furthermore, it gives more lifting power at the

lowest position of the saddle as the links 18, 19 and 26, when lowered, are never on a dead center. The combination of links 18, 19 and 26 holds the saddle always in a truly horizontal position at any height to which the saddle may be lifted. The links 26, in my construction, are disposed so closely to the plane of the links 19 and 18 as to be practically in the same plane.

Extending through the cross-bar 11 which connects the forward ends of the two channel irons 10 is the shank 28 of a screw 29, this screw having threaded engagement with the saddle, the saddle carrying a fixed nut 30 illustrated as being bolted or otherwise attached to the horizontal portion of the carriage. Mounted upon the forward end of the frame composed of the members 10 is a gear case 31 bolted or otherwise attached to the frame, and within this gear case is a gear wheel 32 having a rectangular slot or opening 33 through the center thereof. This gear wheel 32 is rotatably mounted within the gear case 31 and obviously as the gear is rotated, the screw will be turned in one direction or the other and shift the carriage in one direction or the other. Also mounted within the gear case is a pinion 34 less in diameter than the gear wheel 32, and this pinion may be connected to any suitable driving means. I do not wish to be limited to this particular driving means as illustrated in Figure 1 but I have illustrated for this purpose a shaft 35 mounted at its forward end in an angular portion 36 of the handle 13, this shaft at this end being provided with a crank 37. The rear end of this shaft is connected by a swivel or like member 37 to the shaft of the gear wheel 34. It will be obvious now that as the shaft 35 is rotated, the screw 29 will be rotated and will force the carriage forward or rearward and that as the carriage is forced rearward, it will shift the toggle links into a more and more convergent position and thus lift the saddle higher and higher. The reverse motion of the shaft 35 will, of course, lower the carriage in an obvious manner. Inasmuch as the operating means of the carriage is a screw engaging with a nut, it will be obvious that the toggle links will be held in any raised position as the nut cannot move rearward on the screw.

It will also be obvious that I may use a plurality of gears between the pinion 34 and the gear 32, shown in Figure 3, to thus secure increased power. While I have illustrated in Figures 1 to 5 the shaft 35 as being connected to the screw through the gearing described, I obviously do not wish to be limited to this, as other means might be used for this purpose, thus in Figure 6, I illustrate the forward end of the screw shaft or shank 28 as carrying a ratchet wheel 38 and oscillatably mounted upon the screw shaft are the links 39 extending divergently in opposite directions and carrying upon them the pawls 40 which are resiliently urged toward the ratchet wheel. The outer ends of the links 39 are connected by links 41 to a cross-head 42 formed upon, carried by or detachably engaged with a jack handle 13a. The pawls may be carried by the square-headed pivot bolts 43 so that when they are turned in one direction, the pawls will be carried out of engagement with the ratchet wheels 38. When the jack handle 13a is pumped up and down, this ratchet action will turn the screw on both the up and down movements of the handle 13a and this construction permits either a long or a short stroke to be taken on the handle and gives very great power. When it is desired to lower the saddle, an axially rotative wrench may be applied to the square head 28a of the shank 28 and the screw turned in a reverse direction to lower the saddle, the pawls, of course, being turned outward away from the ratchet and into an inoperative position. The jack handle 13a may be formed with a socket at its forward end for the purpose of engaging either with a lug on the cross bar 42 or with the square-headed bolts 42a, so that such a socketed handle may be used for turning the pawls out away from the ratchet 38 and rotating the square end 28a of the shank 28 to lower the saddle.

In Figures 7 and 8, I have illustrated the application of hydraulic means to a jack constructed in accordance with my invention. In these figures, 10 designates as before, the U-shaped channel iron base frame of the jack and 21 the saddle thereof. The pivot pins or roller trunnions 15 support the rollers 16 and the pair of links 18 which are pivoted at 20 to the saddle. The links 18a are substantially as previously disclosed, but these links are shown as connected by a web 18b. The two connected links 18a are pivoted at their upper ends to the saddle at 27 and at their lower ends are pivoted to the base by the pins 15 carrying the rear rollers 16. The carriage 22 has the same general construction as previously described and pivoted thereto at 25a are the links 26a which are the same as links 26 in Figures 4 and 5, except that they are connected by an integral web 26b. Connecting the pairs of links 18a and 26a by these webs makes the structure stronger and more rigid.

Clamped upon the saddle by a band 44 is a cylindrical yoke 45 closed at one end 46. The yoke 45 telescopes over a cylinder 47 and operating in this cylinder is a plunger 48 rigidly engaged with the closed end of the yoke 45. The forward end of the cylinder 47 is laterally enlarged and abutted against a cross-piece 11 of the base frame, thus giving a substantial bearing against the end frame.

Connected to the interior of cylinder 47 is a pump 49, the piston of which is connected to a handle 50, though it is to be understood that the piston might be operated by a motor. I have not illustrated the pump in detail as the mechanism of the pump may be of any ordinary or suitable character. The liquid for the pump is taken from a reservoir 47a formed by laterally enlarging the cylinder 47 at its rear end. This liquid is discharged back into this reservoir when the saddle is to be lowered by opening the relief valve. This particular construction will be later described.

It will be seen that in the construction which I have described, I secure great power and that because of the angular formation of the ends of the links 19 and 26, I can lower the saddle to a position a very short distance from the floor and can raise it to a relatively high position. In actual practice, the saddle will lower to a distance of about 3" from the floor and raise to a distance of 17". Obviously the screw-threaded shaft 29 may be continued beyond the position shown in Figures 1 and 2, and thus secure an even greater movement for the carriage formed by the parts 22 and 23.

It will be noted that the toggle links 18 and 19 are both mounted in approximately the same plane and that the planes of links 26 are so closely adjacent as to be in nearly the same plane so that when the saddle is lowered, the links 18 and 19 lie one on top of the other. By having the toggle links all practically in a single plane and

without lateral deflection, the frame of the jack may be made narrower than otherwise and the saddle will extend over even with the side of the frame. Disposing the rollers of the jack between the two lateral rails, that is, entirely inside of the frame, permits the use of the jack on knee-action cars where no other jack can conveniently be used. By turning up the ends of the toggle links 19 and 26, these toggle links even in their lowest position cannot get closer than 2" to their dead centers. Furthermore, these turned up ends secure a better application of power in every position of the carriage.

It will be seen that I utilize a plurality of mechanical forces in this jack. I utilize the power of the screw, the power of the gears 32 and 34, and the very powerful action of toggle links. By reason of the rollers 17 and 16, the base can be readily shifted beneath the car or drawn out therefrom and transported from place to place. It will be seen that the manually operable shaft 35 may be raised or lowered with the handle 13 into any convenient position for operation.

I am aware that the application of the toggle principle to jacks is not new and that this toggle principle is embodied in what is known as the "scissors" jack. In this jack, however, there is an upper pair and a lower pair of toggle links, the lower ends of the lower pair being pivoted to a base and the upper ends of the upper pair being pivoted to the saddle. The adjacent ends of the two pairs of links are pivoted to each other and operatively engaged by a screw which, when turned in one direction, raises the saddle, and in the other direction lowers the saddle. Power is applied in a longitudinal direction by the screw. One half of the applied power goes to each set of toggle levers. This secures a relatively rapid lift of the saddle in a purely vertical plane. In my jack, as is shown by a comparison of Figures 4 and 5, the saddle rises in an angular direction, that is, it moves upward and toward the rollers 16. This jack, therefore, operates on a wedging principle and the distance which the saddle moves in a longitudinal direction is always greater than the distance moved in a vertical direction. Thus, for example, if the carriage 22 moves 17" toward the rollers 16, the saddle will move upward 12", or in other words, the distance that the carriage travels is always one and one-half times more than the distance that the saddle is elevated. Thus the jack will lift approximately 75% more weight on the saddle than the power applied to the carriage. Of course, conversely the rate of lift of the saddle will be one and one-half times slower than the rate of movement of the carriage. However, my aim is to secure power rather than speed.

Inasmuch as the saddle moves horizontally simultaneously with its vertical movement, either the car must move longitudinally as the rear or front of the car is elevated or the base must move longitudinally. This is permitted by the rollers 16 and 17. These rollers permit the base of the jack to shift outward, assuming, for instance, that the front end of the car is being raised with the rear end having its brake set or with the car blocked. Thus the body of the jack rolls out and away from the center of the car as the car is raised. In other forms of garage jacks having lifting arms, the jack rolls or pulls beneath the car as the saddle is raised and in some cases, the base of the jack moves so far beneath the car that there is not clearance enough to operate the handle or crank of the jack.

In Figure 9, I have shown somewhat in detail the means whereby the pump 49 is connected to the reservoir 47a formed at the rear end of the cylinder 47. The cylinder 47 just forward of the reservoir portion 47a has a transversely extending web 51 which defines a passage 52. Immediately in advance of the pump 49, the passage 53 formed above the wall 51 is provided with the check valves 54. Two of these check valves are shown both opening in the same direction, that is, toward the piston 48. Just rearward of the pump there is provided the check valve 55 which also opens toward the forward end of cylinder 47. Controlling flow through the passage 52 is a valve 56 which is manually shiftable either to permit flow of liquid through the passage 52 or to prevent said flow. This valve has a screw-threaded portion which engages the web 51 and has a shank extending out through the upper wall of the reservoir 47a and is there provided with a handle 57. With this construction, assuming that the valve 56 is closed, then as the pump is operated, liquid will be drawn in upon the upstroke of the piston from the reservoir 47 through the valve 55 and into the space beneath the piston. Upon downward movement of the piston, this liquid will be ejected past the check valves 54 and so into the cylinder 47. Thus the liquid will be drawn from the reservoir 47a and forced into the cylinder 47 as the pump is reciprocated, thus lifting the saddle in an obvious manner. When it is desired to lower the saddle, the relief valve 56 is opened by turning the handle 57 and then the liquid within the cylinder 47 may return through the passage 52 into the reservoir 47a, the weight of the load on the saddle 21 acting to force the piston 48 rearwardly and force the liquid through this opening 52 into the reservoir 47a. This passage 52 may be made sufficiently small so as to prevent any sudden descent of the saddle 21 but permit only a gradual descent thereof. This may also be controlled by controlling the valve 56 so as to permit a greater or less flow of liquid into the reservoir 47a.

While I have illustrated a construction in which the shaft 35 is operated manually and the pump in Figure 7 operated manually, it is to be understood that power, as for instance, the power of a motor, may be applied to rotate the shaft 35 or operate the pump without departing from the spirit of the invention as defined in the appended claims.

It will likewise be obvious that many modifications might be made in the details of construction and arrangement of parts without departing from the spirit of the claims as appended.

What is claimed is:

1. A jack including a base formed by two longitudinally extending frame members constituting rails and connected at their forward ends, a saddle, a pair of toggle links pivotally connected to one end of the base and pivotally connected with the adjacent end of the saddle, a second pair of toggle links pivotally engaged with the base extending in parallel relation to the first named toggle links and pivotally engaged with the forward end of the saddle, a carriage disposed between the rails formed by said frame members and comprising a sheet of metal extending across the space between the rails, then extending upward, outward and downward to arch over the rails and rollers mounted upon the carriage and bearing against the upper faces of the rails, toggle links pivotally mounted upon the carriage and extending upward and rearward and

pivotally connected to the saddle at the same point of pivotal connection as the first named pair of toggle links, a fixed nut carried upon the carriage, a screw mounted upon the frame members and having threaded engagement with the fixed nut, a handle pivotally connected to the forward end of the frame, intermeshing reducing gears mounted upon the forward end of the frame, one of said gears engaging the screw to rotate it, and a longitudinally extending shaft carried by the handle and having a universal joint connection with another of said gears.

2. A jack of the character described, including an approximately U-shaped frame, the side members of the frame constituting rails, two pairs of rollers supporting the rear end of the frame, disposed between the rails and having axles extending through said rails, a roller supporting the forward end of the frame, disposed between the rails and having an axle extending through said frame, a pair of toggle links pivotally mounted upon the axles of the rearmost roller, a parallel pair of toggle links disposed in the same plane pivotally mounted upon the axle of the next adjacent roller, a saddle, the first named pair of toggle links being pivotally connected to the saddle at its adjacent end, the second named pair of toggle links extending forward and having their forward ends angularly extended upward and pivotally connected to the forward end of the saddle, a carriage disposed between the rails of the frame and having portions extending upward and over and then downward to embrace said rails, rollers mounted in the last named portions of the carriage and bearing against the upper surfaces of the rails, toggle links disposed in a plane closely adjacent to the plane of the first named links pivotally mounted upon the carriage and extending rearward and having their free ends angularly bent upward and pivoted to the rear end of the saddle, and manually operable means whereby the carriage may be shifted toward or from the rear end of the frame to thus raise or lower the saddle.

3. A jack, including a base comprising two parallel rails, a saddle, toggle links pivoted to the base inside said rails and pivoted to the saddle, a second set of toggle links pivoted to the saddle and convergently related to the first set and disposed approximately in line therewith, a carriage slidingly mounted on said rails and to which the last-named toggle links are pivotally connected, rollers disposed between the parallel rails at opposite ends thereof, each roller having a length equal to the distance between said rails, and means carried on the rails engaging the carriage and constructed and arranged to shift the carriage longitudinally on the rails toward or from the pivot of the first-named toggle links.

4. A jack, comprising a base formed of two parallel rails, a saddle, a pair of rear toggle links pivoted to the inside faces of said rails and pivotally connected with the adjacent portion of the saddle, a second pair of toggle links disposed in the same plane as the first pair and pivoted to the saddle, a carriage to which the lower ends of the last-named pair of toggle links are pivoted, the carriage having a medial depressed portion and end portions extending upward and then laterally outward and over said rails and having rollers bearing on the rails, and means carried on the base engaging the carriage and constructed and arranged to shift the carriage longitudinally on the base toward or from the pivots of the first-named toggle links.

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