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TAIL GATE LIFT FOR TRUCKS AND THE LIKE

Filed Jan. 19, 1948

2 SHEETS—SHEET 1

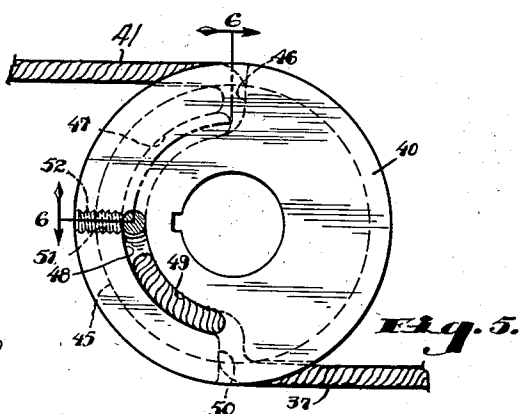
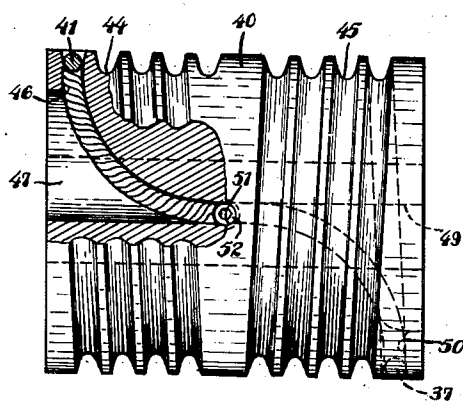
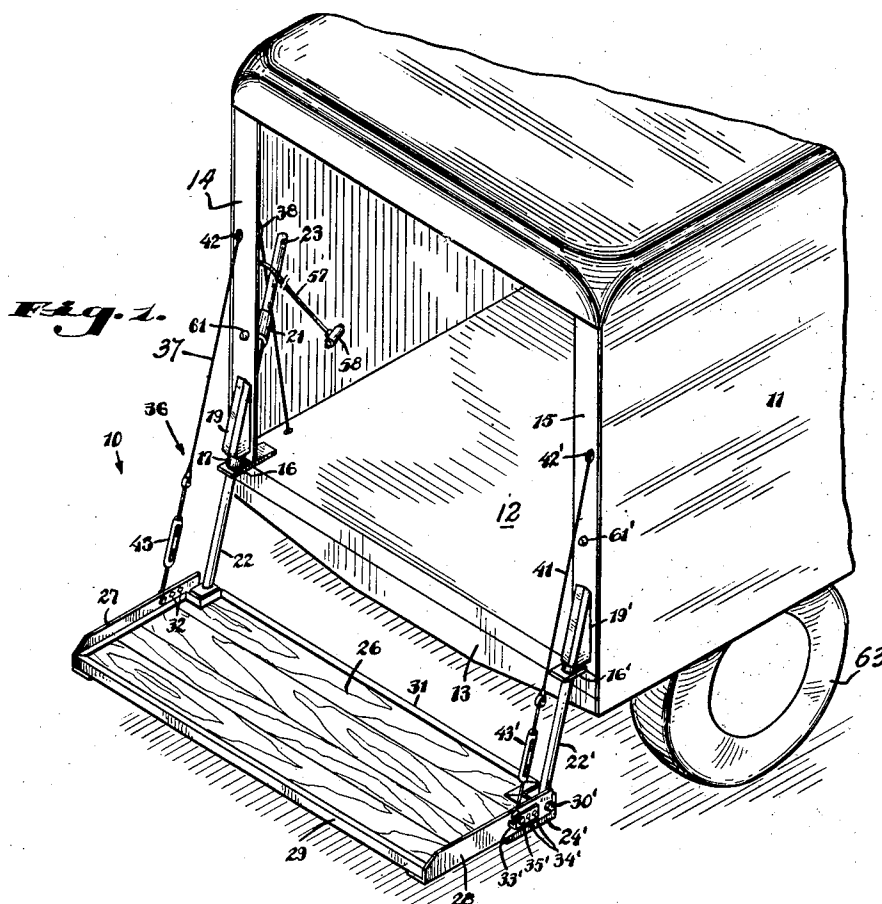


Fig. 6.

Fig. 5.

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2 SHEETS—SHEET 2

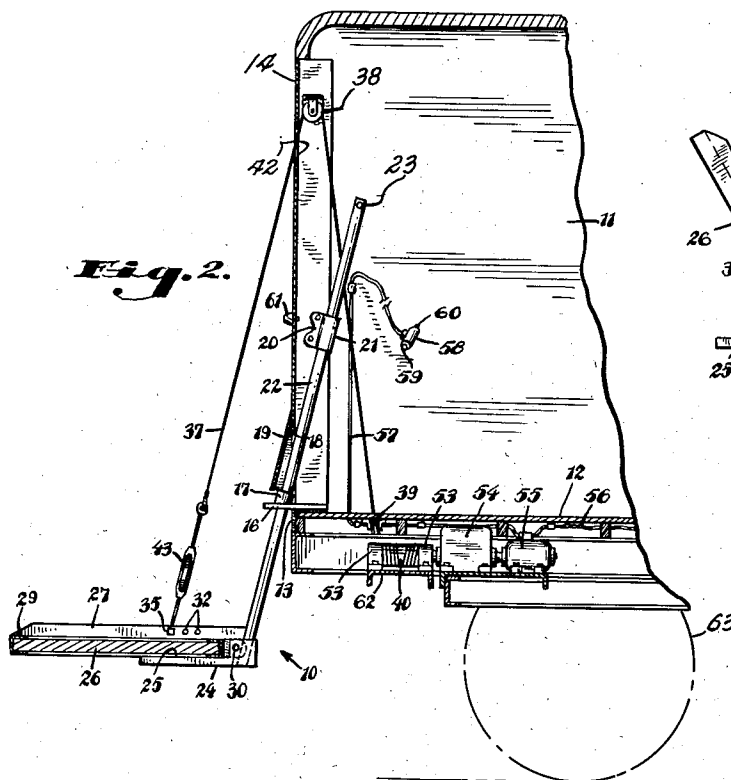


Fig. 2.

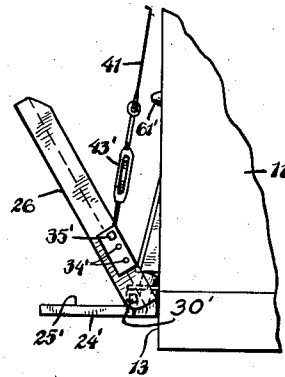


Fig. 3.

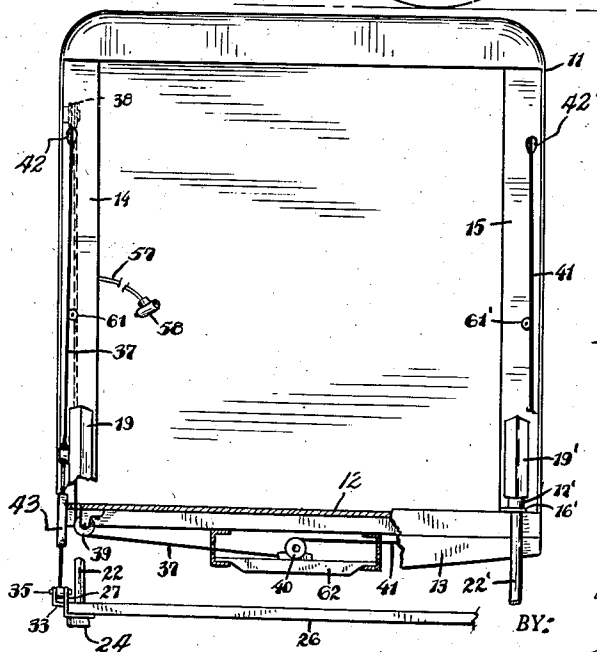


Fig. 4.

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TAIL GATE LIFT FOR TRUCKS
AND THE LIKE

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The present invention relates to a tail-gate-lift for trucks, and the like, and the primary object of the invention is to provide a combination lift and tail-gate which shall be simple, inexpensive, and relatively light in construction, and which shall yet be capable of exerting substantial power for elevating goods from the level of a loading station to the level of the vehicle floor, or lowering such goods from the vehicle floor to an unloading station. A further object of the invention is to provide a device of the character described in which the same mechanism for lifting or lowering goods may also be used for closing the tail-gate; viz., for shifting said tail-gate from a horizontal position into a substantially vertical position.

A further object of the invention is to provide, in an organization of the character described, a guiding arrangement for the lift whereby the lift will be moved away from the adjacent end of the vehicle floor as it moves downwardly from the level of said floor; so that, when the lift is positioned substantially at ground level, for instance, it will likewise be spaced from the plane of the adjacent end of the vehicle floor, in order to facilitate the shifting of goods onto and from such lift.

A further object of the invention is to provide control means for the lift whereby the lift may be stopped, and suitably held, at any elevation between the upper and lower limits of its path. A further object of the invention is to provide manually manipulable means for controlling the position of the lift, which means shall be readily accessible either from inside the vehicle or from outside the same, and which shall be capable of manipulation by an operator inside the vehicle, standing on the ground, or standing on the lift.

A still further object of the invention is to provide, in an organization of the character described, power delivery means associated with the lift, and of such character as to be energizable by the storage battery which is standard equipment on automotive vehicles.

A still further object of the invention is to provide a kit, which may be manufactured and sold as an adapter unit, for installation upon any standard vehicle to provide such vehicle with a tail-gate-lift.

Still further objects of the invention will appear as the description proceeds.

To the accomplishment of the above and related objects, my invention may be embodied in the form illustrated in the accompanying draw-

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ings, attention being called to the fact, however, that the drawings are illustrative only, and that change may be made in the specific construction illustrated and described, so long as the scope of the appended claims is not violated.

Fig. 1 is a perspective view of the rear end of a standard truck with which my tail-gate-lift has been associated;

Fig. 2 is a longitudinal section of the rear end of such truck and the associated parts of my tail-gate-lift;

Fig. 3 is a side elevation of a fragment only of the truck body, showing the parts of my tail-gate-lift in a different position of adjustment;

Fig. 4 is a rear elevation of the organization illustrated in Figs. 1 and 2;

Fig. 5 is an enlarged end elevation of the winding drum forming a part of my kit, parts being shown in section; and

Fig. 6 is a side elevation of the said drum, parts being broken away for clarity of illustration.

Referring more particularly to the drawings, it will be seen that I have illustrated a tail-gate-lift, indicated generally by the reference numeral 10, associated with the rear end of a closed type of truck body 11 having a floor 12 with the rear end 13 of which the lift of the present invention is associated. The illustrated type of truck is conventionally provided with rear end posts 14 and 15 upstanding from the laterally opposite corners of the rear end of the floor. The lift of the present invention may be associated, of course, with any type of truck body; but when applied to a body which is not provided with posts 14 and 15, comparable upright members may preferably be installed upon such body.

A bracket 16 is suitably secured to the floor 12 and projects rearwardly beyond the post 14; and a similar bracket 16' is associated with the post 15. The bracket 16 provides a bearing 17 whose axis is inclined upwardly and forwardly, as is most clearly illustrated in Fig. 2. The post 14 is apertured, as at 18, immediately above the bearing 17; and preferably a shield 19 will be provided to guard the aperture 18. Within the truck, and at an elevation above the floor 12, there is suitably secured to the post 14 a bracket 20 providing a second bearing 21, axially aligned with the bearing 17. Reciprocably mounted and guided in the bearings 17 and 21 is a slide rod 22, the upper end of which is preferably provided with a stop pin 23, and the lower end of which rigidly carries a foot 24 having a rear-

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ward projection providing a substantially horizontal platform surface 25.

A shield 19' similar to the shield 19 is associated with the bracket 16'; and the slide rod 22' is mounted in the bearing 17' and in another bearing, not shown, similar to the bearing 21, for reciprocation upon an axis parallel to the axis of movement of the rod 22. At its lower end, the rod 22' carries a foot 24' presenting a horizontal platform surface 25'. The parts are so proportioned and designed that the two platform surfaces 25 and 25' occupy a common plane.

A tail-gate 26 is preferably provided at its opposite ends with reinforcing angle irons 27 and 28, and is preferably bounded by metallic channel members 29. Said gate is adapted to bridge the foot members 24 and 24' and to be pivotally associated therewith through pins 30 and 30', said pins engaging the opposite ends of the gate 26 upon a common axis spaced from the edge 31 of the gate by a distance substantially equal to the distance between said axis and that surface of the gate which is upwardly presented when the gate occupies the position of Fig. 1. The importance of the specific arrangement of the pivotal axis for the gate 26 will become apparent as the description proceeds.

The angle iron 27 is provided, in its upstanding flange, with a plurality of perforations 32, variously spaced rearwardly from the vertical plane containing the pivotal axis of the tail-gate; and the angle iron 28 is provided with similar perforations (not shown). Preferably, a bracket 33 projects laterally from the outer surface of the angle iron 27; and a similar bracket 33' projects laterally from the angle iron 28, said brackets being formed with perforations, such as 34' of the bracket 33', aligned with the said perforations in the angle iron flanges. These sets of aligned perforations selectively receive anchor pins 35 and 35' for anchoring cable means 36 to the tail-gate 26.

Preferably, the cable means 36 will comprise a single, continuous length of cable, and I have so illustrated such cable means; but it will be apparent that separate cables might extend from the winding means, to be described, to the opposite ends of the gate 26. It will also be apparent that many of the objects of the present invention might be accomplished if the cable means 36 were anchored to the foot members 24 and 24'.

In the illustrated and preferred embodiment of the invention, the section 37 of the cable means 36 extends from the anchor pin 35 through a suitable perforation 42 in the post 14 and over a sheave 38 suitably supported inside the truck body, thence downwardly through the floor 12 and under a sheave 39, suitably supported beneath the floor 12, and so to a drum 40. Another section 41 of the cable means 36 extends from the anchor pin 35' through a perforation 42' in the post 15, and thence, around pulleys (not shown) corresponding to the pulleys 38 and 39 and so to the drum 40. I prefer to connect turnbuckles 43 and 43' in the sections 37 and 41 of the cable means 36 in order to facilitate leveling of the gate 26 and proper distribution of stresses between the cable sections 37 and 41.

According to the preferred embodiment of the invention, the drum 40 (Figs. 5 and 6) is provided with a peripheral spiral groove 44 running from a point near one end of the drum substantially to the transverse median plane thereof; and an oppositely pitched peripheral groove 45

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running from the opposite end of said drum substantially to said median plane. At a point in the groove 44 near the associated end of the drum, a radial opening 46 leads from the surface of the drum into a cavity 47 cored in said end of the drum, said cavity comprising a part of a passage 48 which includes, as well, a similar cavity 49 in the opposite end of the drum communicating with an opening 50 leading to the surface of the drum at a point registering with the groove 45 near the opposite drum end. It will be seen that the passage 48 avoids the axial center of the drum, and that the openings 48 and 50 are, in the illustrated embodiment of the invention, 180° removed from each other.

Substantially in the median plane of the drum, there is formed a threaded radial opening 51 intersecting the passage 48 and adapted to receive a set screw 52 which may be turned down upon that section of the cable means which is threaded through the passage 48, to anchor the cable means firmly in the drum.

It will be readily apparent that, with the cable sections 37 and 41 leading oppositely from the drum in the manner illustrated in Fig. 5, rotation of the drum in one direction will wrap both cable sections about the drum, the section 37 following the spiral groove 45 and the section 41 following the groove 44; while rotation of the drum in the opposite direction will pay out both cable sections. It will also be apparent that the two cable sections will be equally wrapped or payed out, depending upon the direction of rotation of the drum, so that their remote ends will move in unison.

The drum 40 will preferably be mounted, with its axis extending in the direction of longitude of the vehicle body 11, in bearings 53, 53 which will preferably be supported upon a platform 62 suitably mounted upon the vehicle body beneath the floor 12 thereof. The drum is connected to be driven, through a reducing gear 54 of the non-reversing type, by a reversible electric motor 55, said unit 54 and said motor 55 likewise being preferably mounted upon the platform 62. A non-reversing type of reduction gear is a gear of such character that torque applied to its output shaft will not drive the gear.

The motor 55 may be energized through a cable 56 leading from the storage battery (not shown) with which automotive road vehicles are conventionally equipped; and, according to a preferred embodiment of my invention, the energizing circuit includes a cable section 57 which terminates in a flexible portion supporting a switch 58. Preferably the switch 58 will be provided with two buttons 59 and 60, and the switch mechanism will be such that, when the button 59 is pressed, the motor 55 will be energized to rotate in one direction, while actuation of the button 60 will cause the motor to be rotated in the opposite direction. When neither button is pressed, the motor will be deenergized.

The brackets 16 and 16' are so located as to act as stops for the rods 22 and 22', limiting the upper limits of the paths of said rods to a level in which the upwardly presented surface of the gate 26, when in horizontal position, will be substantially coincident with the surface of the floor 12. The parts are so proportioned and designed that, when said rods are at their upper limits, the forward edge 31 of the gate 26 is substantially in contact with the rear end 13 of the vehicle floor 12. The stops 23 are so positioned with respect to the bearing elements 21 that, when

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the rods 22 and 22' are at the lower limits of their paths, the lower surfaces of the foot members 24 and 24' will be substantially in the plane of the surface upon which the truck wheels 63 rest. The inclination of the bearings 17 and 21 is such that, as the gate 26 moves downwardly it moves also rearwardly away from the rear end 13 of the floor 12 so that, when the gate is in its lowermost position, there is a substantial clearance between the forward edge 31 of the gate and the rear end 13 of the vehicle floor, permitting workmen to stand in a position between the gate and the vehicle body, to facilitate movement of goods onto and off of the gate 26 when the latter is in its lowermost position.

It will be apparent that goods may be placed upon the gate 26 when it is in such lowermost position, and that thereafter one of the control buttons 59, for instance, may be pressed to energize the motor 55 to drive the drum in a clockwise direction as viewed in Fig. 5, whereupon the cable means 36 will be wrapped upon the drum to lift the gate 26 and its associated parts, and to elevate the load. When the rods 22 and 22' reach the uppermost limits of their paths, in which the elements 24 and 24' just engage the plates 16 and 16', the button 59 will be released to deenergize the motor. Because the unit 54 is of the non-reversing type, the gate and its load will be sustained in this position, in which the upper surface of the gate will be flush with the floor 12, and thereafter the goods carried on the gate can be moved into the vehicle body without lifting. Now, if desired, the button 59 may be pressed again, whereby the motor 55 will again be energized to rotate in the same direction. Since the foot elements 24 and 24' cannot move higher, because of their engagement with the brackets 16 and 16', further winding of the cable means upon the drum will cause the gate 26 to move pivotally about the pins 30 and 30', in the manner illustrated in Fig. 3. As the gate swings in a clockwise direction, the center of gravity of the lift assembly will move toward the axis of the pivots 30 and 30'; and when that center of gravity passes the axis of the anchors 35 and 35', the gate will swing suddenly into a vertical position, and the lift assembly will drop slightly, the rods 22 and 22' moving downwardly. Thereafter, continued rotation of the drum 40 in the same direction will lift the entire assembly, with the gate 26 in its above-mentioned vertical position, the assembly moving upwardly and forwardly in the line defined by the bearings 17 and 21 until the gate comes into firm closing engagement with the bumpers 61 and 61'. It will be seen that, due to the inherent resiliency in the lifting cable, a tight, non-rattling closure of the gate against the rear end of the truck body will thus be maintained. The button 59 is now released, and the gate will be held in closed position.

The flexible portion of the cable 57 will preferably be of sufficient length to make the switch 58 accessible either to an operator within the truck or to an operator standing on the ground outside the truck. If desired, a hook (not shown) may be provided for supporting the switch member in a position where it can be reached from outside the truck by an operator who reaches over the upper edge of the gate 26. Obviously, an operator may ride on the tail-gate 26, when it is in horizontal position, holding the switch 58 in his hand as the gate moves either upwardly or downwardly.

Depression of the button 60 will cause the motor

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55 to rotate the drum in a counter-clockwise direction as viewed in Fig. 5 to pay out the cable sections 37 and 41. Such operation will pay out the cable sections to permit the rods 22 to move downwardly with the gate 26 in substantially vertical position until the lower ends of the rods 22 come to rest on the ground or other surface upon which the truck wheels are supported. Continued counter-clockwise rotation of the drum will slack the cable sections sufficiently to permit the operator to swing the gate 26 in a counter-clockwise direction as viewed in Fig. 3 past the critical angle; and thereafter the gate may be lowered, through further rotation of the drum, until it comes to rest on the surfaces 25 and 25'.

Since the unit 54 is of the non-reversing type, release of the buttons 59 and 60, when the gate 26 is in any position of elevation, will stop the gate assembly, which will thereafter be held in any selected position until one of the buttons 59 and 60 is again pressed. It is found that operators frequently like to leave the gate in an intermediate position, such as that illustrated in Fig. 2, wherein it serves as a convenient step to facilitate access to the interior of the vehicle body.

It will be clear from the above description that a novel suspension for the tail gate assembly, and for any load supported thereon, has been provided in the illustrated structure. Loads resting on the gate 26 transmit only tensile stresses to the cable sections 37 and 41 and transmit only bending stresses to the rods 22 and 22'. Thus, downwardly-directed forces or shocks impressed on the gate are rather resiliently sustained. Instead of acting on the cables, for instance, sharply as tensile jerks, such shocks are largely absorbed in resilient bending of the rods 22 and 22', while the cable sections swing about the pulleys 38 and 38'; and the arrangement is such that, as the effective lengths of the cable sections 37 and 41 are increased, the flexibility, and consequently the absorptive capacity, of the rods is likewise increased by the further projection of such rods below the bearings 17 and 17'.

I claim as my invention:

1. A tail-gate-lift for vehicles comprising bracket means including elements adapted to be positioned at laterally opposite sides of a vehicle near the rear end thereof, a tail-gate spanning said elements, means providing a pivotal connection between said tail gate and said elements, slide means associated with each of said elements, guide means for each of said slide means, said guide means guiding said slide means for movement on substantially vertical parallel lines, cable means connected directly to said gate and having only an indirect connection with said slide means through said gate and said pivotal connection, and means for applying tensile force to said cable means.

2. The device of claim 1 in which the pivotal connection of said gate with said bracket means is near one edge of said gate and in which the connection of said cable means with said gate is more remote from said gate edge.

3. For use with a vehicle having a floor and a pair of posts upstanding from said floor near the laterally-opposite rear corners thereof, a guide bearing adapted to be supported on each of said posts upon an axis inclined upwardly and forwardly and passing said floor at a point closely adjacent the rear end thereof, a rod slidably mounted in each of said bearings, bracket means carried at the lower end of each rod, a tail-gate

spanning said bracket means and pivotally associated therewith, cable means secured to said gate in a region more remote from said floor than the pivotal connection between said gate and said bracket means, pulley means adapted to be carried by said vehicle above the level of said floor, drum means adapted to be carried by said vehicle, said cable means passing over said pulley means and being operatively associated with said drum means, and means for driving said drum means.

4. For use with a vehicle having a floor and a pair of uprights upstanding from said floor near the laterally-opposite rear corners thereof, guide means adapted to be associated with each of said uprights upon an axis inclined forwardly and upwardly, a rod slidably mounted in each of said guide means, a foot for each rod, each foot being rigidly associated with its rod adjacent the base thereof and providing a substantially horizontal, rearwardly extending platform, when said guide means is associated with said vehicle, each foot providing pivot means adjacent its rod, a tail-gate pivotally mounted, adjacent its forward edge, on said pivot means and adapted to be supported, at times, on said platforms, and power-operated cable means directly connected with said gate and operable, through said gate, to shift said rods axially of said guide means and to swing said gate about its pivotal mounting.

5. In a device of the class described, a tail-gate, stationary guide means and movable slide means guided therein, means pivotally connecting said tail gate to said slide means for substantially vertical bodily movement with said slide means and for swinging movement relative to said slide means about a substantially horizontal axis, cable means connected directly to said tail gate and having only an indirect connection with said slide means through said connecting means, said cable means supporting said tail gate and said slide means, drum means operatively associated with said cable means, and power means for driving said drum means.

6. A tail-gate-lift for vehicles comprising a pair of standards supported from said vehicle, each standard providing guide means, the guide means of each standard having its axis generally upright and parallel with the guide means of the other standard, a slide means mounted in each guide means for free reciprocation axially of its guide means, each slide means being transaxially stiff, support means at corresponding ends of said slide means, a tail gate bridging said support means and pivotally connected to both slide means upon a common axis, transaxially-flexible means connected to said tail gate adjacent opposite ends of said tail gate, at points equally spaced in a common direction from the respective points of pivotal connection between said gate and said slide means, and means on said standards above said last-named points for supporting said transaxially flexible means, said transaxially-flexible means constituting the sole support for said gate and said slide means, whereby downwardly-directed forces applied to said gate transmit only tensile stresses to said transaxially-flexible means and only bending stresses to said slide means.

7. A tail-gate-lift for vehicles comprising means adapted for location adjacent opposite

sides of a loading port for a vehicle body floor, each providing a generally upright guideway, each guideway having its axis parallel with the axis of the other guideway, a transaxially stiff rod mounted for free reciprocation in each guideway and adapted to be projected downwardly below the confines of its guideway, a gate bridging the space between said rods and pivotally connected to said rods near the lower ends thereof upon a common axis, cable means connected to each end of said gate at points equally spaced in a common direction from the respective points of pivotal connection between said gate and said rods, and support means for each cable means stationarily located above said points of pivotal connection, said cable means solely supporting said gate and said rods, whereby downwardly-directed loads impressed on said gate transmit only tensile stresses to said cable means and transmit only bending stresses to said rods.

8. In a device of the class described, a tail gate, slide means, guide means engaging said slide means to restrict the latter to a substantially rectilinear, substantially vertical path, means providing a pivotal connection between said gate and said slide means to enforce bodily movement of said gate with said slide means while permitting swinging movement of said gate relative to said slide means about a substantially horizontal axis, cable means directly connected with said gate and having only an indirect connection with said slide means through said gate to support said gate directly and said slide means indirectly, and means for applying a tensile force to said cable to elevate said gate and slide means along said path.

9. In a device of the class described, a tail gate assembly comprising a pair of laterally-spaced, generally upright slide members and a gate element spanning said slide members and pivotally engaged with both of said slide members for oscillation relative thereto about a laterally-extending axis, generally upright guide means for each of said slide members, and means for supporting and actuating said assembly comprising cable means, sheave means located adjacent the upper ends of said guide means and supporting said cable means, and means for applying a tensile force to said cable means, said cable means being operatively connected to said tail gate assembly only adjacent the laterally-opposite ends of said gate element.

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