

July 13, 1954

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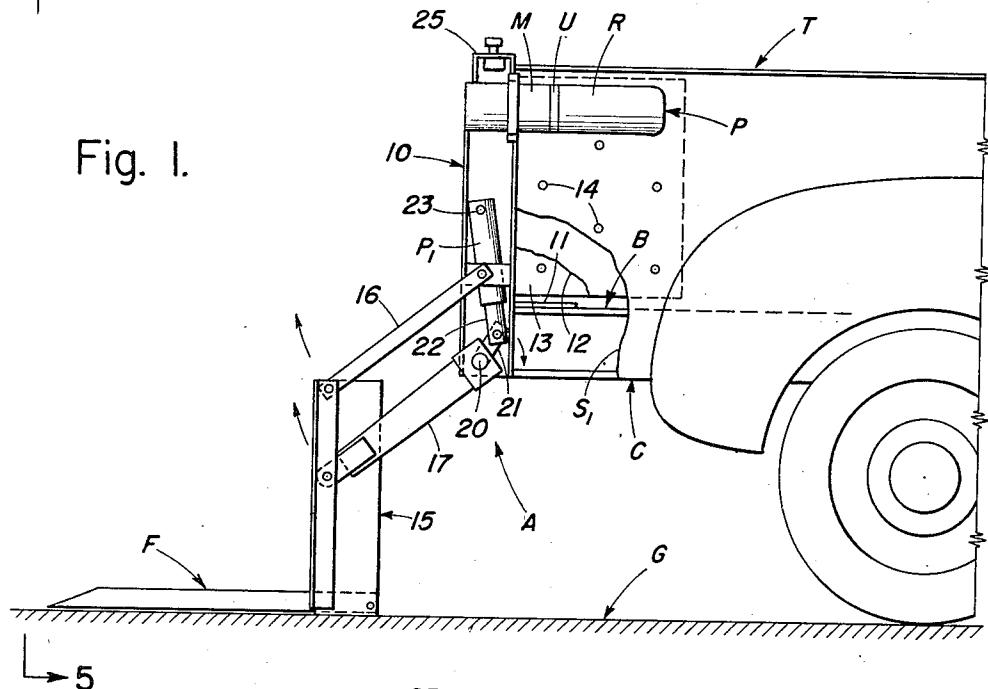
TAIL GATE MECHANISM FOR TRUCKS

Filed Jan. 17, 1952

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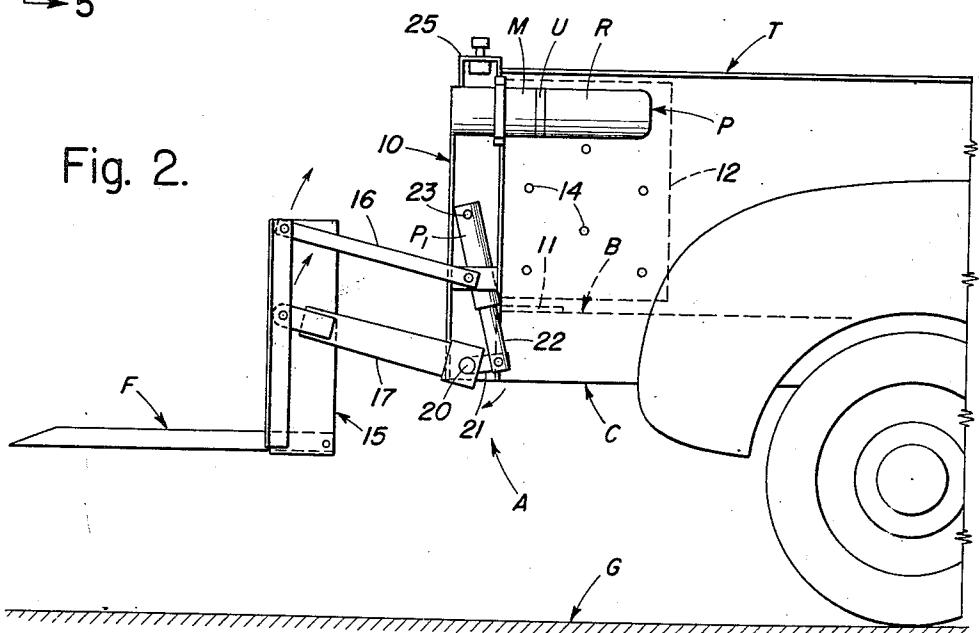
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Fig. 1.



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Fig. 2.



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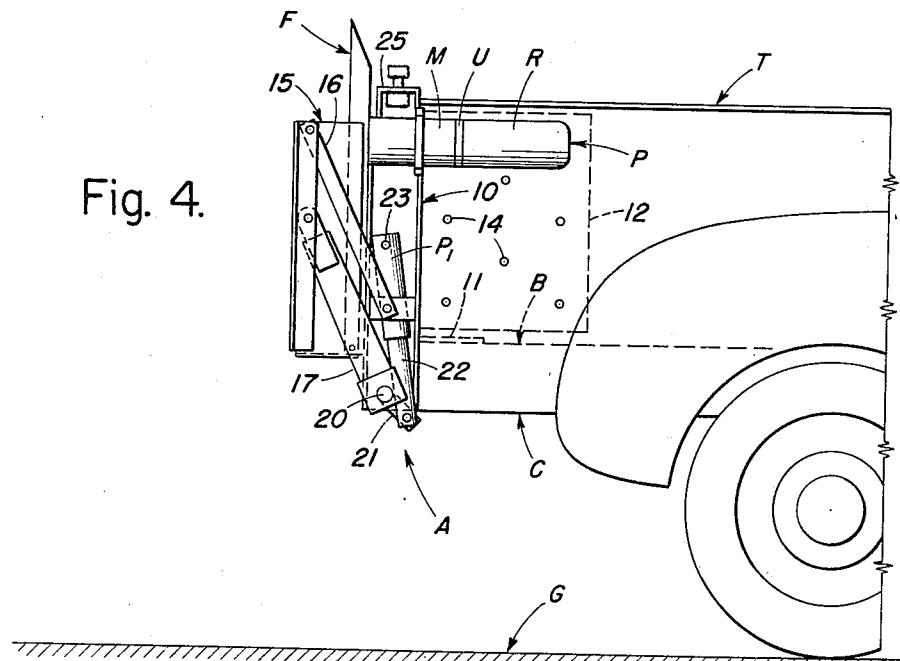
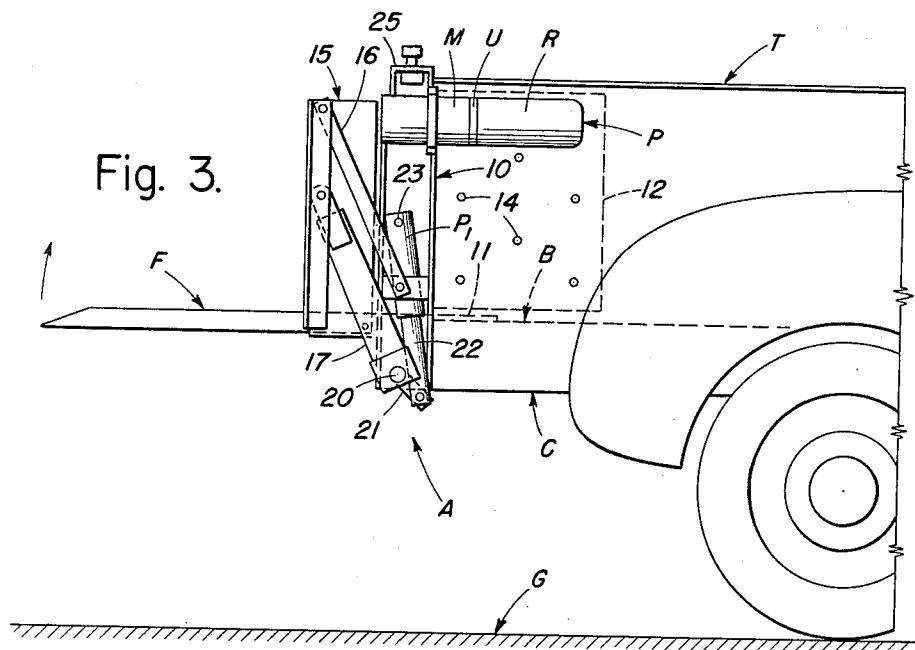
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TAIL GATE MECHANISM FOR TRUCKS

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7 Sheets-Sheet 2



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TAIL GATE MECHANISM FOR TRUCKS

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Fig. 6.

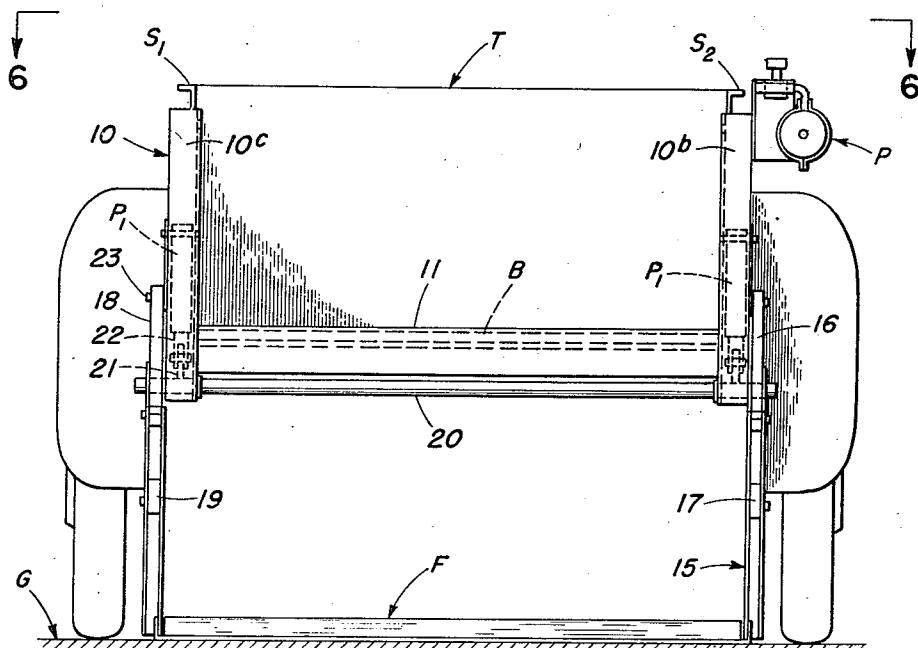
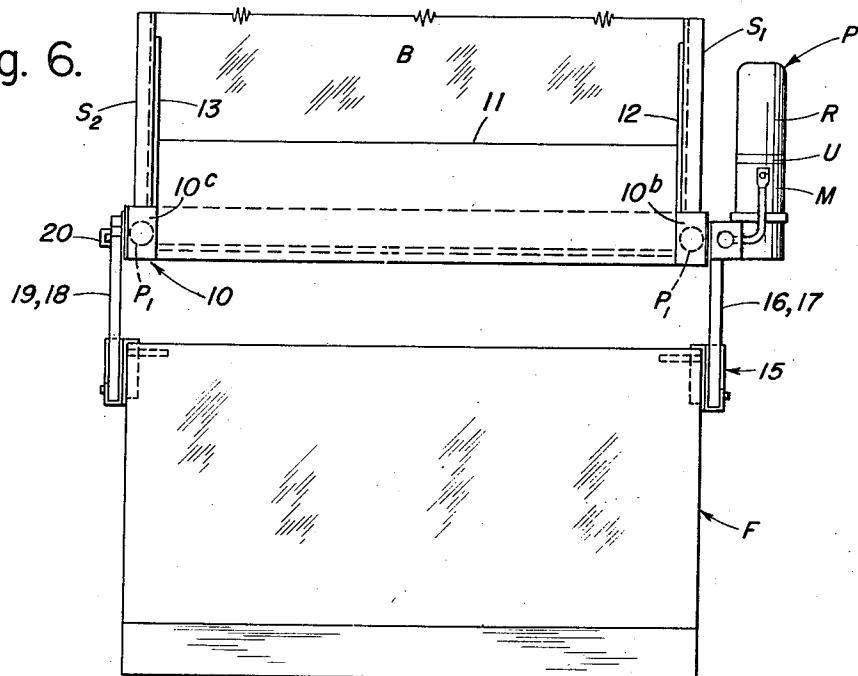


Fig. 5.

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Fig. 7.

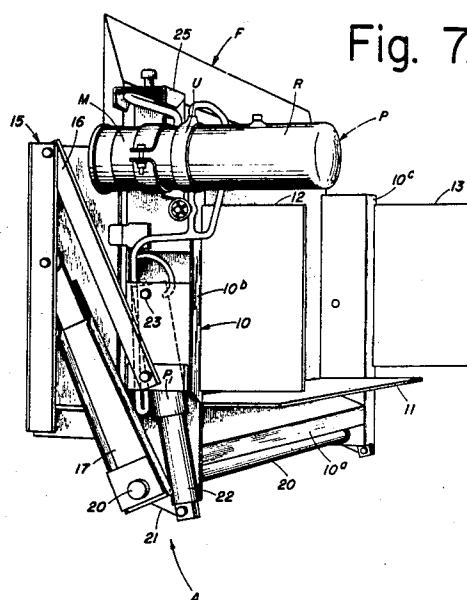


Fig. 9.

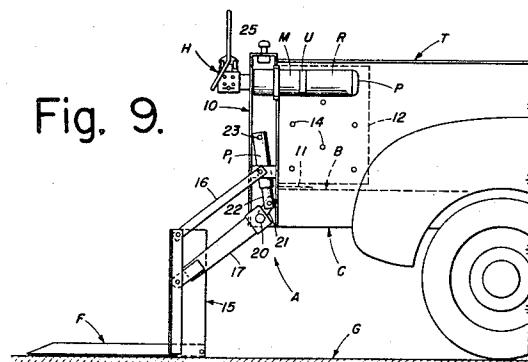
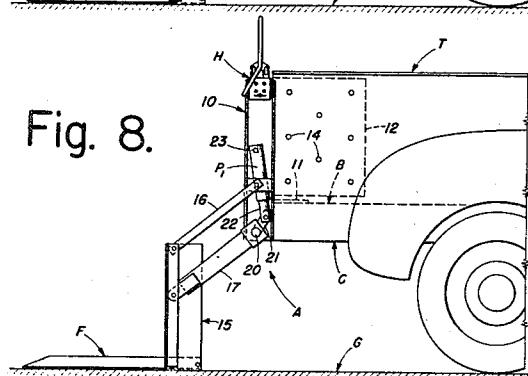


Fig. 8.



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Fig. 10a

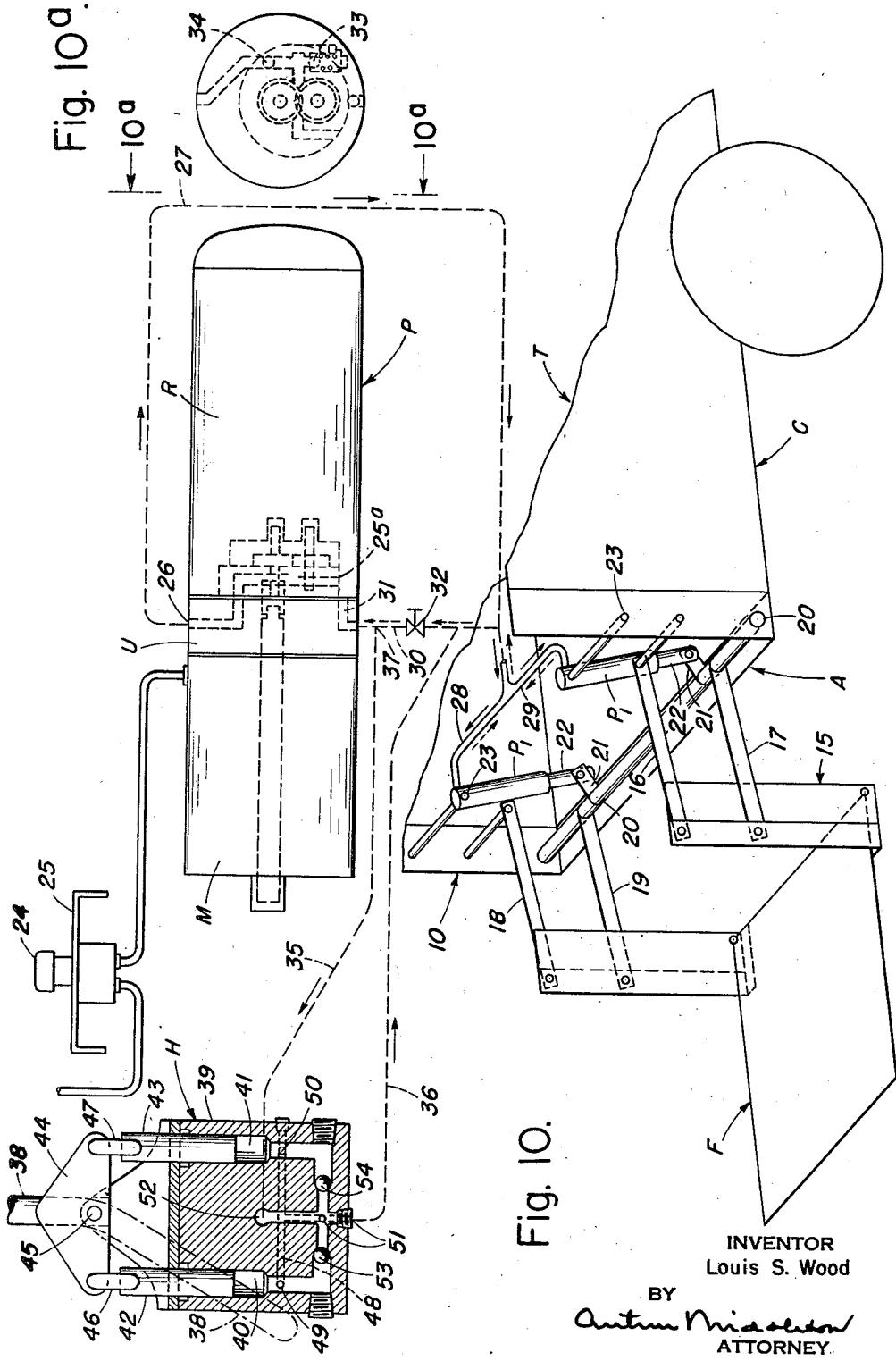


Fig. 10.

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TAIL GATE MECHANISM FOR TRUCKS

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Fig. 1.

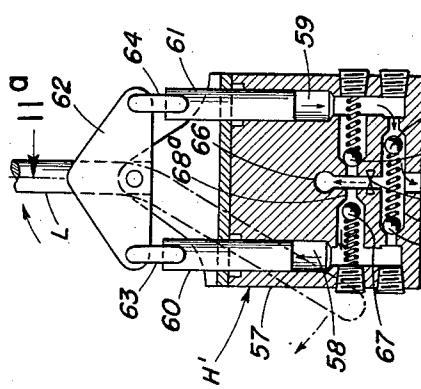
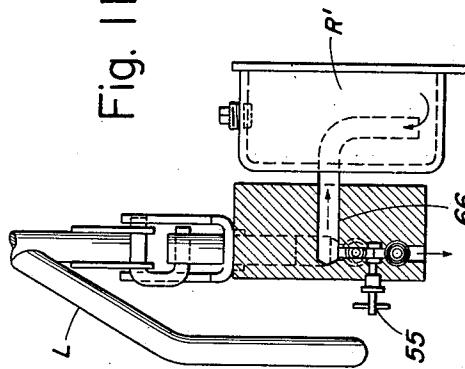
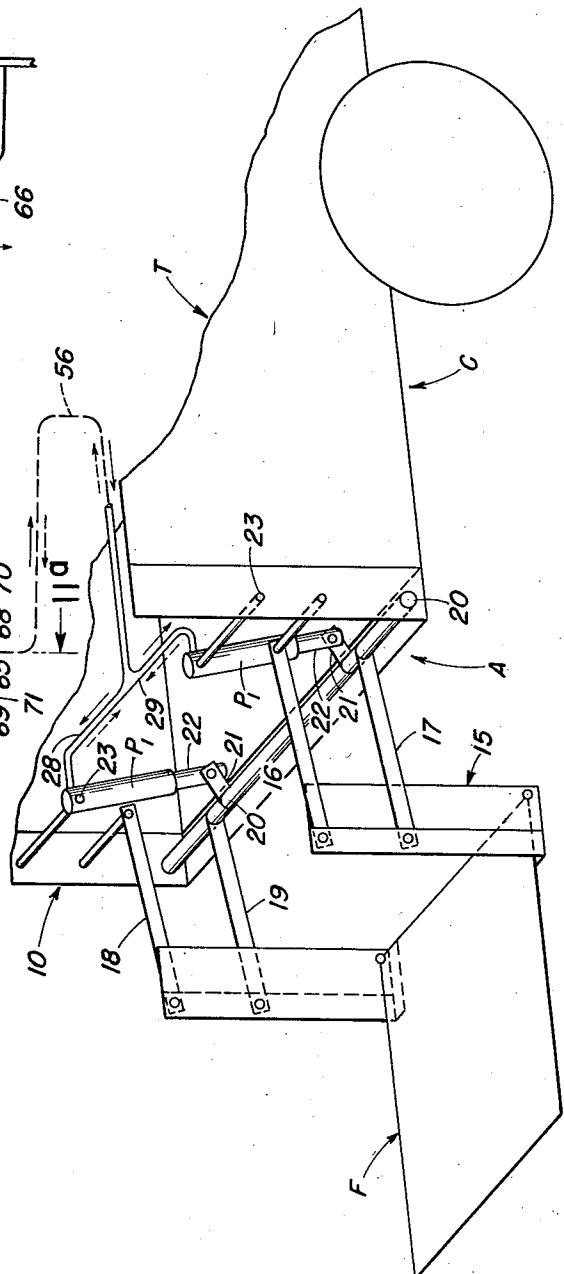


Fig. I.



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TAIL GATE MECHANISM FOR TRUCKS

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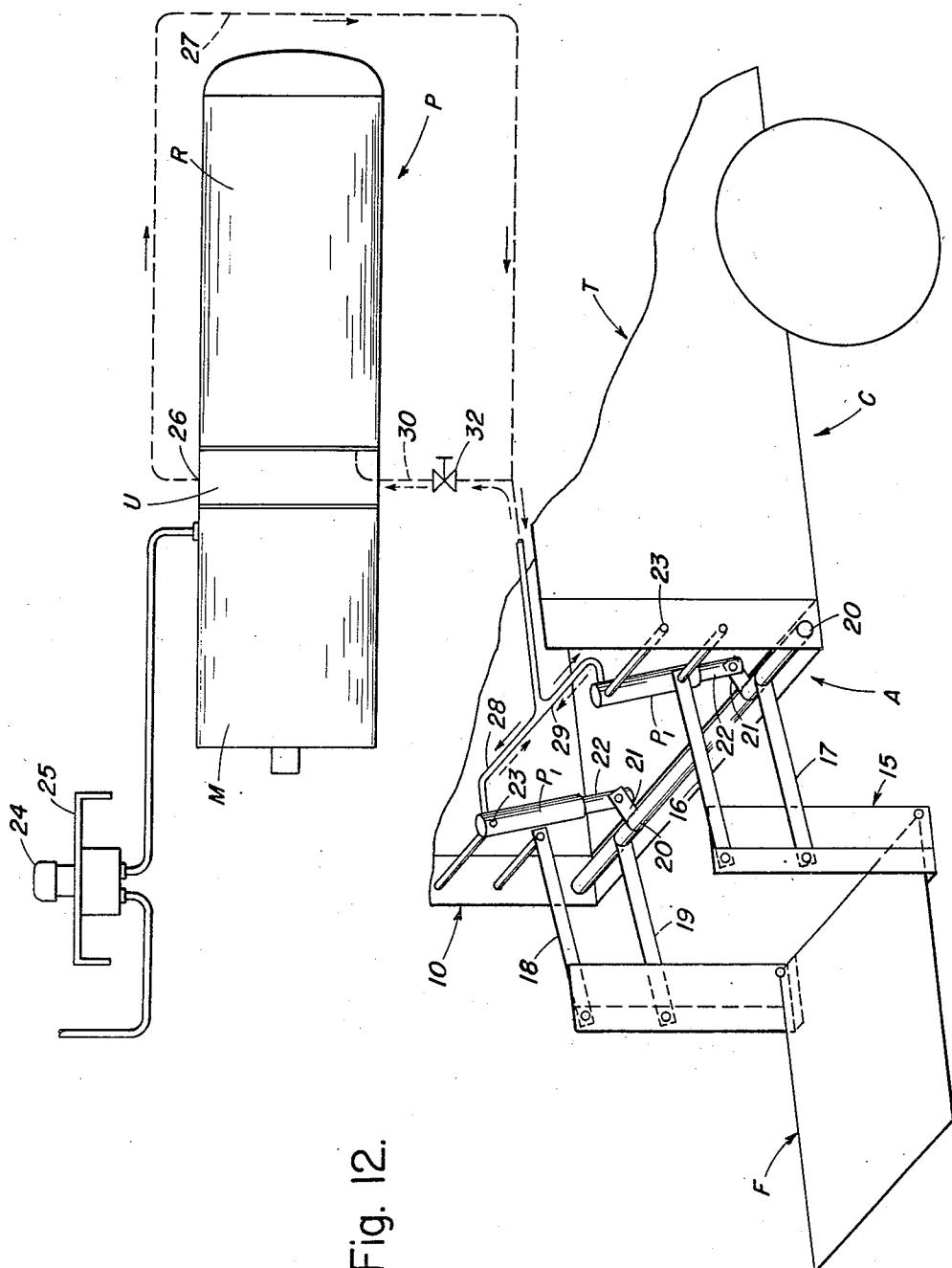


Fig. 12.

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TAIL-GATE MECHANISM FOR TRUCKS

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Application January 17, 1952, Serial No. 266,809

10 Claims. (Cl. 214—77)

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This invention relates to power-actuated loading and unloading apparatus for trucks, of the type known as power-actuated tailgate mechanisms. In such mechanism a tailgate member is swingable up and down about a horizontal axis so as to close or open the rear end of the box body of a truck, with the gate member constituting the vertical rear end wall of the body when closed, while when open it forms a horizontal rearward platform-like extension of the box bottom. Power-actuated mechanism is provided whereby the platform can be lowered parallel to itself to ground level to present a low ramp for convenient and expeditious loading, and then be elevated back to box bottom level to allow the elevated load to be conveniently pushed onto the bottom proper, such power-actuated mechanism herein being termed the platform elevating mechanism, or briefly the elevating mechanism. With such mechanisms manual labor in the loading or unloading operation is required only for moving the load horizontally on and off the platform, while vertical movement of the loaded platform as in raising and lowering is effected by the powered elevating mechanism.

This invention is an improvement over known truck loading apparatus in which hydraulic power cylinder means for actuating the elevating mechanism is supplied with pressure fluid medium such as pressure oil from a pump which is driven by the truck engine and is disposed underneath the truck body together with other components of the hydraulic system such as pipes, connections, and oil reservoir, the engagement and disengagement of the pump drive as well as the control of the power cylinder and thus of the elevating mechanism having heretofore been effected by control valve devices operable from the cab of the truck. This invention is an improvement over such known power-actuated tailgate loading and unloading apparatus or platform-elevating apparatus in which the accessories are spread between the front and the rear end of the truck, and which apparatus is thus more or less integrated with or involved in the general construction of the truck and thus dependent upon certain structural environment within the truck as a whole, that is, dependent upon the arrangement and driving facilities offered by the engine, and dependent upon the chassis frame, as well as dependent upon the truck body and upon the cab, all in relation to one another.

Such platform loading apparatus as heretofore employed was therefore relatively expensive and

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complicated to embody and install in a truck requiring special provisions and design considerations, while its under-the-chassis accessories were spread out between the front and the rear of the truck and relatively inaccessible yet relatively exposed to damage from underneath and difficult to inspect and to service. Under such conditions only relatively large and heavy trucks have heretofore been thus equipped while lighter trucks of standard make have had to do without the convenience and expediency offered by such labor-saving powered loading equipment.

It is among the objects of this invention to provide loading equipment of the power-actuated tailgate type mountable upon trucks of standard make which lack the environment for installing or embodying such equipment in the heretofore accepted manner above indicated; to provide power-actuated platform-loading equipment so constructed that it can be applied to existing trucks rapidly with a minimum expenditure of labor, without requirement of any special skills, and substantially without alteration of any part of a standard make truck not originally constructed for the embodiment therein of such equipment; and to provide such platform-loading equipment that is altogether readily accessible for servicing and inspection, that is extremely compact when assembled rather than spread out, that may be shipped compactly pre-assembled inclusive of accessories and when installed is substantially confined with all accessories and control means to the rear end of the truck, and that can be conveniently operated from the rear of the truck where the loading takes place rather than from the cab.

To attain these objects in a broad sense, this invention provides tailgate loading apparatus including electrically powered hydraulic actuating means whereby the actuation, that is, the lowering and raising of the platform, is rendered independent of any mechanical driving connections with the engine as well as independent of control from the cab, and which makes it possible to confine the apparatus with all its accessories to the rear end of the truck.

More particularly, to attain these objects, this invention provides a self-contained power-actuated tailgate unit attachable to the open rear end of the box body, the unit comprising all operation components and accessories, to wit, a tailgate or platform, an elevating mechanism or parallel motion device for the platform, a hydraulic operating system for the elevating mechanism complete with pump, power cylinder

means, pressure oil lines, oil reservoir, and a manually operable control valve unit, and furthermore significantly an electric motor for driving the pump and adapted to be supplied with electric energy as from the truck battery or other suitable source of electric energy. The self-contained power-actuated unit according to this invention also includes adaptor structure whereby it is attached to and mounted upon the open and unencumbered rear end of the truck body with no need to rely upon the chassis or engine environment or the cab of the truck.

According to one feature the attachable self-contained platform-loading unit comprises a first upright U-shaped adaptor frame to be fastened as by means of adaptor or bracket plates to the open rear end of the box body, and a second upright also U-shaped frame carrying swingable thereon the tailgate member or platform, which second frame is cooperatively associated with and movably interconnected with the adaptor frame by power-actuated elevating mechanism for lowering and raising the platform through the operation of hydraulic power cylinder means and a hydraulic control system therefor. Notably, there is mounted upon the adaptor frame and carried thereby a self-contained hydraulic power unit herein also termed hydraulic power package for actuating the elevating mechanism, which power package contains an oil reservoir, a motor and motor-driven pump for delivering pressure fluid to the power cylinder means characteristically also mounted upon the adaptor frame. A manually operable spare pump for the hydraulic system is associated with the power package, so that the motor-driven pump or the spare pump can be selectively operatively connected with the oil reservoir of the power package.

In one embodiment the elevating mechanism is in the nature of a parallel-link mechanism comprising a pair of parallel links for each side, each pair consisting of an upper and a lower link, each pair of links having a hydraulic power cylinder unit operatively engaging it with both cylinders actuated in unison by the power package governed by the control valve unit. That is to say, each lower link has an arm extending from its inner end to which is pivotally connected the outer end of the plunger of a respective power cylinder, the cylinder itself extending substantially upwardly along a respective side of the adaptor frame and has its upper end pivotally mounted thereon. Pressure oil pipe conduits extend between the hydraulic power package and the hydraulic cylinders in closely hugging relationship with respect to the adaptor frame and largely protected and concealed thereby.

In summary, this invention provides power-actuated tailgate loading apparatus having electrically powered hydraulic actuating means, which apparatus is attachable to the open rear end of the box body of a truck by means of an adaptor frame fastened to the walls of the body, whereby the apparatus and all accessories, including manually operated pump, and control means are confined to the rear end of the truck.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristic thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the

meaning and range of equivalency of the claims are therefore intended to be embraced therein.

In the drawings:

Figures 1 to 4 are semi-diagrammatic operational side views of the tailgate mechanism embodiment that comprises a power package, Figure 1 showing the loading platform after it has been lowered to the ground, Figure 2 showing the loading platform half raised, Figure 3 showing the loading platform fully raised to a level with the bottom of the truck body, and Figure 4 showing the platform swung upwardly to body-closing position.

Figure 5 is an end view of Figure 1.

Figure 6 is a top view of Figure 5.

Figure 7 is a perspective view of the tailgate mechanism of Figure 1 with hydraulic power package, although detached as a unit from the truck body, showing bracket plate for attachment of the unit to the body.

Figure 8 shows a view of the mechanism similar to Figure 1, self-contained although equipped with only a hand pump for actuating the power cylinders.

Figure 9 shows a view of the mechanism similar to Figure 1, self-contained and equipped with hydraulic power package as well as with hand-actuated pump for optional use of either the one or the other.

Figure 10 is a diagrammatic and functional view of the tailgate mechanism and of the hydraulic operating system therefor, represented by the hydraulic power package as well as by a hand-operated pump corresponding to Figure 9.

Figure 10a is an end view on line 10a—10a of the power package.

Figure 11 is a diagrammatic and functional view of the tailgate mechanism and of the hydraulic operating system therefor, the hydraulic system being represented by a hand-operated pump corresponding to Figure 8.

Figure 11a is a sectional side view on line 11a—11a of the hand pump of Figure 11.

Figure 12 is a diagrammatic and functional view of the tailgate mechanism and of the hydraulic operating system therefor, the hydraulic system being represented by a hydraulic power package corresponding to Figures 1 to 7.

The loading apparatus shown in Figures 1 to 6 comprises parts which are largely identifiable also in the perspective view of the apparatus unit shown in Figure 7, like parts being designated as far as possible by like numerals.

The attachable loading apparatus collectively designated by the letter A comprises as a basic element a vertical adaptor frame 10 in the form of a vertical U-shape fastened to the open rear end of the box body of a truck T the chassis of which is indicated at C. The bottom face of the box body is indicated at B.

The adaptor frame 10 is fastened to the bottom of the truck bottom as by means of bottom bracket plate 11 and by means of a pair of side bracket plates 12 and 13. The plate 11 extends fixedly from the bottom portion 10a of the adaptor frame and rests upon and is supported by and fastened to the bottom B of the body, while the plates 12 and 13 extend fixedly from the upright portions or sides 10b and 10c of the adaptor frame and are fastened to corresponding sides S₁ and S₂ of the truck body, such fastening being indicated as by rivets 14 or the like. The legs 10b and 10c of the U-shaped adapter frame are of a box-like structure, each as best seen in Fig. 1, having a wall 10d facing

the interior of the truck body and oppositely facing walls 10^e with connecting walls 10^f. The oppositely facing walls 10^e are shorter in length than the inner facing walls 10^d.

Mounted upon and carried by the adaptor frame 10 is a platform-carrying elevating mechanism complete and self-contained, that is inclusive of a hydraulic power package P further described below, for lowering and raising a loading platform F. The mechanism comprises a second vertical U-shaped frame 15 unitary with the platform F and movably connected to the adaptor frame 10 by means of two pairs of parallel links, namely, one pair of links 16 and 17 at one side and another pair of links 18 and 19 at the opposite side. Thus there is a pair of upper links 16 and 18, and a pair of lower links 17 and 19, both of the lower links being swingable about a transverse axle 20 mounted in and carried by the transverse body portion of the U-shaped adaptor frame 10. Each of the lower links thus has a stationary pivot end at axle 20, and each of these lower links has extending from the stationary pivot end a short rigid arm 21 to which is pivotally connected the lower or outer end portion of the plunger 22 of a hydraulic power cylinder P₁, one such power cylinder being provided at and along each side of the adaptor frame 10 with the upper end of the cylinder having a pivotal mounting 23 upon a respective upright side portion of adaptor frame 10. The power cylinders P₁ are housed within the box-like formation of the upright members of the U-shaped adapter frame and are partially protected by the walls of the box. The power cylinders, however, extend beyond at least one of the walls of the box structure so that the power cylinder and its piston 22 may be accessible for repair thereof. Thus by the operation of the parallel links mechanism as actuated by the two power cylinders P₁ the frame 15 can be bodily lowered and raised parallel to itself as between the level of the bottom B and ground level G, the respective lowered and raised positions of the frame, and thus of the loading platform F being shown in Figures 1 and 3 respectively. That is to say, when the plungers of the power cylinders are held extended the loading platform will be flush with bottom B; retracting the plungers will lower the platform through intermediate position (Figure 2) to ground position (Figure 1).

The hydraulic power package P shown in Figures 1 to 7 as well as in Figure 9 comprises a motor M, a pump U, and an oil reservoir R. A control push button switch for starting and stopping the motor M of the power package is indicated at 24 mounted by means of bracket 25 upon the adaptor frame 10. There are various pipes and valves operatively connecting the power package with the power cylinders (not shown) in Figures 1 to 7 but diagrammatically shown and described below in Figure 12 along with a more detailed description of power package P.

In distinction from the Figures 1 to 7 embodiment, the Figure 8 embodiment omits the hydraulic power package and shows instead the use of a hand-operated pump H which is more fully described along with the operating system in the diagrammatic Figure 11, whereas Figure 9 presents an embodiment showing the provision of an hydraulic power package P as well as of a hand-operated pump H to be used optionally instead of the power package P, details of such alternative operation being shown in diagrammatic Figure 10 described below.

Description and operation of the operating systems in Figures 10, 11, 12

In the combination of hand pump H and power package P in Figure 10 the operation of the power package will first be described, while connections between the hand pump and the power cylinders may be considered inactive.

Pump U of the power package is shown to be in the nature of a rotary gear pump driven by the motor M. The pump has an inlet 25^a whereby it draws oil from reservoir R, and an outlet 26 for delivering pressure oil simultaneously to both power cylinders P₁ as by way of oil pipe 27 and a pair of branch pipes 28 and 29. An oil return pipe 30 connects pipe 27 with an inlet passage 31 in the pump unit U through which passage oil from the power cylinders may be released into the reservoir by way of a control valve 32 provided in return pipe 30.

That is to say, with the motor and pump running, if the control valve 32 is closed oil being drawn by the pump from the reservoir will be delivered under pressure through lines 27, 28, 29 into the power cylinders P₁ so as to extend the plungers 22 thereof downwardly thereby acting upon lever arms 21 in a manner to raise the U-shaped frame 15 with platform F until the platform reaches the level of the box body, when continued oil pressure delivered by the pump will be released as by way of a ball relief valve 33 shown in the Figure 10^a view of the pump. The pump has a ball check valve 34 at its delivery end which holds the oil pressure in the power cylinders unless relieved by opening of the control valve 32 whereby the platform F will be lowered as oil from the cylinders is being displaced and returned to the reservoir through passage 31 due to the weight of frame 15 and platform F acting to retract the plungers 22 of the power cylinders. In other words, when the platform F is to be raised from its ground level position to body level position, valve 32 is closed and motor and pump are started by push button switch 24 to supply pressure oil to the power cylinders by way of ball check 34. When the fully raised position is reached, the continued supply of pressure oil will be diverted through relief valve 33 into the reservoir until motor and pump are stopped, while pressure remains in the cylinders to uphold the platform in its raised position as the valve 32 remains closed. If the platform is to be lowered, it is only necessary to open the valve 32 to allow the pressure oil from the cylinders to escape through return line 30 into the reservoir.

In the Figure 10 system, the hand pump H may be used instead of the power-driven rotary gear pump U, for instance in case the supply of electrical energy for the pump motor should fail. With the control valve 32 closed the hand pump will draw oil by way of a pipe or suction line 35 and the passage 31 from reservoir R, while delivering pressure oil as through a pipe or pressure line 36. That is to say, pipe 35 joins pipe 30 as at point 37 at one side of valve 32, while the pipe 36 joins pipe 30 at the other side of valve 32. Thus if pump H is manually actuated as by reciprocating a hand lever 38 with valve 32 closed, such manual actuation will raise the platform F from its ground level position to body level position and hold it there while continued supply of pressure is relieved through suitable relief valve into the reservoir until actuation of the pump is stopped. The hand pump, of course, has a suitable check valve for one-way passage therethrough of pressure oil to the cyl-

inders. If platform F is to be lowered, all that is necessary is to open control valve 32 so that oil from the cylinders may escape through branches 28 and 29, through part of pipe 27 and through return pipe 30 and passage 31 into the reservoir. The hand pump H is semi-diagrammatically indicated in Figure 10 as comprising a pump housing 39, a pair of cylinders 40 and 41 with plungers 42 and 43 respectively reciprocable in complementary fashion by a tiltable beam 44 pivotally mounted at 45 upon housing 39 and connected to the plungers by means of links 46 and 47 respectively. As the lever 38 is rocked or oscillated by hand the plungers will alternately force pressure oil through a common passage 48 in the housing and through a pair of ball check valves not shown but indicated by port openings 49 and 50, and out at 51 into the pressure line 36 to the cylinders, while oil is being drawn from reservoir R through passage 31, suction line 35, port 52 and through a pair of ball check valves 53 and 54.

In the Figure 11 embodiment of the operating system the power cylinders P₁ are shown to be supplied with pressure oil solely from a hand pump unit H'. By oscillating the hand lever L of this pump unit oil is drawn from a reservoir R' unitary with the pump, while with a control valve 55 in this unit kept closed pressure oil is delivered by this pump through a line 56 and branches 28 and 29 to the power cylinders P₁, to effect raising of platform F from ground level to body level. In order to effect lowering the platform from body level to ground level it is only necessary to open the valve 55 which is in the nature of a needle valve, so that pressure oil from the cylinders may be released for escape through line 56 into the reservoir as in sinking the weight of the platform structure in effect expels the oil from the cylinders.

The hand pump H' appears similar to the hand pump H of Figure 10, although differing somewhat with respect to the arrangement of ports and check valves therein as well as with respect to the arrangement of the reservoir R'. That is, the pump H' comprises a housing 57 having a pair of cylinders 58 and 59 in which operate plungers 60 and 61 respectively. The plungers are connected to respective ends of beam 62 as by means of short links 63 and 64, the beam being rockable by oscillating the hand lever L. If the control valve 55 is closed so as to close a port or passage 65, then the plungers 60 and 61 will draw oil from the reservoir R' through a passage 66 and by way of a pair of ball checks 67 and 68 in a passage 68^a, and will deliver it by way of another pair of ball checks 69 and 70 provided in a passage 71 through line 56 and branches 28 and 29 to the power cylinders P₁, to effect raising of the platform F from ground level position to body level position. In order to lower the platform it is only necessary to open the control valve 55 so that oil from the cylinders or from the pressure side of the pump may escape into reservoir R', namely by short circuiting from passage 71 past the valve 55 to passage 66 leading into the reservoir. In a practical embodiment of this invention this reservoir R' is disposed inside the associated hollow upright portion 10^b of the U-shaped adaptor frame 10.

The Figure 12 embodiment of the operating system differs from that of Figure 10 in so far as it is shown to rely solely upon the functioning of the power package P without making provision

for a hand-operated spare pump to be associated with the power package. However, the operation of the power package in Figure 12 is taken by itself the same as the operation of the power package P in Figure 10, so that its description in the Figure 12 embodiment need not now be repeated.

What I claim is:

1. The combination of a truck having a box body with power-actuated loading apparatus of the tail-gate type with the tail-gate serving as a loading platform, and for the bottom of the body, a platform-carrying vertical frame comprising a first upright U-shaped frame substantially corresponding to the cross-sectional shape of the box body and fastened to the rear end thereof, each leg of the U-shaped frame being of a box-like formation having a wall facing the interior of the truck body, an oppositely facing wall and connecting walls, some of the walls being shorter in length than the other walls, a second upright U-shaped frame carrying the platform and in parallelism with the first frame with parallel motion means operatively interconnecting said frames, an elevating mechanism comprising hydraulic cylinder means mounted within and supported by the respective legs of the first frame and partially protected by the walls but extending beyond at least one of the walls and connected to and actuating the parallel motion means, a power driven pump connected to the hydraulic cylinders, a fluid reservoir associated with the pump, manually actuated control means for controlling the operation of the cylinders, means for controlling the power drive, an electric motor for driving the pump, and the pump, reservoir and motor being mounted upon and supported by one of the legs of the first frame.

2. The combination of a truck having a box body with power-actuated loading apparatus of the tail-gate type with the tail-gate serving as a loading platform, and for the bottom of the body, a platform-carrying vertical frame comprising a first upright U-shaped frame substantially corresponding to the cross-sectional shape of the box body and fastened to the rear end thereof, each leg of the U-shaped frame being of a box-like formation having a wall facing the interior of the truck body, an oppositely facing wall and connecting walls, some of the walls being shorter in length than the other walls, a second upright U-shaped frame carrying the platform and in parallelism with the first frame with parallel motion means operatively interconnecting said frames, an elevating mechanism comprising hydraulic cylinder means mounted within and supported by the respective legs of the first frame and partially protected by the walls but extending beyond at least one of the walls and connected to and actuating the parallel motion means, a power driven pump connected to the hydraulic cylinders, a fluid reservoir associated with the pump, manually actuated control means for controlling the operation of the cylinders, means for controlling the power drive, an electric motor for driving the pump, and the pump, reservoir and motor constituting a single unit and being mounted upon and supported by one of the legs of the first frame.

3. A tailgate type loading mechanism adapted for attachment to a box body of a truck in which the tailgate constitutes a loading platform, comprising a vertical U-shaped adaptor frame adapted to be fastened to the open end of the box body, each leg of the U-shaped frame being of a box-

like formation having a wall facing the interior of the truck body, an oppositely facing wall and connecting walls, some of the walls being shorter in length than the other walls, a second U-shaped vertical frame carrying the platform, parallel link elevating mechanism operatively interconnecting said frames, a pair of hydraulic power cylinders one housed in each leg of the adaptor frame partially protected by the walls but extending beyond at least one of the walls for actuating the elevating mechanism; a hydraulic pump, a motor therefor, and a reservoir for operating the power cylinders and mounted upon and carried by one leg of the first U-shaped frame.

4. The mechanism according to claim 3, with the addition of hand pump means operatively associated with said power cylinders and also mounted upon and carried by one leg of the first U-shaped frame.

5. The mechanism according to claim 3, in which the pump, the motor, and the reservoir constitute a package unit.

6. The mechanism according to claim 3, with the addition of hand pump means operatively associated with said power cylinders, said hand pump means, said pump, said motor and said reservoir constituting a package unit.

7. A tailgate type loading apparatus adapted for attachment to a box body of a truck in which the tailgate constitutes a loading platform, comprising a vertical U-shaped adaptor frame adapted to be fastened to the open end of the box body, each leg of the U-shaped frame being of a box-like formation having a wall facing the interior of the truck body, an oppositely facing wall and connecting walls, some of the walls being shorter in length than the other walls, a second U-shaped vertical frame carrying the platform, parallel link elevating mechanism operatively interconnecting said frames, a pair of hydraulic power cylinders one carried within each leg of the adaptor frame partially protected by the walls but extending beyond at least one of the walls for actuating the elevating mechanism, hydraulic pump means and a reservoir for operating the power cylinders and mounted upon and carried by one leg of the first frame.

8. Apparatus according to claim 7, in which the pump means comprise a hand-operated pump.

9. A tailgate type loading apparatus adapted for attachment to a box body of a truck in which the tailgate constitutes a loading platform, comprising a vertical U-shaped adaptor frame having bracket plates extending from the bottom

portion and from the sides of the adaptor frame for attachment to the bottom and the sides of the body, each leg of the U-shaped frame being of a box-like formation having a wall facing the interior of the truck body, an oppositely facing wall and connecting walls, some of the walls being shorter in length than the other walls, a second U-shaped vertical frame carrying the platform, parallel link elevating mechanism operatively interconnecting said frames, a pair of hydraulic power cylinders one housed in each leg of the adaptor frame partially protected by the walls but extending beyond at least one of the walls for actuating the elevating mechanism, and actuating means for the power cylinders, the actuating means being mounted upon and carried by one leg of the first frame.

10. A tailgate type loading mechanism adapted for attachment to a box body of a truck in which the tailgate constitutes a loading platform, comprising a vertical U-shaped adaptor frame adapted to be fastened to the open end of the box body, each leg of the U-shaped frame being of a box-like formation having a wall facing the interior of the truck body, an oppositely facing wall and connecting walls, some of the walls being shorter in length than the other walls, a second U-shaped vertical frame carrying the platform, parallel link elevating mechanism operatively interconnecting said frames, a pair of hydraulic power cylinders one housed in each leg of the adaptor frame partially protected by the walls but extending beyond at least one of the walls for actuating the elevating mechanism, a power-driven hydraulic pump, a motor therefor, a reservoir for operating the power cylinders and mounted upon and carried by one leg of the first frame, a hand-operated hydraulic pump, and means for selectively operatively associating said power-driven pump or said hand-operated pump with said reservoir.

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