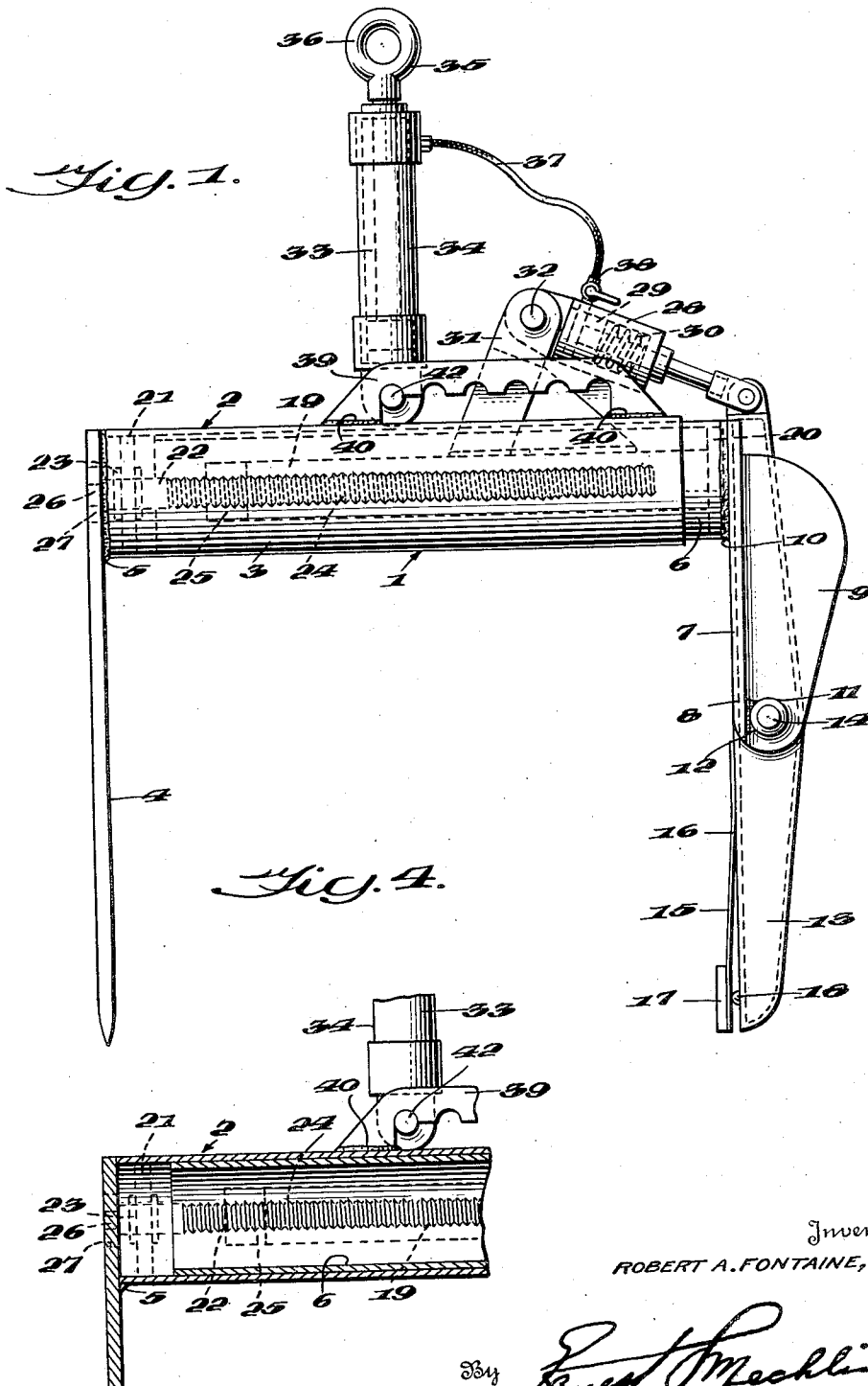


Feb. 27, 1945.

R. A. FONTAINE
MATERIAL HANDLING DEVICE
Filed July 15, 1942

2,370,528

4 Sheets-Sheet 1



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MATERIAL HANDLING DEVICE

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Fig. 2.

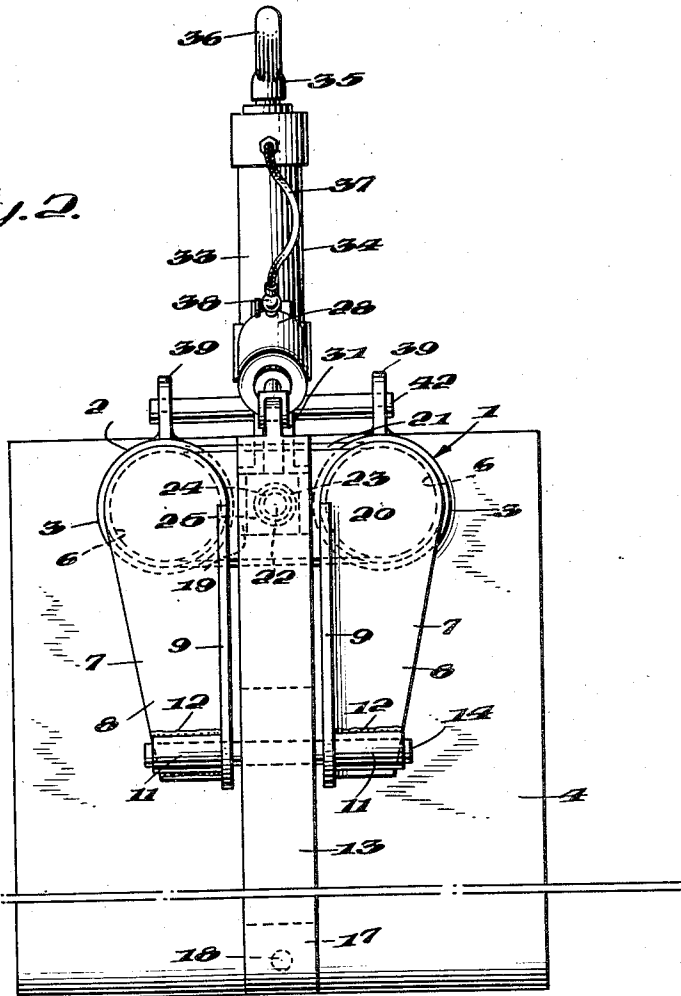
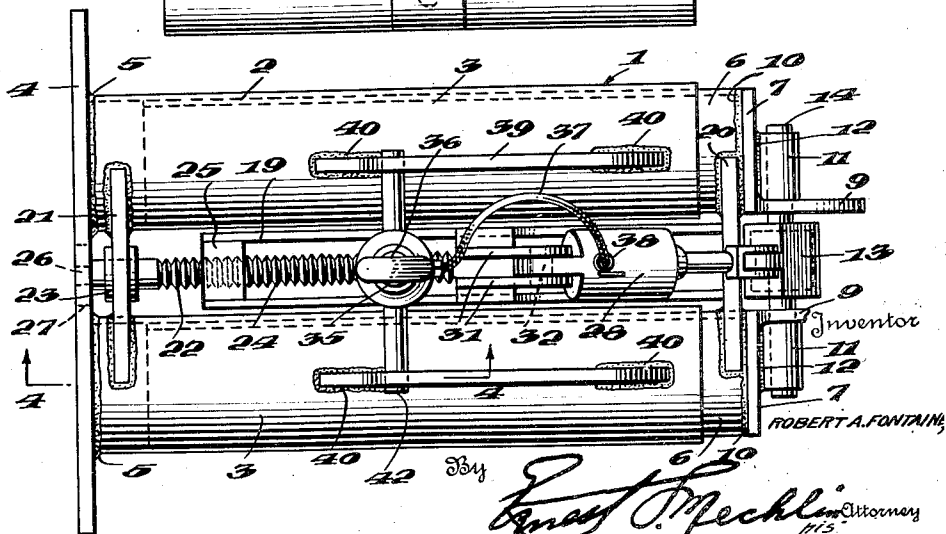


Fig. 3.



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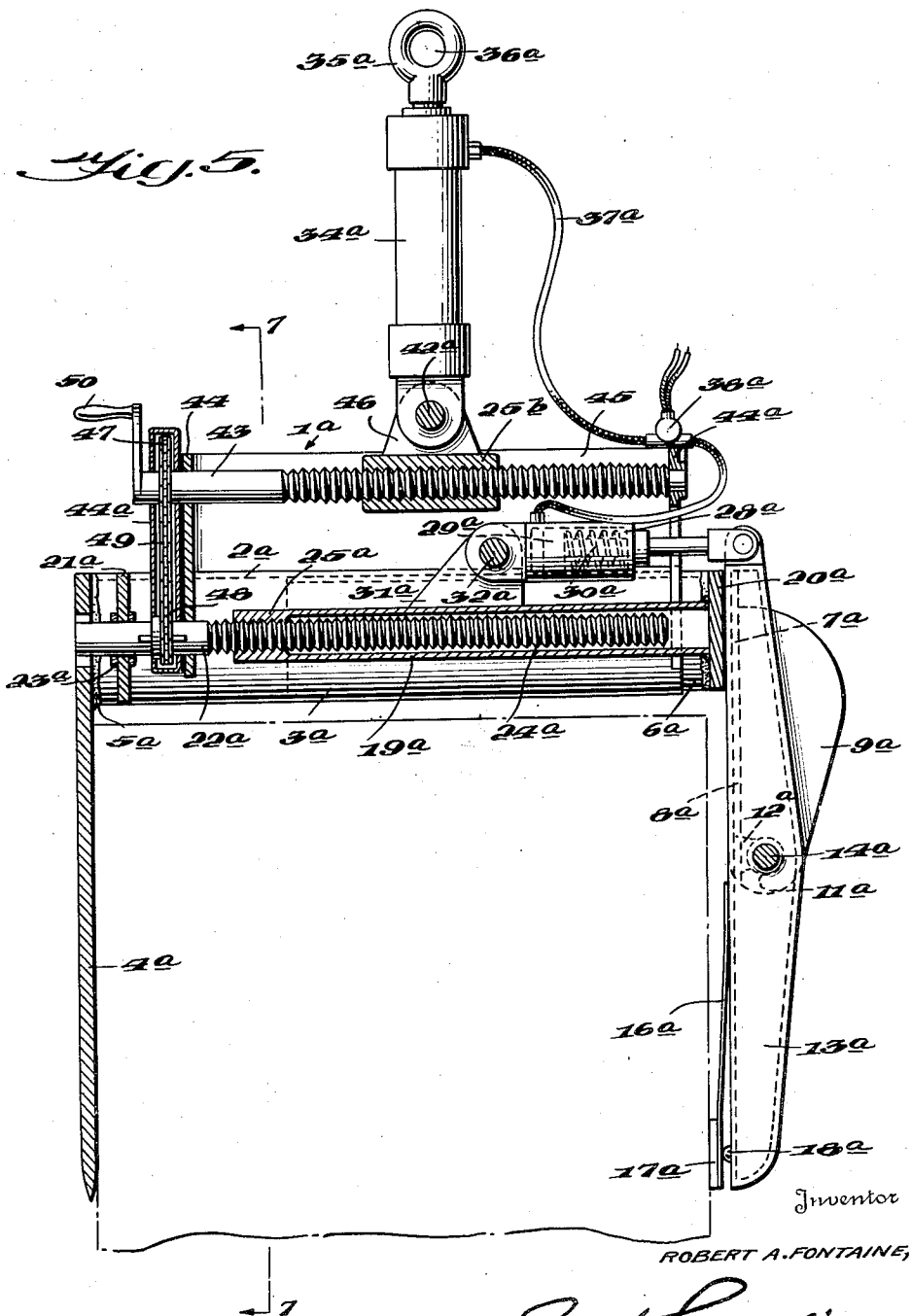
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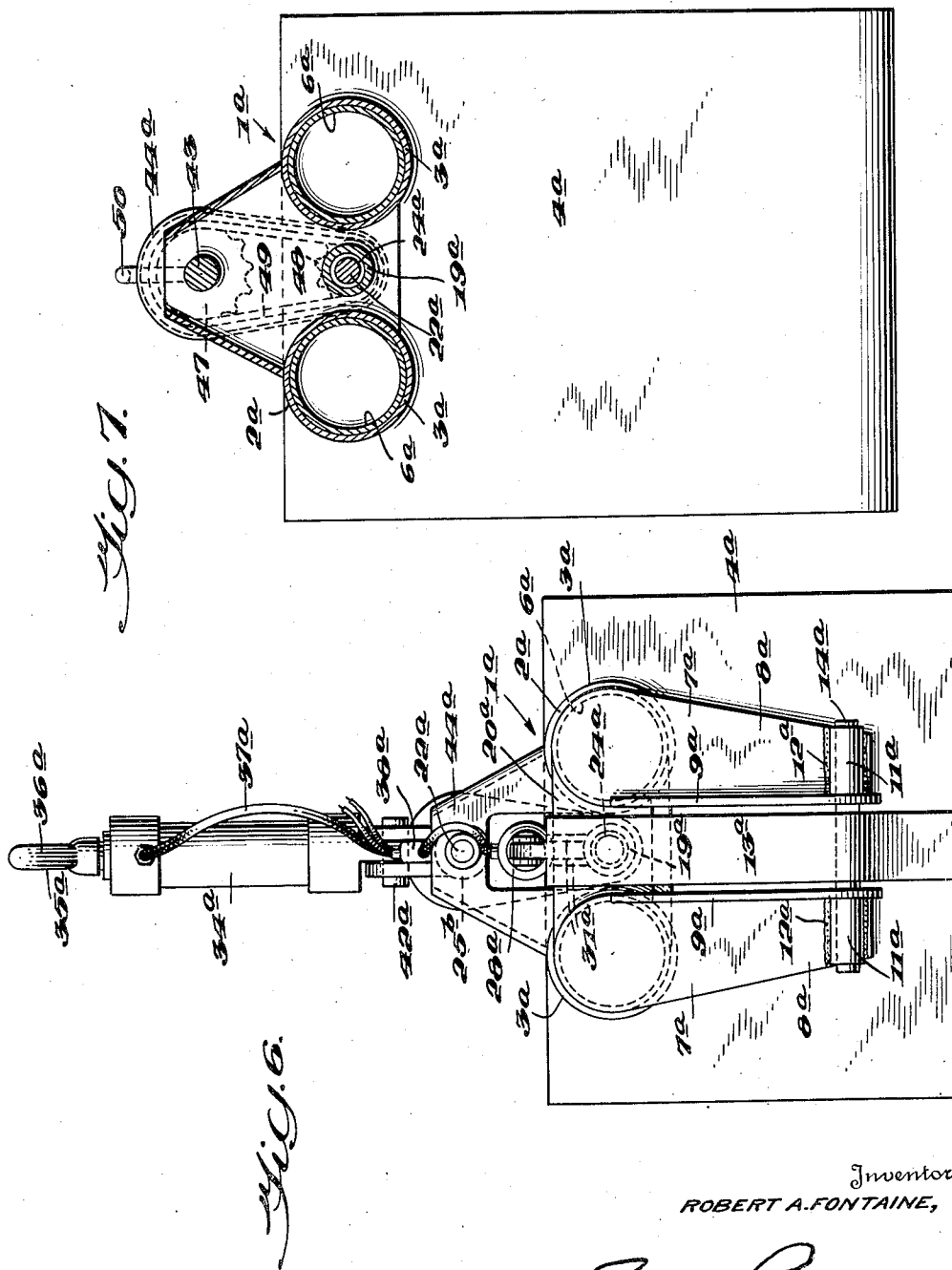
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MATERIAL HANDLING DEVICE

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,370,528

MATERIAL HANDLING DEVICE

Robert A. Fontaine, Martinsville, Va.

Application July 15, 1942, Serial No. 451,038

14 Claims. (Cl. 294—104)

This invention pertains to a material handling device and more particularly to a grab means arranged for moving boxes, crates, packages, containers or the like from one location to another.

An object of the invention is to provide, in a material handling device, a lifting or hoist means arranged for movement or shifting longitudinally of the device so as to be approximately in vertical alignment with the center of mass of a loaded or unloaded device.

Another object of the invention is to provide, in a material handling device, a lifting or hoist means including fluid pressure responsive means in communication with an arm actuating means so that upon a lifting force being applied to the hoist means the arm actuating means will become energized.

A further object of the invention is to provide, in a material handling device, a stationary tong and a pivotally mounted tong adjustable longitudinally of the device relative to the stationary tong and a fluid responsive means shiftable longitudinally of the device for actuating the pivoted tong.

An added object of the invention is the provision, in a material handling device, of a hoist means arranged for centralization of the device and in communication with a tong actuating mechanism with a valve means selectively controllable for arresting fluid in either the hoist means or the tong actuating mechanism.

The above as well as numerous other objects will become apparent from the succeeding description considered together with the accompanying drawings which disclose exemplified forms of the invention and wherein:

Figure 1 is a side elevational view of a material handling device embodying the present invention.

Figure 2 is an end elevational view of the grab illustrated in Figure 1.

Figure 3 is a plan view of the material handling device illustrated in Figure 1.

Figure 4 is a vertical sectional view taken along the lines 4—4 of Figure 3, looking in the direction of the arrows.

Figure 5 is a longitudinal vertical sectional view of a material handling device of a modified form of the invention.

Figure 6 is an end elevational view of the material handling device shown in Figure 5.

Figure 7 is a vertical transverse sectional view taken along the line 7—7 of Figure 5, looking in the direction of the arrows.

Referring now in detail to the drawings, particularly to Figures 1 to 4 thereof, and wherein like reference characters indicate like parts, the numeral 1 is employed to designate in a somewhat general manner, a material handling device or grab whereby receptacles such as boxes, packages, crates, containers or an assembly thereof may be transferred, carried or lifted from one location to another. The grab or material handling device comprises a frame 2 formed by a plurality, preferably two, of cylindrical, transversely spaced, longitudinally directed sleeves or tubes 3. Depending from one or an associated extremity of the tubes is a stationary tong, fork or plate 4 secured to the sleeves by any manner or method desired such as the illustrated welds 5 so as to make the plate and tubes as an integral unit. Disposed or projecting within the tubes in telescoping and neatly accommodated relationship therewith are a plurality, preferably a pair, of cylindrical, longitudinally movable and disposed cores or plungers 6. Each core or plunger has secured to a free or outer extremity thereof, a vertically disposed, depending arm or bracket 7 of angular formation in horizontal cross section and comprising a transversely directed leg 8 and a longitudinally arranged leg 9. Each leg 8 is secured to a related core or plunger by means of a, preferably continuous, weld 10 so as to be made as a part thereof with the legs 9 adjacent to but spaced apart on each side of the longitudinal vertical plane bisecting the material handling device and the legs 8 extending in opposite directions or away from one another. Outstanding from the legs 9 in parallel spaced relation with the legs 8 are oppositely directed horizontally aligned ferrules or hub forming nipples 11 secured to the legs 8 and 9 by means of welds 12. Disposed between the arms or brackets is a vertically directed lever or movable tong 13 preferably of box-like horizontal section to present a solid or rigid member and arranged intermediate its height with a shaft 14 extending therethrough and neatly accommodated by the ferrules to form a means about which the lever is arranged to pivot or rotate, within certain predetermined limits, in service. The lever or tong is provided with a self-adjusting means 15 as is common in grabs arranged to move a hack of bricks, particular reference being made to my co-pending application Serial Number 428,612, filed January 28, 1942, entitled Brick grab. Generally the self-adjusting means comprises a flexible leaf or spring-like shaft 16 having one or

an upper extremity welded or otherwise secured to the lever intermediate the height thereof and the lower extremity of the shaft carrying a material engaging shoe 17. The lever has adjacent its lower extremity a semi-spherically headed member or abutment 18 outstanding therefrom and arranged to be contacted by the shaft so that during service the shoe, due to the flexibility of the shaft 16 and the latter contacting or bearing against the abutment, will adjust itself so as to have a full bearing contact with the crate, box or package embraced by the tongs in service.

Means is provided in the grab or material handling device to adjust or alter the distance or spread between the plate and lever or arms so as to accommodate packages, crates, boxes or the like of different dimensions, and as exemplary of such a means there is arranged a pair of transversely spaced longitudinally directed control bars 19 interposed between and lying preferably within the horizontal plane of the sleeves to extend in parallel relation therewith. The extremity of the bars adjacent the arms is secured to a cross brace 20 by welds or any other desired means so as to be formed integral or rigid therewith. The cross brace directed transversely of the grab in spaced relation to the associated extremity of the sleeves extends between the core or plungers and is arranged to transmit forces thereto for the purpose of elongating or reducing the effective length of the grab. Joined to the sleeves in horizontal alignment with the cross brace is an anchor or barrier 21 positioned adjacent to the plate 4 but spaced inwardly therefrom. A rotatable element or rod 22 extends through the anchor or barrier to have outstanding therefrom on each side of the barrier a collar or shoulder 23 which prevents an accidental axial displacement of the rod or maintains the rod in a predetermined position. From a location immediately inwardly of the innermost collar to the opposite extremity the rod is provided with exterior threads 24. A block 25 is positioned between and secured to the extremity of the bars removed from the cross brace and this block is interiorly threaded to accommodate the threads 24 of the rod. A reduced portion or section 26 of the rod extends through a suitable and aligned aperture 27 in the plate so that a tool or crank of any nature (not shown) may be applied to the reduced section to rotate the rod in a clockwise or counterclockwise direction as desired. Any rotative motion imparted to the rod will cause the block to move along the rod thereby urging the control bars in a corresponding direction. This action on the part of the control bars will, through the cross brace, move the plungers inwardly or outwardly of the sleeves to vary the distance between the plate and lever or arms or alter the effective grasping distance of the device to accommodate the particular packages, boxes or crates to be transferred or moved.

Fluid actuated means is arranged with the device to impart a pivotal motion to the lever and as exemplary of such a means there is provided a cylinder 28 substantially horizontally disposed and having outstanding therefrom a reciprocal plunger 29 pivotally connected to an adjacent or upper extremity of the lever. Upon fluid pressure being admitted to the cylinder the plunger thereof is urged outwardly to force the lever in a clockwise direction in a package clamping action. When the cylinder is relieved of fluid pressure, a compression, helical or coil spring 30 within the cylinder retracts the plunger to cause the

lever to rotate about the shaft 14 in a counterclockwise direction. The horizontal cylinder is supported in part by longitudinally spaced, vertically directed, angular brackets 31 secured to the control bars in any desired manner. A pin 32 pivotally connects the cylinder to the brackets 31 so that during service the cylinder may adjust itself and prevent abnormal stresses being created in the plunger. By reason of the cylinder being mounted on the control bars any movement of the control bars to move the cores 6 and vary the distance between the lever and plate will move the cylinder in a corresponding direction and distance and in this manner the relationship between the arms or lever and cylinder will remain at all times constant.

A lifting means or hoist 33 is associated with the grab to function as a medium through which the material handling device is transported from one location to another. The lifting means is characterized by a vertically disposed fluid actuating means or cylinder 34 having a piston 35 disposed axially thereof. The piston is provided with an eye-shaped head 36 disposed outwardly of the cylinder so that a hook or any other instrument of an overhead crane (neither of which are shown) may be connected thereto to impart an elevating motion to the grab. A conduit or hose 37 is in communication with the uppermost extremity of the hoist and the bracket adjacent extremity of the horizontal cylinder 28 and by reason of this communication any lifting action imparted to the piston 35 will cause the fluid within the related cylinder to be urged through the hose connection into the horizontal cylinder to force the plunger 29 outwardly thereof. Likewise, when the piston is relieved of lifting forces the pressure built up within the cylinder 28 and the energy stored up in the helical spring will cause the fluid to pass through the hose and enter the hoist. If in the event it is desirous of retaining a container, crate or box clamped between the lever and plate while the piston is retracted within the hoist, a valve 38 provided in the conduit or hose is actuated to arrest the back flow of fluid from the horizontal cylinder to the hoist thereby retaining the horizontal cylinder energized.

The hoist, as illustrated, is in a vertical plane passing through the center of mass of a loaded or unloaded grab with the plunger 6 fully retracted or the plate or lever in their closest relationship. When the lever is moved horizontally away from the plate to accommodate a larger box, crate or container, the hoist must, in order to be centralized, be moved proportionately in a corresponding direction. So as to accomplish this latter function each sleeve or tube has upstanding vertically therefrom a strap or hanger 39 secured to the associated sleeve by any manner or means such as the illustrated welds 40. The straps are of bar-like formation and in transverse spaced relation to extend longitudinally of the grab and each has a series of downwardly facing cup-shaped intermittently spaced bearing recesses 41. The hoist is provided with a bearing rod 42 of circular cross section functioning as a cross arm and arranged to fit into or occupy an aligned pair of strap recesses. From the above it will be understood that as the lever or movable tong is moved horizontally away from the plate or stationary tong to accommodate a receptacle of particular size, the hoist is advanced from its illustrated position so that the cross arm thereof will nest into the proper re-

cesses and thereby position the hoist in a vertical plane passing through or adjacent to the center of mass.

Referring now in detail to the embodiment of the invention disclosed by Figures 5 through 7, the numeral 1a designates a material handling device or grab comprising a frame 2a having a plurality, preferably two, cylindrical transversely spaced and longitudinally disposed sleeves or tubes 3a. A stationary tong, fork or plate 4a is secured to associated extremities of the sleeve to join them together through the medium of welds 5a and to depend therefrom to thereby present a stationary arm or material container, box or crate engaging member. Each sleeve or tube is provided with a cylindrical core or plunger 6a arranged to be guided by and movable longitudinally of the grab relative to the related sleeve. Depending from and secured to the free extremity of each core is an arm or bracket 7a preferably of angular form to consist of a transversely directed leg 8a and a longitudinally extending leg 9a. The legs 8a of the arms are fixed in any manner to the cores with the legs 9a related in transverse spaced relation. The legs 9a of the arms are provided with ferrules or bearing forming nipples 11a presenting appreciable aligned bearing areas outstanding from the longitudinal legs 9a. Welds 12a are employed to form the ferrules as integral parts of the related legs. Positioned between the legs 9a of the arm is a vertically disposed lever or movable fork or tong 13a provided, intermediate the height thereof, with a shaft or journal 14a; the latter of which is formed rigid with the lever and extends through the nipples to present a means about which the lever may move in a rotative manner and in fixed limits. The movable tong has, inwardly of the grab, a flexible spring or leaf shaft 16a with one or the upper end secured to the tong and the other or lower extremity carrying a shoe 17a for engaging the material to be handled. In the rear or within the horizontal confines of the shoe and secured to the lever is a spherical element 18a arranged to be engaged by the shaft so that the latter may adjust itself to insure a surface bearing relation between the shoe and boxes, crates, containers or the like during service.

So as to vary the distance between the movable and fixed forks to accommodate various sized packages, crates, boxes, containers or the like, there is provided a control bar or tube 19a disposed between and preferably positioned within the horizontal limits of the sleeves in parallel relation thereto. One of the extremities of the control tube is welded to a cross brace 20a which in turn spans the distance between and is welded to the cores 6a to join the latter together and move them in unison inwardly and outwardly of the sleeves as desired. Positioned oppositely of the cross brace and adjacent to the plate or stationary tong is an anchor or barrier 21a spanning the distance between and welded or otherwise secured to the sleeves. A horizontally disposed rod or rotatable element 22a has one extremity extending through the anchor and is provided with fixedly associated collars or shoulders 23a positioned on each side of the barrier so that upon any rotative movement being imparted to the rod the latter will not move in a direction of its axis or transversely of the grab or material handling device. The control bar has its extremity removed from the cross brace arranged with a bushing or block 25a fit-

ting within the control bar and securedly fastened therein so that the control bar and bushing or block will be formed as an integral unitary structure. The bushing is interiorly threaded to accommodate corresponding formed exterior threads 24a appearing on the rod and by reason thereof any rotative action imparted to the rod will create a longitudinal movement of the cores or plungers 6a axially of the sleeves and consequently vary the distance between the movable and stationary tongs.

To impart a pivotal movement to the lever there is provided a horizontal cylinder or fluid pressure responsive means 28a having an inwardly and outwardly movable plunger 29a pivotally secured to an adjacent extremity of the lever. The admission of fluid pressure to the horizontal cylinder in rear of the plunger create an outward movement of the plunger 29a and a clockwise motion of the lever to effect a clamping action of the grab. When the fluid pressure is exhausted from the horizontal cylinder, a coil or helical compression spring 30a within the cylinder arranged to react against a cross head of the plunger will retract the plunger within the cylinder to cause a counterclockwise rotative movement of the lever and an unclamping action thereof. The one extremity of the horizontal cylinder is supported by transversely spaced upstanding brackets 31a secured to the control bar. The horizontal cylinder is pivotally secured to the brackets through the medium of a pin 32a. As will be noted, any transverse movement of the control bar resulting in a corresponding movement of the arms and lever will carry the horizontal cylinder through an equal distance so as to make the horizontal cylinder effective at all times to accomplish its intended purpose.

Positioned in vertical alignment with the control bar and desirably in parallel relation therewith is a rotatable element or axle 43 exteriorly threaded and supported at its extremities by gussets or plate-like standards 44 and 44a spaced longitudinally of the material handling device. The standards desirably form a part of the frame and accordingly are upstanding from and secured to the sleeves. The standards, by joining the sleeves, form rigidifying means to reinforce the frame against strains to which it will be subjected in service. Connecting plates 45 are also secured to the sleeves and extend between the standards to form with the latter a housing and complete the frame. As will be noted the axle is journaled in the standards and prevented thereby to move in the direction of its axis. Mounted on the axle, in circumambient relation therewith, is a coupling 25b interiorly threaded to correspond with and accommodate the exterior threads of the axle. Extending upwardly from the coupling between adjacent edges of the connecting plates is a lip or tongue 46 retained in a vertical position by the connecting plate edges, the latter of which overcome any tendency for the coupling to rotate during an adjustment or service. Pivotally secured to the coupling tongue through the medium of a bearing rod 42a is a hoist or fluid actuating means or vertical cylinder 34a having a piston 35a, arranged to move in a reciprocatory manner therein. An eye-shaped head 36a is formed on the outer or free extremity of the piston to accommodate a hook or other instrument (not shown) of an overhead crane (not shown) for the purpose of moving the material handling device or grab from one

location to another. The vertical and horizontal cylinders are in communication with one another through a conduit or hose 37a which connects the upper interior portion of the vertical cylinder with the interior of the bracket adjacent extremity of the horizontal cylinder. By reason of this arrangement any tendency of the piston 35a to move outwardly of its associated cylinder will result in fluid being urged through the conduit to energize the horizontal cylinder and impart a clamping action to the lever. A valve 38a, desirably electrically controlled, is incorporated in the hose or conduit so that the fluid may be arrested from flowing from the vertical cylinder to the horizontal cylinder or vice versa, as and if desired.

Connected means has been provided in the grab to actuate the axle and the rod 22a and as exemplary of such a means there is secured and made firm with respect to the axle in the proximity of the standard 44a, a sprocket 47 in vertical alignment with a subjacent sprocket 48 made rigid with the rod. Extending around the sprockets is a force imparting or conveying flexible chain or belt 49 capable of operatively connecting the sprockets. The sprockets are formed in a 2 to 1 ratio, that is to say, the sprocket 47 is twice the size of the sprocket 48 in order that the axle 43 will complete a half revolution to every complete revolution of the rod 22a and consequently the cores or plungers 6a and their related elements will move longitudinally of the device by an amount twice the distance of the coupling and hoist means. In this manner the hoist means or vertical cylinder will at all times be maintained in vertical alignment with or adjacent to the center of mass of a loaded or unloaded material handling device or grab. It will of course be clearly understood that the device need not be necessarily limited to the sprockets of different size since the same function may be accomplished by forming the threads of the axle and rod of different pitch and forming the sprockets as counter parts of one another or of the same size. An operating or crank arm 50 is attached to the axle exteriorly of the adjacent brace to impart a rotative motion to the axle and associated structure.

From the above, it will be noted that various alterations and changes may be made to the exemplified form of the hereinabove described and illustrated construction without departing from within the spirit of the invention and the scope of the appended claims.

I claim:

1. In a grab, the combination of, a frame having depending therefrom a stationary tong and a movable tong spaced longitudinally therefrom, a vertically disposed fluid pressure hoisting means, a fluid pressure responsive actuating means pivotally connected to said movable tong and connected with said hoisting means, said hoisting and actuating means being arranged and constructed so that, upon a lifting force being applied to said hoisting means fluid pressure will be urged therefrom into said actuating means to move the connected tong towards said stationary tong.

2. In a grab, the combination of, a frame, stationary means depending from said frame, movable means spaced from said stationary means and shiftable relative to said stationary means, fluid responsive actuating means connected to said movable means, shiftable fluid actuating hoisting means associated with said frame and

communicating with said fluid responsive actuating means, and means interposed between said fluid responsive actuating means and shiftable fluid actuating hoisting means for controlling the fluid arranged to pass therebetween.

3. In a grab, the combination of, a frame, a tong depending from said frame, a tong spaced from said first named tong and being slidably associated with said frame, rotatable means for moving said movable tong toward and away from said first named tong, a shiftable hoist means including a fluid pressure means associated with said frame, and actuating means associated with said hoist means and movable tong; said actuating means being connected to said shiftable hoist means so as to be energized upon the application of a lifting force applied to said hoist means.

4. In a grab, the combination of, a frame, a material engaging means depending from said frame, pivotally mounted means spaced oppositely from said first named means and slidably associated with said frame, hoist means pivotally mounted on said frame, and connected rotatable means for centralizing said hoist means and moving said pivotally mounted means relative to said material engaging means.

5. In a material handling device, the combination of, a frame, a plate depending from one extremity of said frame, means slidably associated with and shiftable longitudinally of said frame, arms depending from said slidable means and disposed in spaced relation to said plate, means pivotally mounted to said arms, a multipart actuating means comprising one part rotatably associated with another part associated with said frame for moving said shiftable means, fluid pressure responsive means carried by one part of said actuating means and connected to said pivotally mounted means, straps secured to and upstanding from said frame, and hoist means comprising a cylinder and piston arranged to be pivotally secured to said straps at a plurality of locations to be positioned adjacent the center of mass of a loaded device; said hoist means being in communication with said fluid pressure responsive means so that upon a lifting force being applied to said hoist means said fluid pressure responsive means will become energized.

6. In a material handling device, the combination of, a frame comprising longitudinally extending transversely spaced cylindrical means, a plate secured to said cylindrical means and depending therefrom, sliding means associated with said cylindrical means, arms depending from said sliding means, a lever pivotally connected to said arms, means interposed between said cylindrical means for moving said arms and sliding means relative to said plate, and fluid pressure responsive means connected to said lever.

7. In a material handling device, the combination of a frame comprising longitudinally extending transversely spaced cylindrical means, a plate secured to said cylindrical means and depending therefrom, cylindrical means slidingly and telescopically associated with said first named cylindrical means, arms depending from said second named cylindrical means, a lever pivotally secured to said arms, extensible means positioned between said first named cylindrical means for moving said arms and second named cylindrical means relative to said plate, and actuating means carried by said extensible means and connected to said lever.

8. In a material handling device, the combination of, a frame, a plate depending from said

frame, means movable longitudinally of said device including pivoted means in spaced relation to said plate, means extending between said frame and movable means for moving said movable means longitudinally of said device, fluid pressure responsive means carried by said last named means and pivotally connected to said pivoted means, and hoisting means comprising a cylinder and piston connected to said frame and in communication with said fluid pressure responsive means.

9. In a material handling device, the combination of, a frame, a plate depending from said frame, means movable longitudinally of said device including a pivoted arm in longitudinal spaced relation to said plate, means for actuating said arm and carried by said movable means, hoist means associated with said frame, and connected means for shifting said hoist means proportionately with said movable means so as to maintain said hoist means substantially in alignment with the center of mass of a loaded device.

10. In a material handling device, the combination of, a frame, a plate depending from said frame, means movable longitudinally of said device including a pivoted arm, means for actuating said arm and carried by said movable means, hoist means associated with said frame, and connected means for shifting said hoist means proportionately with said movable means so as to maintain said hoist means substantially in vertical alignment with the center of mass of a loaded device; said hoist means including a fluid pressure means in communication with said means for actuating said arm so that a lifting force applied to said hoist means will energize said arm actuating means.

11. In a material handling device, the combination of, a frame, a plate stationary with respect to and depending from said frame adjacent one side thereof, means carried by said frame and movable longitudinally thereof relative to said plate, an arm depending from said means in spaced relation to said plate, lever means pivotally secured to said arm, fluid pressure responsive means for actuating said lever means, means for controlling said movable means, and hoist means shiftable longitudinally of said device and in proportion to the movement of said first named means so as to maintain said hoist means substantially in alignment with the center of mass of a loaded device.

12. In a material handling device, the combination of, a frame, a plate depending from said frame adjacent one side thereof, means carried by said frame and movable longitudinally thereof relative to said plate, arms depending from said means in spaced relation to said plate, means pivotally mounted on said arms, actuating means including a rotative means and longitudinal movable means for moving said first named means longitudinally of said device, fluid pressure responsive means carried by said longitudinally movable means and connected to said pivotally mounted means, and hoist means shiftable longitudinally of said device in proportion to the movement of said first named means so as to maintain said hoist means substantially in alignment with the center of mass of a loaded device.

13. In a material handling device, the combination of, a frame, a plate stationary with and depending from one extremity of said frame, means slidably associated with and shiftable longitudinally of said frame, arms depending from said slideable means and disposed in spaced relation to said plate, means pivotally mounted on said arms, a multi-part actuating means comprising a rotatable means and longitudinally movable means associated with said frame for moving said shiftable means, fluid pressure responsive means carried by one part of said actuating means and connected to said pivotally mounted means, straps secured to and upstanding from said frame, and hoist means arranged to be pivotally secured to said straps at a plurality of locations so that said hoist means may be shifted longitudinally of said device and thereby be positioned adjacent the center of mass of a loaded device.

14. In a material handling device, the combination of, a frame, a plate stationary with and depending from said frame, means movable longitudinally of said device including pivotal means in longitudinal spaced relation to said plate, means carried by said frame for moving said movable means longitudinally of said device, said last mentioned means comprising one part rotatably associated with another part, fluid pressure responsive means carried by one part of said last mentioned means and pivotally connected to said pivoted means, and fluid pressure responsive hoist means connected to and arranged to actuate said first named fluid pressure responsive means.

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