July 2, 1946. W. C. FRANCIS 2,403,356

HYDRAULIC LIFT ASSEMBLY ATTACHMENTS

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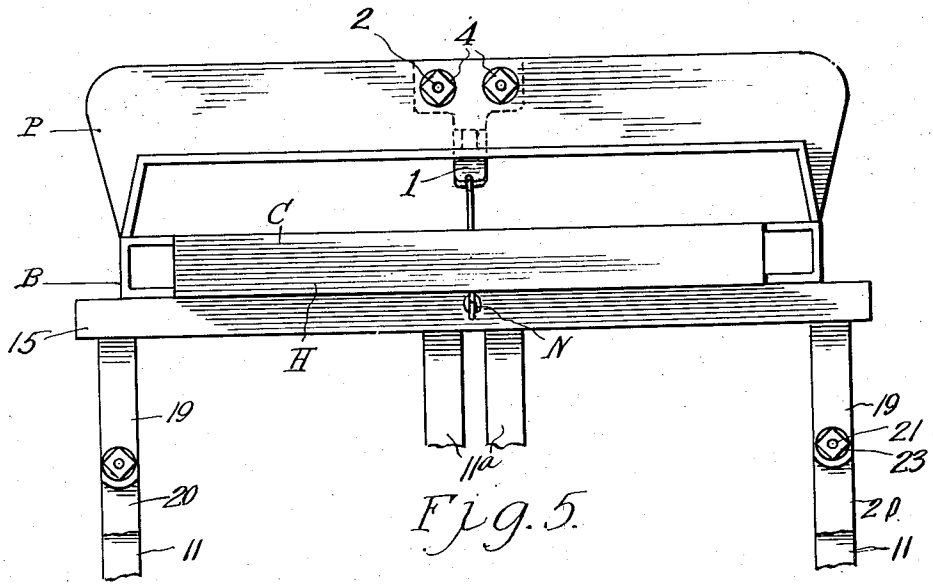


Fig. 5.

Fig. 1.

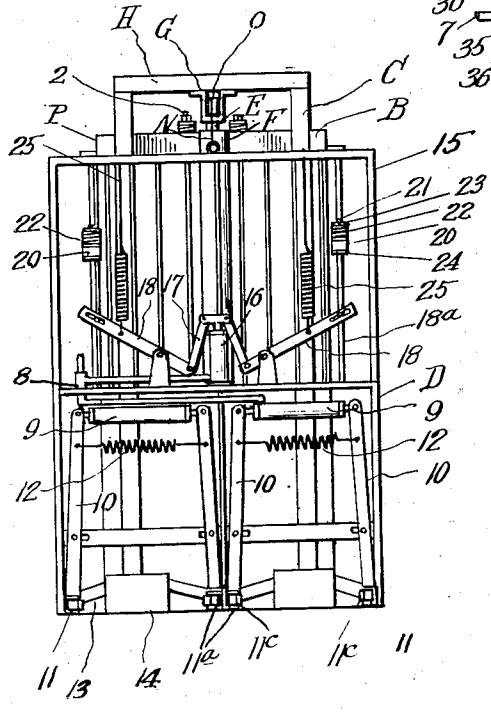


Fig. 14.

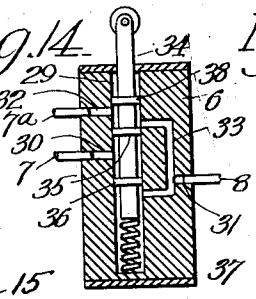


Fig. 15.

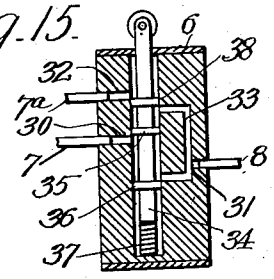
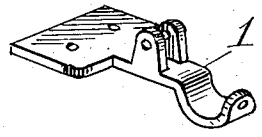


Fig. 6.



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HYDRAULIC LIFT ASSEMBLY ATTACHMENTS

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Fig. 2.

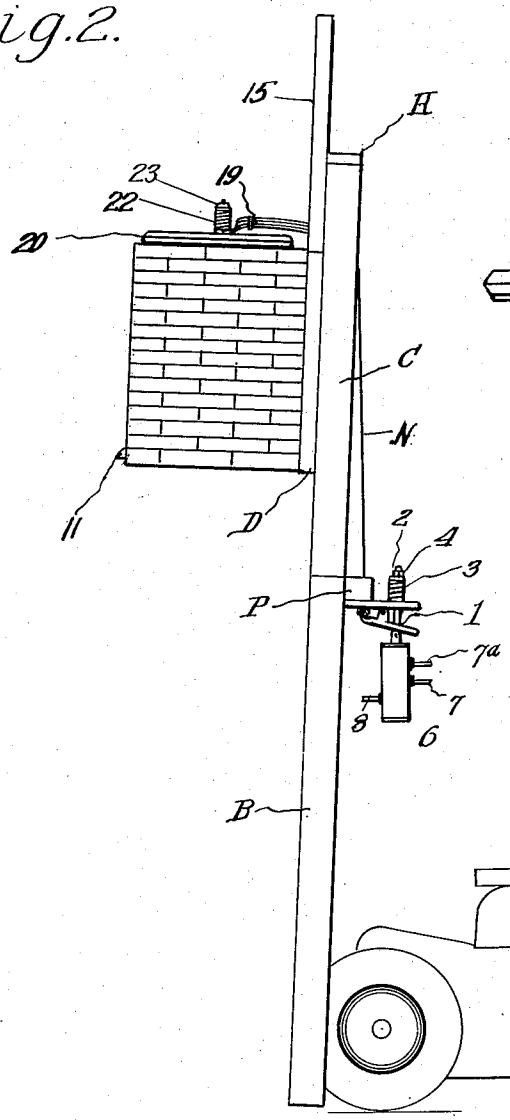


Fig 8.

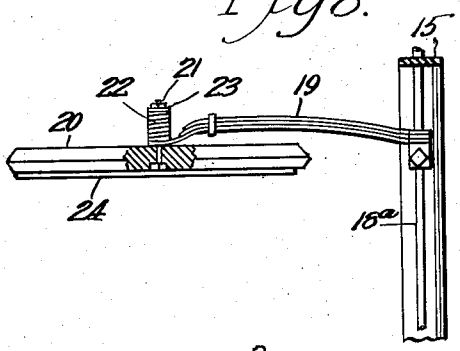
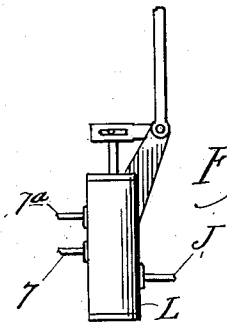
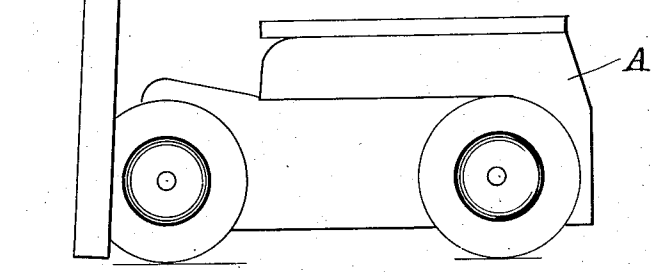


Fig. 9.





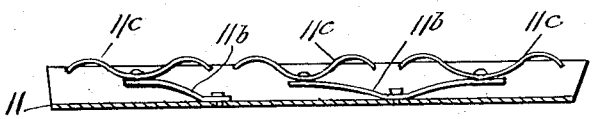


Fig. 10.

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Fig. 7.

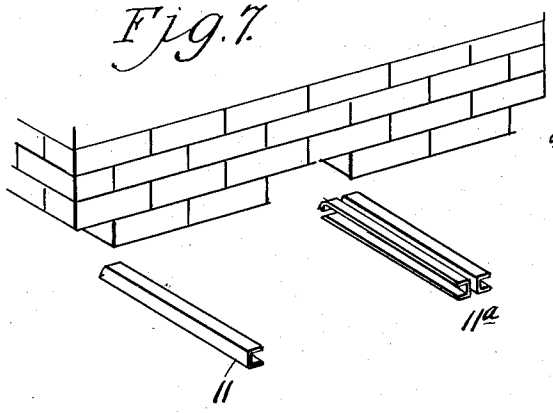


Fig. 4.

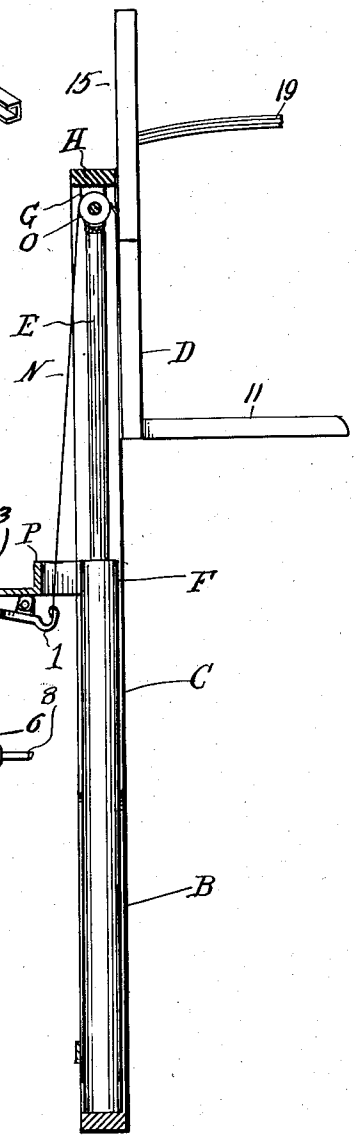
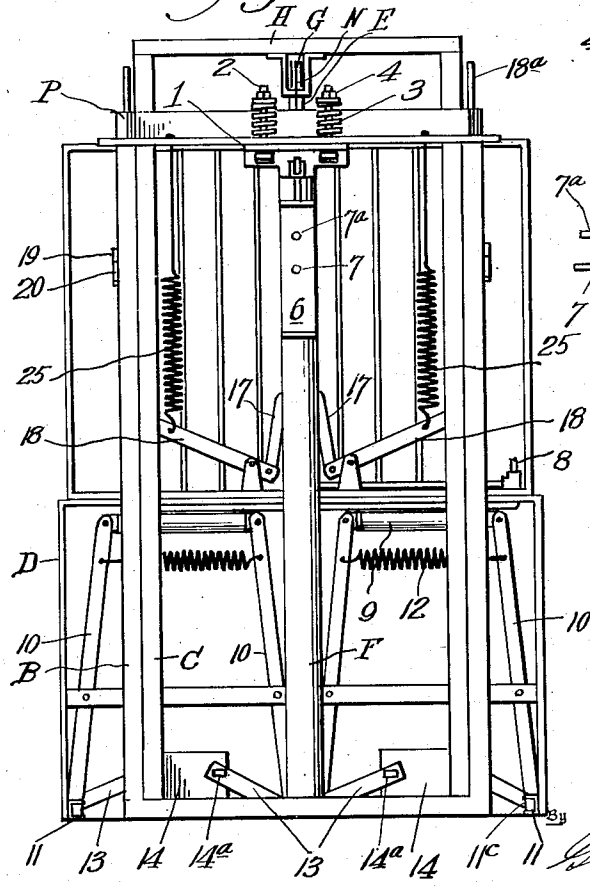


Fig. 3.



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HYDRAULIC LIFT ASSEMBLY ATTACHMENTS

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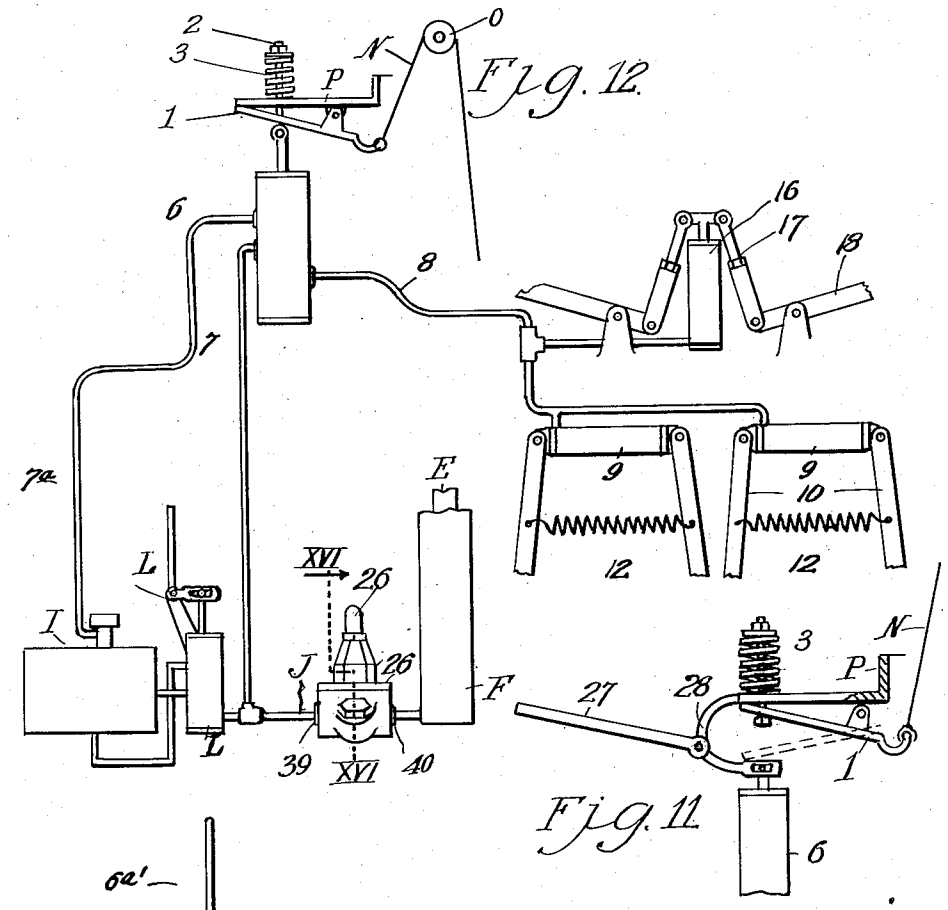


Fig. 12.

Fig. 11.

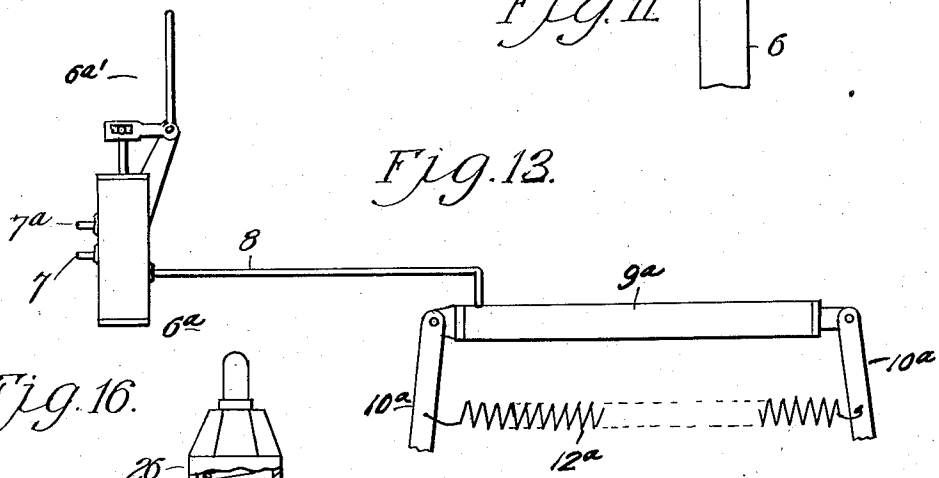


Fig. 13.

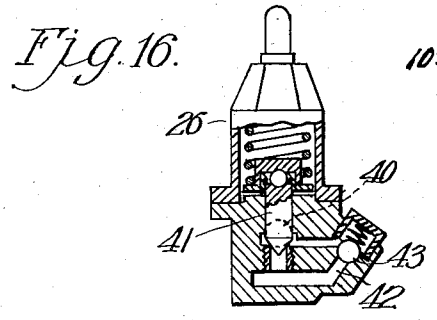


Fig. 16.

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Patented July 2, 1946 2,403,356

UNITED STATES PATENT OFFICE

2,403,356

HYDRAULIC LIFT ASSEMBLY ATTACHMENTS

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Application May 14, 1945, Serial No. 593,694

7 Claims. (Cl. 214—65.2)

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This invention relates to a class of machines for lifting, conveying and depositing heavy loads, machines for example, of the character of the well-known "Hyster" lift trucks, comprising an automotive tractor provided with hydraulically-operated equipment for picking up and conveying a load to and depositing it on the ground or other support—such as another load or the floor of a box car—all such trucks, as far as my knowledge extends, requiring the use of pallets or skids, which in time, necessitate the use of manual labor for unloading purposes if the load is composed of loose units, such as a symmetrical stack of bricks or tiles, especially if the units must be restacked for conservation of space, as usually required for transportation in box cars.

The object broadly, is to produce an attachment for lift trucks of conventional type, such as the "Hyster," whereby loads may be picked up at ground or higher level, conveyed to the point desired, and deposited at ground or higher level upon a selected support, without the use of pallets or skids, and regardless of whether the load is a large single unit or a stack of loose units, and in the latter case with the stack intact to avoid the use of manual restacking labor.

More specifically, my object is to produce an attachment for a lift truck in which the customary fixed load-apron arms for underlying a pallet or skid on which the load is mounted, are replaced by laterally-movable arms for applying lateral compressive force or pressure on the load an instant prior to the starting upward of said arms with the load-apron under the power of the customary lift-mechanism of the truck, and in which the lateral movement of said arms is instantly reversed after the load has been deposited upon and is sustained by the selected support.

Another object is to provide a lift-truck having hydraulic power equipment for load-lifting and sustaining purposes, and laterally-movable arms for gripping an interposed load, with a valve for automatic opening immediately the strain of lifting the load is started, to supply hydraulic pressure for effecting gripping action on the load by said laterally-movable arms, and for automatically closing to cut off said pressure by said arms, the instant the load apron is relieved of the weight of the load.

Another object is to provide springs to be tensioned by hydraulic pressure applied to effect the gripping action or movement of said arms, for reversing the movement of the arms, the instant the fluid under pressure is cut off by the reclosure of the valve through which the fluid under pressure passed to effect the gripping action of the arms.

A further object of the invention is to produce an attachment in which the load apron of the truck, is equipped with duplicate sets of outer

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and inner arms for supplying compressive force on the bottom course of a stack of loose units arranged at the bottom with channels at the sides of a central channel, the side channels to receive the outer arms for applying force inwardly on the opposite sides of the bottom course of the stacked units, and the central channel to receive the inner arms to apply force outwardly on the units of such course interposed between such arms and the respective or companion outer arms.

Another object of the invention is to provide a lift-apron equipped with duplicate sets of laterally-movable outer and inner arms, with a set of vertically-movable arms for applying pressure downward on the top of a stack of loose units concurrently with the clamping action of the laterally-movable arms on the stack, and for withdrawing from the top of the stack simultaneously with the unclamping action of the laterally-movable arms.

A still further object of the invention is to provide a conventional lift-truck of the type mentioned, in conjunction with its main line hydraulic system for the operation of its lifting-mechanism, with a branch of the main line, containing an hydraulic cylinder and a controlling valve for the branch, the valve being normally closed to cut off the flow of fluid from the main line to the cylinder but adapted when open, to supply fluid under pressure to the cylinder to effect expansion thereof, the valve when reclosed after supplying fluid to the cylinder, providing a path for back flow of fluid to permit retraction of the cylinder.

Another object is to provide the load-apron of a lift truck, with arms for yieldingly applying uniform pressure for their full length upon an interposed object to be lifted, to compensate for slight irregularities in the shape or the surfaces of the object where contacted by said arms.

With the objects mentioned in view, the invention consists in certain novel and useful features of construction and organization as hereinafter described and claimed; and in order that it may be fully understood, reference is to be had to the accompanying drawings, in which:

Figure 1 is a front view of a lift-truck equipped with an attachment embodying the invention as designed for handling a substantially flat-sided and flat-topped stack of loose units, such as brick or tile, the load apron of the truck occupying its initial or depressed position.

Figure 2 is a side elevation of the lift truck with the load apron in elevated position.

Figure 3 is a rear view of the upright framework of the truck, with the load apron disposed in depressed position.

Figure 4 is a view partly in side elevation and partly in central vertical section, of the conventional lift-truck upright framework and

parts of the attachment applied to said framework, the load apron occupying its most elevated position.

Figure 5 is an enlarged top plan view of said framework partly in horizontal section and with parts of the attachment associated therewith.

Figure 6 is a perspective view of a trigger forming a part of one form of the attachment.

Figure 7 is a fragmentary perspective of the load apron lift-arms and of a stack of loose units formed with bottom and side channels to receive said arms.

Figure 8 is an enlarged fragmentary side view, partly in section, of the load-backing extension of the load-apron, and one of the snubbing arms for applying pressure downward on the upper side of a stack of loose units.

Figure 9 is a view of a manually-operable valve for controlling the flow of oil under pressure from the power unit and back flow of oil to the latter from the hoist cylinder.

Figure 10 is a longitudinal section of one of the laterally-movable gripping arms of the load-apron.

Figure 11 is a fragmentary view of the construction involving the use of a self-closing valve in an hydraulic system for lifting, conveying and depositing a one-piece load or multiple load which can be clamped between the arms, and of a lever whereby the valve may be opened by manual power to effect the clamping action of the lift arms on the load at any desired point in the height thereof.

Figure 12 is a schematic diagrammatic view of the hydraulic system conventional on lift trucks of the "Hyster" type, and the branch of such system forming a part of my attachment as arranged for use with a stack of loose units forming the load to be lifted.

Figure 13 is a similar view but with the branch of the system as arranged for use with a manually operable valve for control of the clamp arms.

Figure 14 is central vertical section of the branch line valve in normal or closed condition.

Figure 15 is a similar view with the branch line valve open to the flow of fluid under pressure from the power unit.

Figure 16 is a vertical section taken on the line XVI—XVI of Figure 12.

As most of the "Hyster" type lift-truck construction as essential for ready understanding of the attachment is shown (some parts diagrammatically), and briefly described, letter reference characters are applied thereto and number characters to the attachment parts.

Referring now to the drawings in detail, in which like reference identify like parts in all of the views, A is the tractor element of the lift truck, and pivotally carried at the front of the tractor as customary but not so shown, is a frame work which may be tilted forward or backward for load-balancing purposes. The framework comprises a member B and a member C for slidable movement upward and downward on member B. Slidable on member C, is the so-called load-apron D, which in the conventional type of lift-truck, has at its lower end a pair of rigid forwardly-projecting laterally-spaced lift arms (not shown), for underlying a pallet or skid (not shown) of common type which carries the load to be raised, conveyed and lowered. With constructions of this type all loads must rest on a pallet or skid or be otherwise raised above the floor since there is no means for lateral clamping of the load by inward movement of the lift arms.

The "Hyster" lift truck disclosed in this application, is equipped with a system for applying force hydraulically to lift, sustain, and lower the slidable member C and the load-apron D, and with means of block and tackle character, whereby the load apron moves upward with the member C, but at greater speed, so that when said member has been fully elevated, the load apron has also attained its highest point of adjustment, and both are lifted and sustained by the piston E of the hoist cylinder F of the truck. The piston bears against a bracket G secured to the underside of the top cross-bar H of member C.

The hydraulic system of the "Hyster" truck, comprises a power unit I, a tube J leading from the high side of the power unit to the lower end of the hoist cylinder, and a manually-operable valve L for said tube between the power unit and the hoist cylinder, the arrangement being such that by operating the handle of valve L rearward from its neutral or closed position, hydraulic fluid, such as oil, under pressure, passes from the high side of the power unit through tube J to the hoist cylinder to elevate member C and the load apron to the desired height. Swinging said valve handle in the reverse direction back to neutral position, holds said elevated parts against further movement, and results in reversing the flow, the oil passing back from the hoist-cylinder through valve L to the low side of the power unit to permit the member C and the load-apron to descend.

The valve L is of a conventional type known to industry under the name "Logan," and except that it is for manual operation, it is a duplicate of a self-closing valve hereinafter described, and shown by Figures 14 and 15 of the drawings. Valve L controls the flow in the hydraulic system for lifting and lowering the load-apron, and as no claim is made to it per se, it is disclosed only in elevation. For use as a part of my attachment, an oil pressure regulator valve, hereinafter identified, is applied to tube or line J, between the valve L and the hoist-cylinder, for a purpose hereinafter explained.

To accomplish the load-apron movement, a chain or cable N is trained over a sheave O, journaled in the bracket G depending from the cross-bar H at the top of member C, and is attached at its opposite ends to the load-apron and a cross-bar P at the upper end of the member B, and rearward of the line of travel of member C. The attachment of the chain to said cross-bar is conventional in the "Hyster" lift truck, and may be followed in the use of one arrangement of my attachment for handling one-piece loads, but where the load is in the form of a stack of loose units or consists of a receptacle for fragile articles, said end of the chain or cable is connected to a movable element identified in the following description. The said element may be used also in conjunction with a manually-operable lever for opening the self-closing valve hereinafter mentioned, and will be found desirable in the use of the attachment for handling packing cases or the like, containing fragile articles. One simple arrangement in which a lever is employed in conjunction with a self-closing or so-called automatic valve, appears in Figure 11. In this connection it should be understood that my attachment whether employed for handling one-piece

loads, such as packing cases or barrels, or stacks of loose units, includes a so-called delayed-action by-pass or pressure regulator valve, hereinafter described and known as a "Logan" valve to industry, and located on line J, between the control valve L and the hoist-cylinder, as by the use of such regulator valve, the various load apron arms are caused to properly engage the load prior to the actual start of the load-lifting operation by the hoist-cylinder piston.

The lift-truck as equipped with my attachment for lifting, conveying and depositing a load in the form of a symmetrical stack of loose units, such as bricks, tiles or the like, has a movable trigger 1, pivoted to and underlying the cross-bar P at the top of member B, and to the front end of the trigger, the adjacent end of the chain or cable N is attached. To hold the trigger inoperative in the event the load apron is raised when empty, a pair of bolts 2, extend up through the trigger, the cross-bar P and a pair of expansive coil springs 3, and are engaged at their upper ends by nuts 4, the springs being interposed between and engaging the nuts and cross-bar, to normally hold the trigger out of contact with the piston or plunger of an automatic or self-closing valve 6, adapted to be simultaneously closed against fluid under pressure and open to back flow of fluid to the low side of the power unit. The said valve is shown by Figures 14 and 15, and described in detail hereinafter.

Valve 6 is located on a branch line of the truck hydraulic system, and its intake port is connected by a tube 7 to the tube J, and its exhaust port is connected by a tube 7*a*, to the low side of the power unit. A tube 8 leads from a third port of the valve 6 to a pair of laterally-spaced hydraulic cylinders 9, mounted horizontally on the load-apron and pivotally connected at opposite ends to the upper ends of pairs of levers 10 fulcrumed upon the load apron and equipped at their lower ends with forwardly-projecting lift-arms 11 and 11*a*. The arms 11*a* are between the arms 11; the arrangement being such that arms 11 move inward and arms 11*a* outward upon expansion of said cylinders 9, and are reversely operated by retractile springs 12 connecting the outer and inner levers in pairs. As the arms are subjected to lifting heavy loads, they are braced by rigid arms 13 projecting back of rigid plates 14 of the load-apron, the arms 13 being equipped with rollers 14*a* to bear against said plates for minimizing friction.

The load-apron is provided with an upward extension 15 to form a backing for a load picked up by the lift arms, and secured vertically in fixed relation to said extension, is an hydraulic cylinder 16, to the lower end of which the tube 8 is connected. The upper end or piston of the cylinder is pivotally attached to a pair of links 17, pivotally attached respectively to a pair of levers 18, fulcrumed on the said extension, and having pivotal connection with a pair of vertical rods 18*a*, slidingly mounted in any suitable way for up and down movement on the extension. At a suitable height on said rods and adjustable thereon to accommodate the height of the load, is a pair of forwardly-projecting leaf or equivalent springs 19. A pair of clamp or load-snubbing arms 20 underlie the leaf springs, and are fitted loosely on vertical bolts 21, which also extend through the leaf springs and overlie compression springs 22, the upper ends of the bolts being engaged by nuts 23. The arrangement is such that the snubber arms 20 are capable of sufficient rocking

movement to adapt themselves to the flat top of a load and apply uniform pressure thereon even though the top may not be substantially horizontal. The body of each snubber arm is preferably of wood with an underlying attached rubber or equivalent strip 24. The expansion of the cylinder 16 occurs concurrently with the expansion of cylinders 9, to apply downward pressure by the snubber arms on a load as the latter is gripped by the lift arms, and retractile springs 25, connect the levers 18 with the load-apron extension, to reelevate the snubber arms, as arms 11—11*a* are withdrawn by the springs 12.

As an element of my attachment necessary for the proper and timely operation of the various cylinders of the branch line, a pressure regulator valve 26, hereinbefore mentioned, and known to industry as a "Logan" valve, is mounted on line J between valve I and the hoist-cylinder F, and its functions appear in the description of the operation of the attachment in the handling of stacks of loose units. It is described hereinafter and its construction appears in Figure 16.

When a one-piece load, such as a packing case, barrel or the like, is to be lifted, conveyed and deposited upon a support, and it is impracticable to dispose the lift arms through the load or even under it without resorting to the use of pallets or skids, only one pair of lift arms is employed, the tractor being advanced until the arms are disposed at opposite sides of the load. In this case the inner pair of lift arms 11*a*, and the trigger mechanism may be dispensed with, and a manually-operable valve 6*a* substituted for ıe spring-closed valve 6, and the chain or cable N, may be caused to connect the load apron with the cross-bar P or other point fixed with relation to member B, of the upright framework. Furthermore a single fairly large hydraulic cylinder 9*a* one pair of levers 10*a*, and one spring 12*a* are sufficient for the handling of one-piece loads. An arrangement such as described appears in Figure 13. The snubber arms 20 and the parts associated therewith may be employed if the load is of such form as to suggest the advisability of their use.

The valve 6*a* corresponds to valve L and functions in the same manner, and its handle 6*a*′, shown as fulcrumed on the valve, enables the operator at will, to open said valve to a flow of oil under pressure to cylinder 9*a* to expand the same and effect the gripping of the load at the height thereof which he deems best for lifting and conveying purposes, to avoid the chance of oscillation or overturning the load. It will be noted that this construction has no trigger or automatic control on the branch line cylinder valve. Likewise, after the load is lowered upon a support by the operator manipulating valve L to open communication between the hoist cylinder and the low side of the power unit, through the regulator valve 26 on tube J, the operator manipulates handle 6*a*′ to close valve 6*a* to pressure from the high side of the power unit, and open it to the back flow of oil from cylinder 9*a*, to the low side of the power unit. As this occurs, spring 12*a* disengages the lift arms and springs 18 disengage the snubber arms, if the latter are used, from the load, and leave the tractor free to be backed and put to other use.

In Figure 11 appears an arrangement for handling a one-piece load, such as a packing case or barrel containing fragile contents. As in Figure 13, only one lift-arm operating cylinder is

needed. In this arrangement, however, the trigger mechanism is employed, and the piston of the automatic or self-closing valve 6, is connected to a lever or handle 27, which as shown, is fulcrumed on an arm 28 of the cross-bar P of member B, and pivotally connected to said piston below the trigger.

Assuming that oil under pressure is great enough to expand the cylinder for operating the load-apron arms, but that there is insufficient pressure in the hoist-cylinder to lift the load or effect the trigger operation, the operator by means of the lever, can open the said valve to effect the gripping action, but after pressure arises enough to effect the upward straining action of the arms and the consequent operation of the trigger, the operator cannot reclose the valve until the load weight has been removed from the load-apron by deposit on a support. It will thus be apparent that it will be impossible to close the valve accidentally or intentionally and drop the load, as long as the weight of the load is borne by the load-apron.

Referring now to the use of the lift-truck as equipped with my attachment for lifting, conveying and depositing a stack of loose units standing on the ground or other support, and provided with side and bottom central channels, the attachment will employ the two pairs or sets of outer and inner laterally-movable lift-arms 11 and 11a of the load-apron, spaced laterally in accordance with the spacing of the channels of the stack, as shown by Figure 7, the two outer arms for entrance into the side channels and the inner arms for entrance into the central channel.

Assuming that the tractor has been advanced and disposed the arms in the respective channels of the stack, the first action is to operate the valve L, to permit oil under pressure to flow into the line J and branch line 7, and, due to resistance offered by the regulator valve 26, the pressure builds up to requirements in tubes J and 7, against the valve 6.

When the required pressure is attained, the regulator valve resistance is overcome, and enough oil passes through it to the hoist-cylinder to apply sufficient pressure on the piston to cause the load-apron arms to strain upward on the load with enough force to overcome the resistance of springs 3, and, through the tensioned chain or cable, cause the trigger to open said valve 6. This permits the oil at the required or regulated pressure, to flow through line or tube 8, to effect expansion of the cylinders 9 and 16, before the pressure in the hoist-cylinder is great enough to lift the load.

The valve L continuing open, the pressure necessary to lift the load is quickly developed and at the same time pressure in the cylinders 9 and 16 is intensified to a degree equal to that in the hoist-cylinder. In other words, regulated pressure, say 400 pounds, is applied on and operates the load-apron arms before the regulator valve opens to permit oil to flow to the hoist cylinder, and hence before there is sufficient pressure on the hoist-cylinder piston to raise the load when the oil passing through the open valve L, builds up to load-lifting force, for example a thousand pounds, the valve 6 being still open, the increased or full pressure on piston E is, at the same instant, applied on the load by the load-apron arms. It will thus be seen that the gripping action of said arms occurs prior to the load-lifting action of piston, and that the gripping

force of said arms is increased to that applied by the piston to lift the load, and that to attain such result the use of the regulator valve 26, or its equivalent, is indispensable.

For a full understanding of the construction and operation of valves L, 6 and 6a, and the regulator valve 26, the following description and Figures 14, 15 and 16 of the drawings are supplied:

Valve 6 has a bore 29, a pressure intake port 30 in communication with the branch line or tube 7, a port 31 in communication with the tube or line 8, an exhaust port 32 in communication with the drain tube 7a, and this statement that all of said ports are in communication with the bore 29, applies also to the by-pass passage 33 in communication with the port 31.

The piston 34 of the valve fits slidingly in bore 29 and has a bore-partitioning enlargement 35 between the port 30 and the upper end of passage 33, and an enlargement 36 which, when the valve is closed, constitutes a partition between the intake port and the port 31. The valve is closed under the pressure applied upwardly on the piston by an underlying spring 37, and when closed another partitioning enlargement 38 of the piston, lies in a plane above that of port 32, and therefor establishes communication between the latter and the upper end of the bypass passage 33, as shown by Figure 14.

When the trigger 1 is operated through the tensioning of the chain or cable N, the piston of valve 6 is forced downward and establishes communication between the intake port and port 31, and at the same time closes communication between the upper end of the by-pass passage 33 and the exhaust port 32, and thereby insures the expansion of the cylinder or cylinders for effecting the clamping operations of the load-apron arms. The valves L and 6a, not detailed, are duplicates of valve 6, except that the piston operation is effected in both directions, by manually-operated levers, no spring being employed.

The construction and operation of the regulator valve 26 is as follows: The said valve has opposite ports 39 and 40, a spring-closed plunger 41 normally closing communication between said ports but adapted to open such communication when a given pressure from the power unit is attained, to permit the flow of oil to the hoist-cylinder. The valve also has a by-pass passage 42 and a spring-pressed check valve 43 adapted to open under back flow of oil from the hoist-cylinder when valve L is closed to pressure from the power unit to permit the back-flowing oil to pass through the port 39 and valve L, to the low side of the power unit. The latter is not shown in detail as it may be of any conventional type, such as a pump mechanism, not shown, the view of the power unit being merely symbolical or diagrammatic.

While the gripping faces of the load-apron lift-arms may be appropriate to the character of the material to be gripped for safe handling, it has been found in handling loads of one thousand pounds and more that a yielding or cushion face gives satisfactory service. As shown by Figure 10, an arm is of channel form and contains bowed flat springs 11b, carrying a second set of bowed springs 11c, the latter protruding from the open sides of the channel. This arrangement not only provides for a dependable grip on the load but also adapts itself to a full-length grip at a uniform pressure.

From the above description and drawings, it will be apparent that I have produced a construc-

tion embodying all of the features of advantage set forth as objectives, and while I have described and illustrated the preferred embodiment, it is to be understood that I reserve the right to all changes falling within the spirit and scope of the appended claims.

I claim:

1. The combination in a hydraulic system including a load apron having a pair of laterally-movable lift arms to be raised by liquid under pressure of such system and lowered by relaxation of such pressure respectively, of a branch line of said system, an expansible hydraulic cylinder on said branch line, a valve on said branch line closed against liquid under pressure and open to back flow of fluid from said cylinder, a regulator valve on the main line of such system closed against the flow of fluid under pressure for effecting the raising of the load apron until the fluid attains a given pressure against said valve and the closed valve in the branch line, and then opens to supply fluid under pressure to effect upward straining pressure of the lift arms against a load to be lifted, a trigger, yielding means holding the trigger inoperative, means actuated by the upward pressure of the lift arms on the load, to overcome said yielding means and cause the trigger to open said branch line valve to effect the expansion of said cylinder by fluid under pressure passing through the opened branch line valve, and means actuated by the expansion of said cylinder to cause the lift arms to approach and apply opposite clamping pressure on the load.

2. In a hydraulic load lifting and lowering system, a load apron having a pair of spaced lift arms, a branch line in such system, a hydraulic cylinder in said branch line, a valve in said branch line closed against fluid under pressure of the system and open to back flow of fluid from the cylinder, a regulator valve in the main line of the system closed against the flow of fluid under pressure for effecting the raising of the load apron until the fluid attains a given pressure against said valve and the closed valve of the branch line and then opens to supply fluid under pressure to effect upward straining pressure by the lift arms on the load, manually-operable means for opening the branch line valve, a trigger, yielding means for holding the trigger inoperative, means actuated by the pressure of the lift arms on the load, for overcoming said yielding means and causing said trigger to maintain said valve in opened position to the flow of fluid to said cylinder, and means actuated by the expansion of said cylinder to effect approaching movement laterally of the lift arms.

3. The combination in a hydraulic system including a load apron having two sets of outer and inner lift arms, to be raised by liquid under pressure of said system and lowered by relaxation of such pressure respectively, of a branch line of such system, a pair of expansible hydraulic cylinders in said branch line, a valve in said branch line closed against fluid under pressure and open to back flow of fluid from said cylinders, a regulator valve on the main line of the system, closed against the flow of fluid under pressure of the system for effecting the raising of the load apron until the fluid attains a given pressure against said valve and the closed valve of the branch line, and then supply fluid under pressure to the lifting mechanism to effect upward straining pressure on the load by said lift arms, a trigger, yielding means holding the trigger inoperative, means actuated by the upward pressure of the lift arms on the load, to overcome the yielding means and cause the trigger to open the branch line valve to pass fluid under pressure to said cylinders to expand the same, and means caused by the expansion of said cylinders to respectively cause the arms of said sets of lift arms to relatively approach each other and clamp upon a load to be lifted.

4. In a hydraulic load lifting and lower system characterized as in claim 3, a pair of snubber arms carried by the load apron, and means actuated by pressure from the branch line, to cause said snubber arms to clamp down upon the load concurrently with the clamping of the latter by the lift arms.

5. In a hydraulic load lifting and lowering system, characterized as in claim 3, a pair of snubber arms carried by the load apron, means actuated by pressure from the branch line, to cause said snubber arms to clamp down upon the load concurrently with the clamping of the latter by said lift arms, means when the weight of the load is removed from the load apron, for reclosing the branch line valve to pressure and opening it to back flow of fluid, and separate means for disengaging the lift arms and the snubber arms from the load.

6. In a hydraulic system for lifting and lowering loads, the combination with an automotive lift-truck having a hydraulic power unit element, a hoist cylinder element, a fluid line between said elements, a manually-operable control valve in said line, an extensible upright framework comprising a base member and a movable member to be raised and lowered on the base member, by said hoist cylinder, a load apron slidable on the framework, of an attachment comprising a pair of lift-arms carried by the load apron and movable laterally toward and from each other, a branch line from the first-named line, a hydraulic cylinder in the branch line, a valve in the branch line between the first-named line and said branch line cylinder and concurrently closed against fluid under pressure from the power unit and open to back flow of fluid from said branch line cylinder to the lower side of the power unit, a regulator valve on the first-named line withholding fluid under pressure from the hoist cylinder until such fluid attains a given pressure against it and the said closed valve in the branch line, manually operable means to open the branch line valve to the fluid under pressure and close it to back flow of fluid from the branch line cylinder to effect expansion of the latter, and means actuated by the expansion of said branch line cylinder to cause approaching movement of the lift arms, the opening of the regulator valve when the given pressure is attained, permitting fluid under pressure to enter and start expansion of the hoist cylinder to impart upward movement to said sliding member and apron and at the same time increase the pressure for expanding the branch line cylinder to equal that applied for expanding the hoist cylinder.

7. In a hydraulic system for lifting and lowering loads, characterized as in claim 6, and means upon the reclosing of the branch line valve to fluid under pressure and its opening to back flow of fluid from the branch line cylinder to the lower side of the power unit, for causing the lift arms to move apart.

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