

April 15, 1941.

H. J. TROCHE

2,238,665

UTILITY VEHICLE

Filed Nov. 22, 1939

3 Sheets-Sheet 1

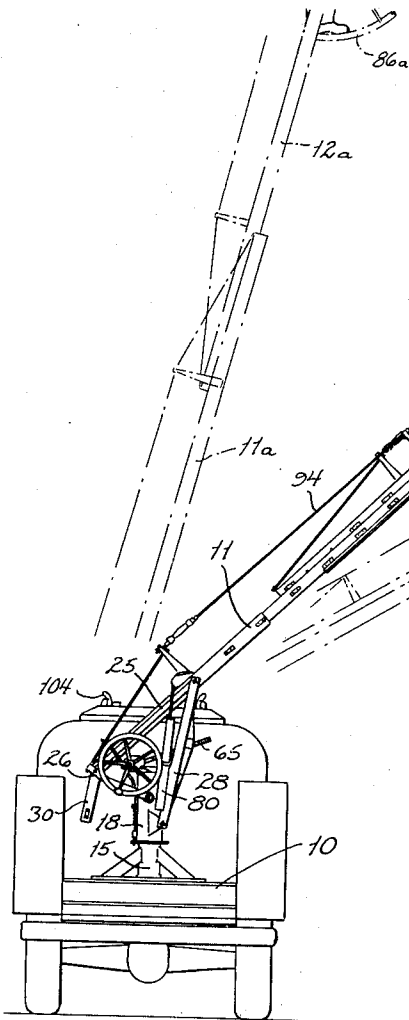


Fig. 1

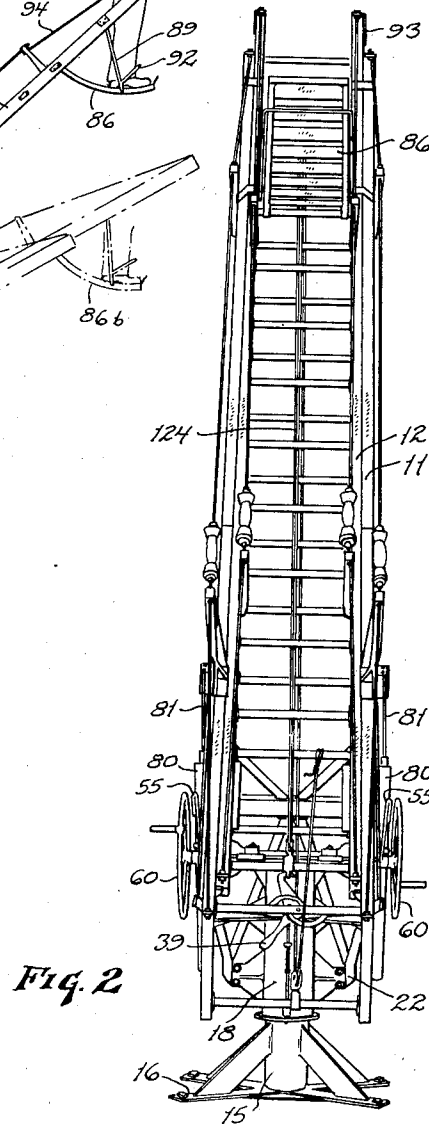


Fig. 2

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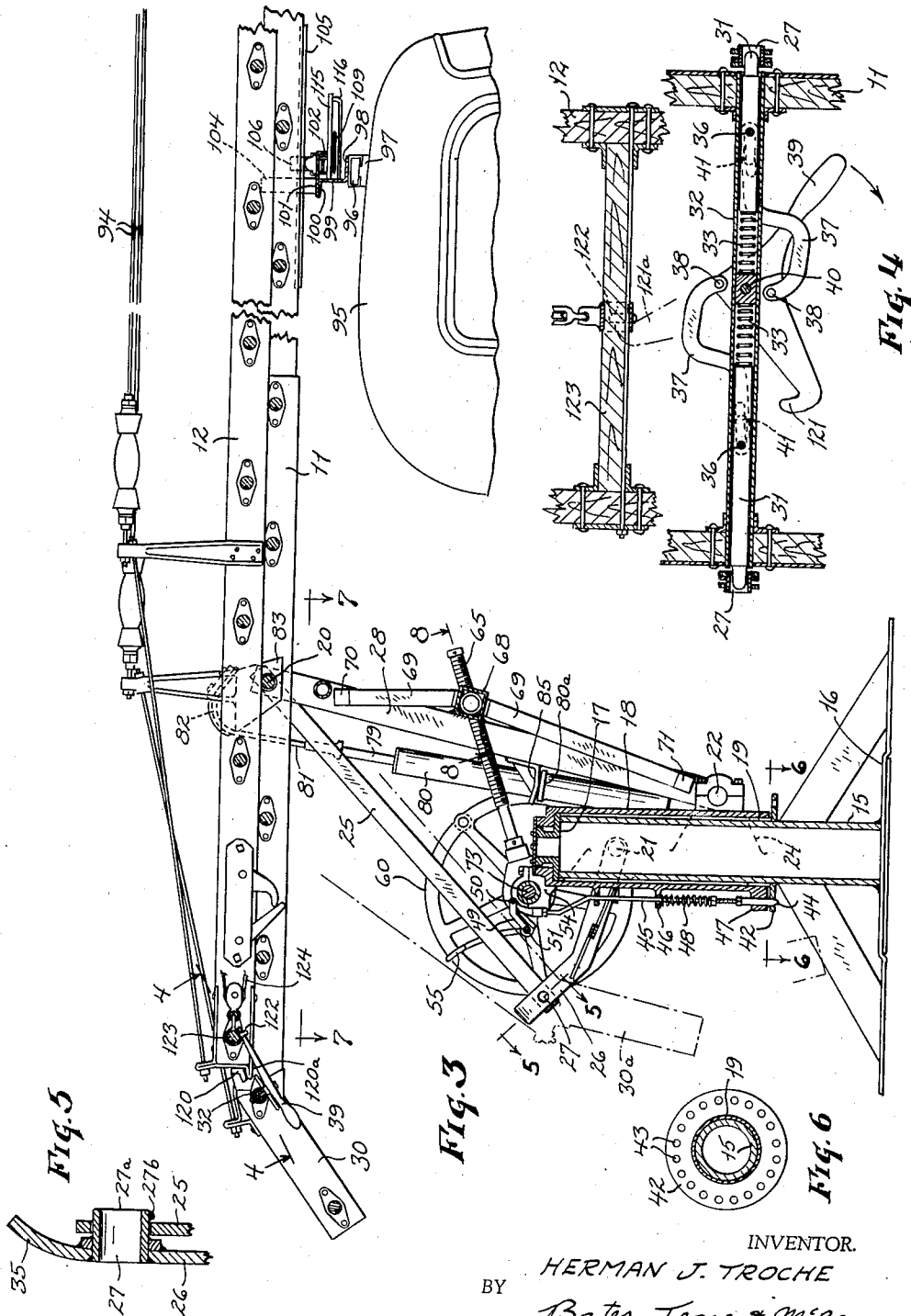
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3 Sheets-Sheet 3

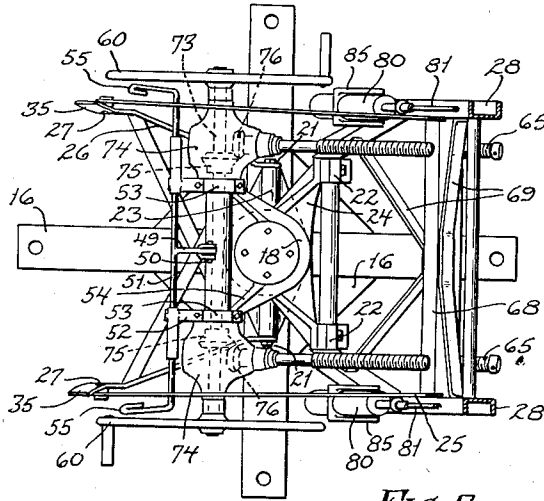


Fig. 7

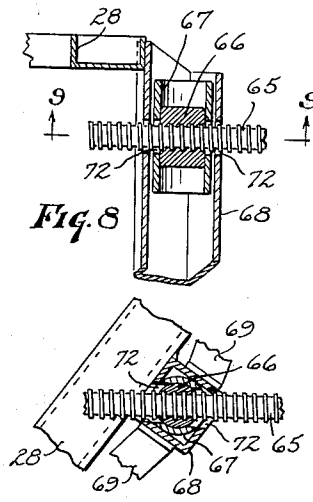


Fig. 8

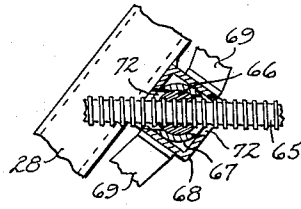


Fig. 9

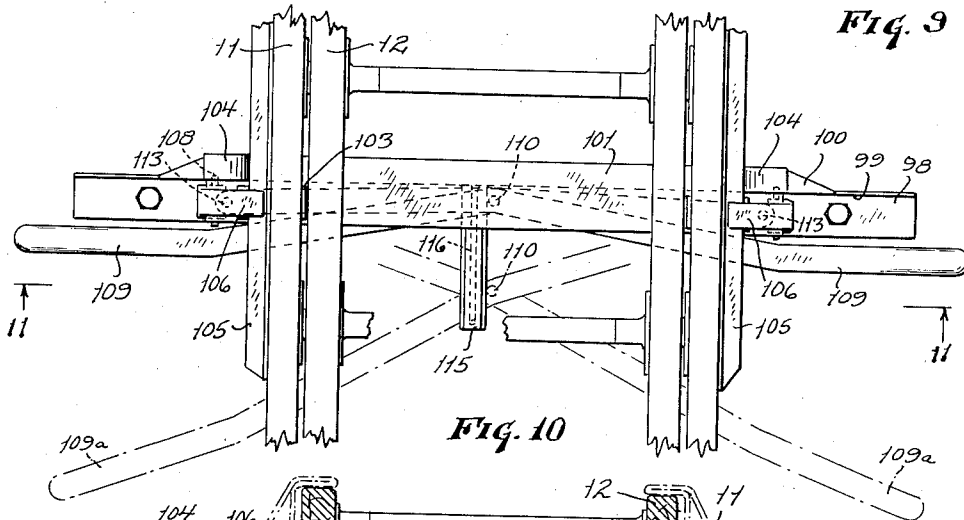


Fig. 10

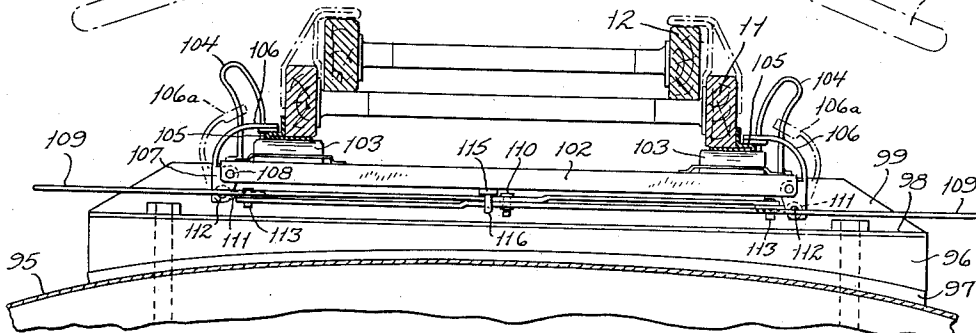


Fig. 11

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2,238,665

UTILITY VEHICLE

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Application November 22, 1939, Serial No. 305,664

10 Claims. (Cl. 228—13)

This invention relates to a utility vehicle having a ladder thereon that is swingable and tiltable with reference to the vehicle for obtaining access to overhead traffic lights, street lamps, and the like. The invention finds particular application in cities where traffic is heavy, and where provision must be made for reaching an overhead location speedily without interfering with the normal operation of traffic, and without interference from cars which may be parked beside the signal to be attended.

One of the difficulties in mounting a ladder upon a truck has been to make it long enough to reach the desired objectives within the limited space of a vehicle and yet light enough to be operated by only one man. An additional difficulty has been the fact that after a ladder has been once adjusted for direction and height, the operator could not move around upon it to different locations without endangering his safety.

The present invention has for one of its objects, an arrangement which permits one man to swing and tilt the ladder quickly to any desired position, and to provide a platform at the upper end thereof which will automatically fall into operating position upon the mere act of extending the ladder, and which will enable an operator to move about and always to stand upon a horizontal surface regardless of the angle at which the ladder is disposed with reference to the ground.

Referring now to the drawings, Fig. 1 is a rear view of a motor vehicle having a ladder embodying my invention mounted thereon and illustrating the ladder in various positions; Fig. 2 shows the ladder in telescoped, but elevated position; Fig. 3 is a longitudinal section of the ladder and supporting structure showing the ladder in retracted position and locked to the roof of the cab; Figs. 4, 5 and 6 are sections taken on the planes indicated by the correspondingly numbered lines in Fig. 3; Figs. 7 and 8 are sections taken on the correspondingly numbered lines in Fig. 3; Fig. 9 is a section taken on the line 9—9 in Fig. 3; Fig. 10 is a top plan view showing the mechanism for locking the ladder to the cab; and Fig. 11 is a section taken on the line 11—11 in Fig. 10.

I have shown the ladder as being mounted upon the floor of a motor vehicle, indicated in general at 10, and as being used for providing access to an overhead lamp. The ladder illustrated is the extensible type, there being two sections 11 and 12 indicated in this application. These sections are mounted for telescopic movement with respect to each other in the customary manner, and for the purpose of description herein, the section 11 will be referred to as the lower or stationary section while the section 12 will be designated as the upper or extensible section.

The ladder is so supported upon the vehicle that it can be swung through an entire circle with

reference thereto, and tilted at any desired angle, within its range, with reference thereto. The supporting structure for the ladder may comprise a column 15 which is shown in the form of a cylindrical member that projects upwardly from a base 16 which, in turn, is rigidly fastened to the floor of the truck. The top of the column may have a bearing ring 17 supported thereon for receiving a sleeve 18 that extends downwardly about the standard with a lower bearing on the ring 19. Thus the spaced bearing members 17 and 19 permit rotation of the sleeve with reference to the column and at the same time, distribute the load stresses along a considerable length of the column.

The mechanism for connecting the ladder to the sleeve 18 preferably embodies a system of linkage which is connected at one point 20 to the ladder, and at spaced points 21 and 22 to the sleeve. As shown in Fig. 9, there are two sets of links that are preferably spaced equally from the center of the column and on opposite sides thereof. Thus, the load is equally distributed upon the supporting structure while the elevating mechanism is compactly arranged in a relatively small space.

The spaced points of connection 21 and 22 between the sleeve and the linkage mechanism comprise pivots on arms 23 and 24 respectively which project outwardly from the sleeve 18. The points 20 and 21 are connected preferably by links 25 and 26 which are shown as being interconnected by a hollow pivot 27 shown in detail in Fig. 5 as a short cylinder 27a welded into the link 26. The link 25 pivots on the cylinder and is prevented from sliding off by a projection 27b. The points 20 and 22 are interconnected by a link 28, thereby providing a linkage system which has a single pivot on the ladder and a double pivot on the supporting sleeve. This arrangement again distributes the load along substantially the entire length of the sleeve 18 and provides a compact structure which permits rotation of the sleeve through 360° in a relatively restricted space within a motor vehicle.

The ladder is normally carried for transportation in a horizontal position as shown in Fig. 3, but is adapted to be elevated by tilting about the pivot 20. This can be quickly accomplished by pulling downwardly on the bottom of the ladder which, for convenience, has a downwardly extending offset portion 30 that may be readily grasped by the operator and swung downwardly to the broken line position 30a in Fig. 3. The apparatus for holding the ladder in position may comprise pins 31 which are disposed within a hollow rung 32 and are normally urged outwardly by springs 33 as shown particularly in Fig. 4. The members 31 normally project beyond the side rail for engagement in the openings of the hollow

pivots 27 in the flared end portions 35 of the links 26 (Figs. 5 and 7). This arrangement provides a snap-fastening action that locks the ladder in elevated position as soon as it reaches the broken line position of Fig. 3.

To withdraw the locking pin 31 from the openings 27, I have shown each pin 31 as connected at 36 to an arm 37, and I have shown each arm 37 as being pivotally connected at 38 to a hand controlled lever 39 which in turn may be pivotally connected at 40 to the hollow rung 32. Suitable slots 41, are provided in the rung 32 and the transverse pins 36 are embraced by slots in the arms 37, the arrangement being such that whenever the lever 39 is swung in the direction of the arrow in Fig. 4, the locking pins 31 will be drawn into the rung sufficiently to clear the openings 27 and to allow the extension 30 to be moved upwardly and the main body of the ladder to be moved downwardly to the horizontal position of Fig. 3. When the ladder is elevated as previously described, and the pins 31 are cammed inwardly by the flared portions 35 and then outwardly into the openings 27 by the springs 33, the pins 36 move within the slots, the handle 39 remaining stationary.

To lock the entire superstructure that is supported on the standard 15 in any desired angular position about a vertical axis, I have shown a plate 42 which is carried by the standard beneath the sleeve and which has apertures 43 (Fig. 6) extending at spaced intervals there-through. A plunger 44 carried by a rod 45 is slidably mounted in lugs 46 and 47 that project from the sleeve as shown in Fig. 3. The plunger-carrying rod is normally urged downwardly by the spring 48, but is adapted to be manually withdrawn or lifted to permit rotation of the sleeve and the accompanying superstructure to a different angular position. The mechanism for lifting the rod is shown as an arm 49 which is pivotally connected at 50 to the rod which is rigidly attached to a cross bar 51 that is supported for oscillation in brackets 52, Fig. 7, which in turn are supported on bearing blocks 53. The bearing blocks may be suitably carried by arms 54 that project outwardly and upwardly from the sleeve. The cross bar 51 terminates at each end in a handle 55 which is disposed adjacent a hand wheel 60 where it is convenient for an operator to depress while simultaneously manipulating the hand wheel for the purpose hereinafter set forth.

To alter the vertical angular position of the ladder after it has been locked in the tilted position, I utilize a mechanism for swinging the links about the pivots 21 and 22. Such mechanism is shown as comprising threaded spindles 65 which, as shown in Fig. 8, extend through threaded cylindrical nuts 66 that are disposed within a sleeve 67 which in turn is mounted within a hollow cross brace 68. The cross brace, in turn, is rigidly attached at its ends, as by welding, to the links 28. Trusses 69 extend from the central region of the cross brace 68 to points near the upper and lower ends of the links 28, at 70 and 71 respectively. As is shown in Fig. 9, slots 72 in the cross brace and sleeves 67 allow a limited rotation of the nuts 66 with reference to the cross brace so as to permit freedom of movement of the nuts along the entire threaded portion of the spindle 65 as the angles between the linkage members vary. Such movement of the nuts is effective to tilt the ladder so as to

vary the inclination of it while it is in elevated position.

The mechanism for rotating the spindles 65 preferably comprises hand wheels 60 which are rigidly mounted upon a shaft 73, which in turn is supported by the bearing blocks 53. The shaft is connected to the threaded spindles by suitable beveled gears, indicated at 75 and 76 respectively, within housings 74 rotatable on the shaft 73.

By utilizing two hand wheels and by placing the levers 55 in close proximity thereto, an operator may stand at the foot of the ladder and quickly position the upper end of it in any desired overhead location with dispatch.

To facilitate manipulation of the ladder by only one operator, I prefer to counterbalance the weight of the ladder, and for such purpose I utilize spring loaded plungers 79, at each side of the support, within casings 80 which are connected to the ladder by flexible cables 81. The cables extend over curved top surfaces 82 of brackets 83 which are attached to the side rails of the lower section. As shown in Figs. 3 and 7, the casing 80 for each device projects through a bracket 85 rigidly carried by the link 23. A shoulder 80a, formed upon the casing, effectively restrains the casing and provides a pivotal connection with the slightly crowned face of the bracket.

To accommodate an operator, I may provide a platform adjacent the top of the movable ladder section that permits him to stand erect regardless of the angular position of the ladder. Moreover, I may so construct the platform that it may swing automatically into operating position whenever the ladder is extended and will automatically move back into idle position upon retraction of the ladder to the storage position. The upwardly facing concave platform 86 and the support for the same by means of rods 89, which at their upper ends may slide in the extension 12 to allow the folding of the platform, is not claimed herein but in my divisional application No. 327,674, filed April 3, 1940.

As an added safety feature for the workman at the top of the ladder, I provide a U-shaped foot guard 92 which connects the rods 89, and I provide hand grip brackets 93 which are rigidly attached to the upper end of the movable ladder section. The brackets 93 also permit the attachment of the safety belt as is shown in Fig. 1. An additional safety feature are the truss rods 94 which reinforce the ladder rails against deflection and which serve as hand rails while the workman is moving along the ladder.

To lock the ladder in horizontal position as shown in Fig. 3, I have shown a clamping device which is mounted on the top of the cab 95 upon a base 96 which extends transversely thereof. A layer of rubber 97 may be disposed between the base block and the cab roof to protect the roof and to absorb vibration. The base block has attached to it, a clamp supporting member which as shown in Figs. 10 and 11 has a base 98 which may be fastened to the base block by the same securing members which secure it to the cab. The member also has a vertical wall, 99, the upper portion of which is shown as being bent outwardly as at 100, bent inwardly as at 101, and then downwardly as at 102. The part 101 forms a supporting surface for rubber pillow blocks 103 upon which the ladders are adapted to rest. The surface 101 also provides a support for flared ladder guides 104.

The rails of the lower section may be provided with a laterally extending flanged portion 105 which is formed from a strip of metal that is attached to the bottom and side faces of the ladder rails. These strips provide a surface against which the ends of arms 106 may engage for clamping the ladder against the blocks 103. As shown in Fig. 11, the arms 106 are attached to a U-shaped plate 107 which is pivotally mounted at 108 between the vertical face 99 and the downturned face 102. There are two arms 106 shown in Fig. 11 for engaging opposite sides of the ladder, but the arms are adapted to be moved in unison from the full line to the broken line position 106a in Fig. 11.

The simultaneous movement of the clamping arms 106 may be accomplished by movement of a hand lever from either side of the vehicle. Accordingly, two hand levers 109 are shown that are pivotally connected intermediately at 110, and are pivotally connected at their respective ends to the brackets 107. The last named connection preferably takes the form of an intermediate link 111, one end of which is pivoted at 112 to the member 107, and the other end of which is pivoted at 113 to the handle 109. The pivot 112 has its axis extending in a horizontal plane, while the pivot 113 has its axis extending in a vertical plane. This, therefore, provides in effect a universal joint between the part 107 and the handle 109. The handles are guided for sliding movement in a slot, the upper side of which is formed by a bar 115 which extends toward the front end of the truck and which is securely fastened as by welding to the bottom edge of the flange 102 and to the vertical portion or face 99. The upturned forward end of a rod 116 may be welded to the plate 115 and the rear end to the face 99 to complete the passage way within which the arms 109 may be moved.

The clamping mechanism is so arranged that whenever either one of the hand levers 109 is shifted from the full to the broken line position 109a in Fig. 10, both ends of the arms are drawn inwardly, thus springing the members 107 about their pivots 108 and causing the clamping arms 106 to move outwardly to the broken line position 106a. This releases the ladder for immediate use. When the levers 109 are in the full line position, then the pivotal connection therebetween them moves past the dead center position shown in Fig. 10, and thus the arms 106 are automatically maintained in a clamping position.

To clamp the sections of the ladder against movement longitudinally with respect to each other during transportation, I have shown in Fig. 4 an interlocking hook and eye device which locks the two sections together whenever the upper ladder section is moved backwardly until the end of the rails thereof engage a stop 120 (Fig. 3), which is carried by the lower section and under which a projection 120a on the upper section is wedged. The interlocking device takes the form of a hook 121 which is formed on the end of the hand lever 39, while the eye 122 is attached to the rung 123 on the upper section. Thus failure to lock the ladder sections, due to oversight on the part of the operator, is obviated by causing the locking movement to be a continuation of the movement necessary to lower the ladder to storage position. The locked position is shown in Fig. 3 and in broken lines at 121a in Fig. 4.

The operation of a ladder made in accordance with my invention is as follows: Assuming that the ladder is carried in the clamped position as is shown in Fig. 3, and that the vehicle has arrived at a location where the ladder is to be used, then the vehicle is stopped in a position which will be as near as possible to the overhead device to be serviced without interfering with the normal flow of traffic along the street. Thereupon, the operator swings the lever 109 to release the clamps 106 and then he releases the clamp which holds the two sections together by swinging the lever 39 in a direction to disengage the hook 121 from the eye 122. Thereupon the operator pulls downwardly on the end of the lower ladder section, thereby swinging it about the pivot 20 until the offset portion 30 is in the position indicated at 30a (Fig. 3), at which time the pins 31 automatically engage the hollow pivots 27, and thereby lock the ladder in the elevated position. The ladder may then be extended by pulling the upper section along the lower section in the customary manner as by means of a rope until the top of the movable section is sufficiently close to the article upon which the operator intends to work. If the top of the ladder is not positioned accurately enough by the operation just described, then the operator can revolve it and also vary the angle of inclination to suit the desired location.

The ladder is revolved by pressing downwardly on the levers 55, thus releasing the locking engagement between the ring 42 and the plunger 44, whereupon the ladder may be swung horizontally and then locked in the desired position by releasing the levers 55. This causes a new engagement of the plunger 44 with a different opening 43 in the ring 42. The vertical angular position of the ladder may then be altered, if desired, by rotating the hand wheels 60, which in turn rotate the spindles 65 and cause the nuts 66 to move along the axis of the spindles. Inasmuch as the nuts are attached to the linkage system which supports the ladder, the links are caused to move about their pivots 21 and 22 so as to alter the angular position, as is shown for example by the broken lines 11a and 11b in Fig. 1.

At the completion of the work for which the ladder was used, it may be retracted in the reverse order of elevation, and locked in position upon the cab of the vehicle. Due to the lightness in weight, the counterbalancing of the ladder, and the compact arrangement of the operating mechanism, the ladder may be elevated and retracted by only one operator. Moreover, the construction shown enables the ladder to be directed to any overhead position by extending across any motor vehicles that may be parked alongside the curb or may extend from a position near the curb to an overhead position adjacent the center of a street intersection without interfering with the normal flow of traffic in any direction.

I claim:

1. In combination, a vehicle, a ladder, means for mounting the ladder for swinging and tilting movement on the vehicle, said means comprising a column rigidly attached to the vehicle, and a sleeve swiveled on the column, said means also including two sets of links that are connected to the ladder on a common pivot and to the sleeve at spaced pivots, and a screw and nut couple also carried by the sleeve for moving the links and ladder with reference to the sleeve.

2. In combination, a vehicle, a ladder, means for mounting the ladder for swinging and tilting movement with reference to the vehicle, said means including a column rigidly mounted on the vehicle, a sleeve swiveled on the column, a member pivotally connected to the sleeve and to the ladder, and two links pivotally connected together and also pivotally connected to the ladder and sleeve respectively, means for locking the ladder to one of the links, and means for moving the member with reference to the sleeve to tilt the ladder with reference to the vehicle.

3. In combination, a vehicle, a ladder having a relatively stationary and a relatively movable section, means for mounting the ladder for swinging and tilting movement with reference to the vehicle, the ladder having an offset portion extending downwardly adjacent the lower end thereof, means adjacent the offset portion for locking the ladder to the mounting means and for holding the ladder in tilted position, a device carried by the ladder for releasing the locking means, said device operating to lock the sections of the ladder together upon release of the locking connection.

4. In combination, a vehicle having a platform, a ladder having an extensible section, means for mounting the ladder for swinging and tilting movement upon the platform, said means including a column affixed to the platform, a sleeve swivelled on the column, the column having an apertured ring rigidly mounted thereon beneath the sleeve, a shiftable member carried by the sleeve and adapted to engage an aperture in the ring for locking the sleeve against rotation with respect to the column, a plurality of links pivotally connected to one section of the ladder, a screw and nut couple carried by the sleeve for actuating the links to alter the angular position of the ladder, a hand wheel for actuating one member of the couple, and a lever pivotally mounted on the sleeve and disposed adjacent the hand wheel for releasing the locking connection between the sleeve and column, said wheel and member being accessible for manipulation by an operator positioned at the base of the ladder and in front thereof.

5. In combination, a vehicle, a ladder, means for mounting the ladder for swinging and tilting movement with reference to the vehicle, said means including a column rigidly mounted on the vehicle, a sleeve swiveled on the column, a member pivotally connected to the sleeve and to the ladder intermediate the ends of the ladder, a shaft journaled on the sleeve and extending transversely of the ladder, a hand wheel on each end of the shaft and disposed outside the path of tilting movement of the ladder, a screw and nut couple operatively connected to said shaft and to said member respectively, and means carried by the ladder adjacent the bottom thereof for locking it in tilted position to the sleeve.

6. In combination, a vehicle, a ladder, means for mounting the ladder for swinging and tilting movement with reference to the vehicle, said means including a column rigidly mounted on the vehicle, a sleeve swiveled on the column, a member pivotally connected to the sleeve near the lower end thereof and pivotally connected to the ladder intermediate the ends thereof, a screw shaft journaled on the sleeve, a nut coacting with said screw shaft and swivelly mount-

ed on said member near the mid-portion thereof, a tube carried by the member and a spring actuated device mounted within the tube and connected to the ladder and operating as a counter-balance therefor.

7. In combination, a vehicle, a ladder, means for mounting the ladder for swinging and tilting movement with reference to the vehicle, said means including a column rigidly mounted on the vehicle, a sleeve swiveled on the column, a link pivotally connected to the sleeve and to the ladder, a shaft journaled on the sleeve and extending transversely of the ladder, means for rotating the shaft, a screw and nut couple operatively connected to said shaft and to said link respectively, coacting means on the sleeve and ladder for locking the ladder in a tilted position, said last named means including a tubular member on the ladder, a rod mounted therein and means for selectively moving the rod to project a portion thereof outside the tubular member.

8. In combination, a vehicle, a ladder mounted thereon for swinging and tilting movement, said mounting including a column rigidly attached to the vehicle, and a sleeve supported by the column for rotation thereon, and a link pivoted to the sleeve and connecting the sleeve to the ladder, and other means connecting the sleeve to the ladder, said mounting also including a screw and nut couple connecting the link and the sleeve for moving the link about said pivot to tilt the ladder with relation to the sleeve, said couple having one member thereof carried by the sleeve and the other member thereof swiveled on the link at a point intermediate the ends thereof.

9. In combination, a vehicle, a ladder, means for mounting the ladder for swinging and tilting movement on the vehicle, said means comprising a column rigidly attached to the vehicle, and a sleeve swiveled on the column, and a link pivotally connected to the sleeve and to the ladder and an additional connection between the sleeve and ladder comprising a pair of links pivotally joined together, said means also including a screw and nut couple connecting the link first mentioned and the sleeve for moving the ladder with reference to the sleeve, means for actuating one member of the couple, a device for locking the ladder in predetermined positions of swinging movement.

10. In combination, a vehicle, a ladder, means for mounting the ladder for swinging and tilting movement on the vehicle, said means comprising a column rigidly attached to the vehicle, and a sleeve swiveled on the column, and a link pivotally connected to the sleeve and to the ladder and an additional connection between the sleeve and ladder, said means also including a screw and nut couple connecting the link first mentioned and the sleeve for moving the ladder with reference to the sleeve, a hand operated wheel for actuating one member of the couple, a device for locking the ladder in predetermined positions of swinging movement, and a member having a hand engaging portion disposed adjacent the wheel for releasing the locking device, said wheel and member being accessible for manipulation by an operator positioned at the base of the ladder and in front thereof.

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