

Sept. 28, 1965

L. D. BARRY

3,208,789

SELF-ALIGNING LIFTING DEVICE

Filed Dec. 27, 1962

4 Sheets-Sheet 1

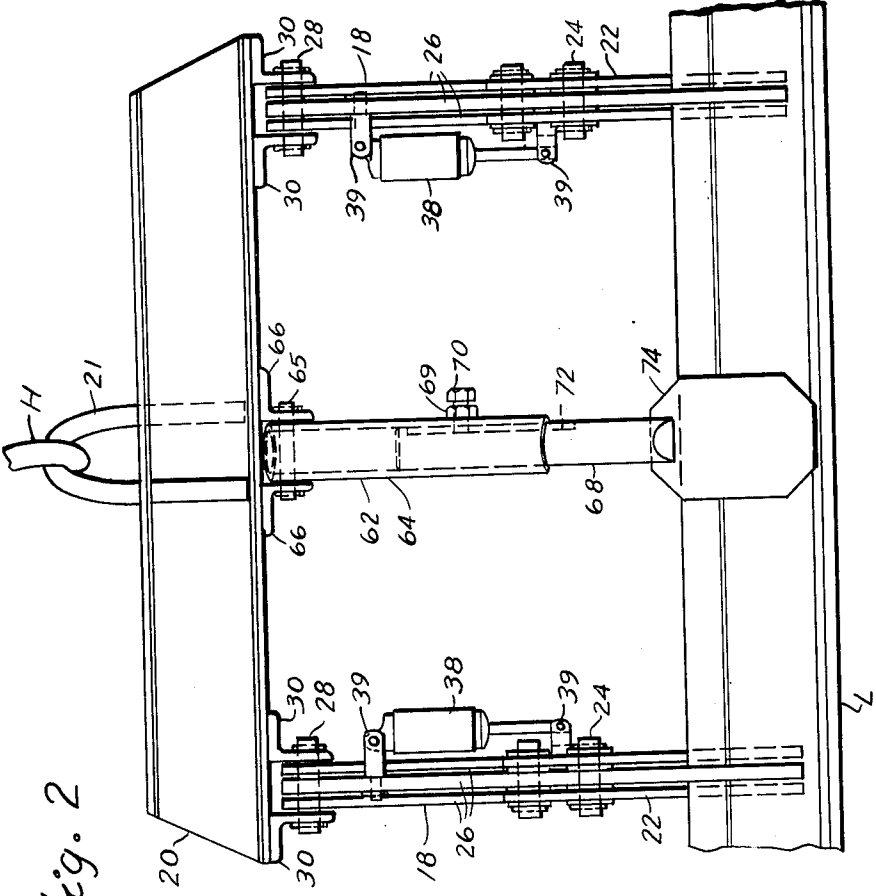


Fig. 2

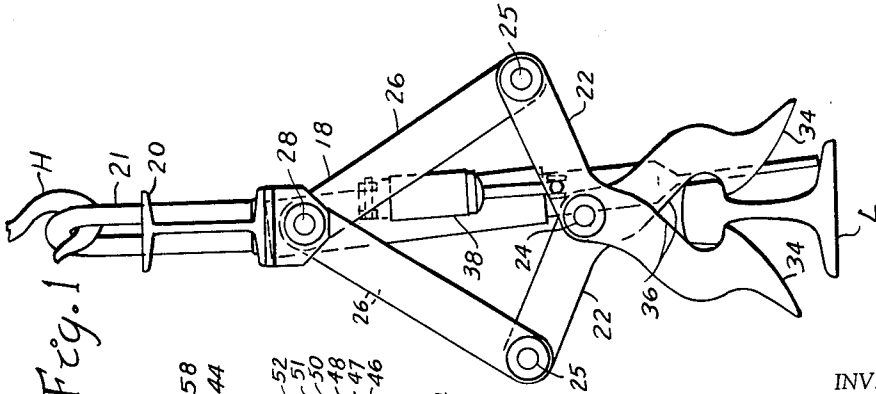


Fig. 1

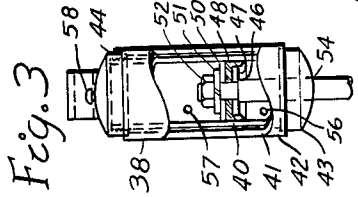


Fig. 3

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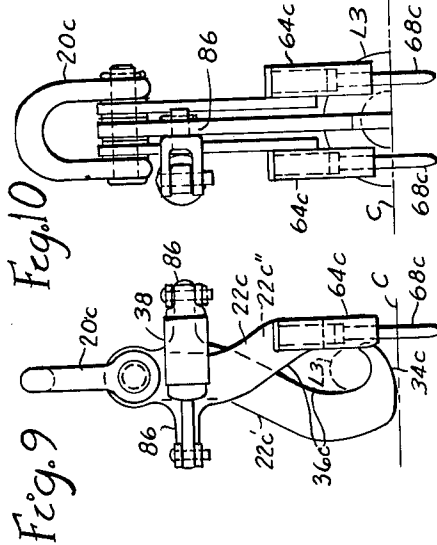
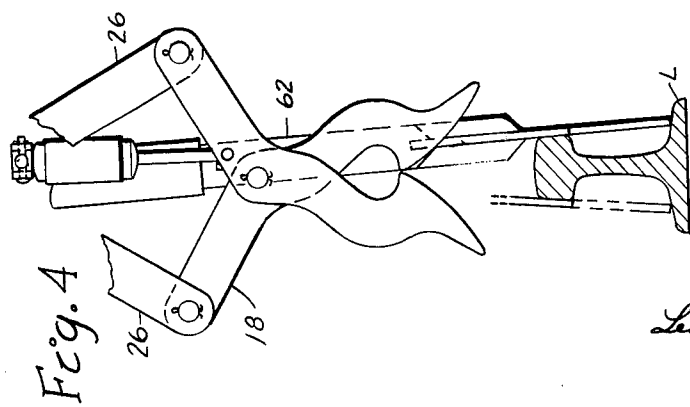
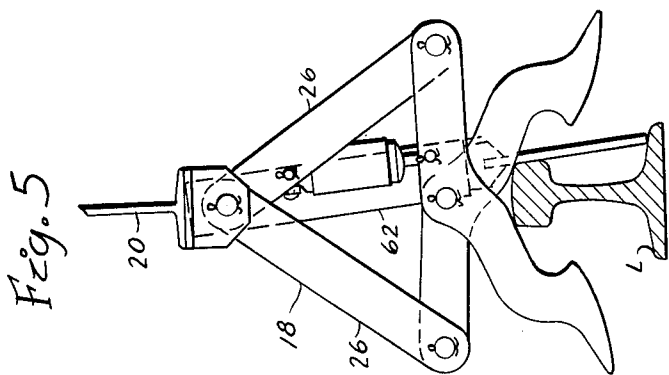
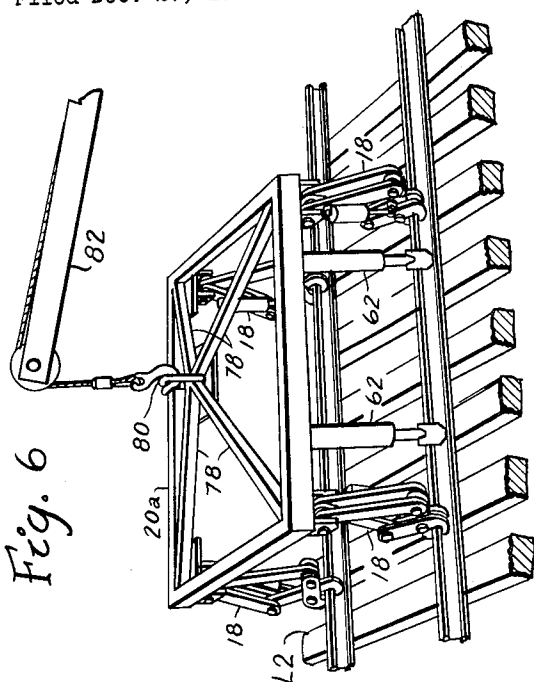
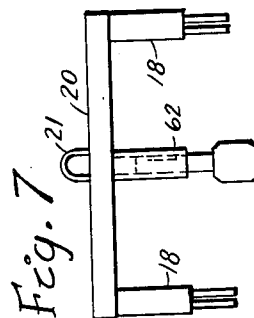
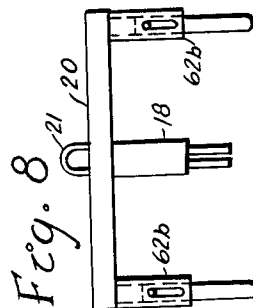
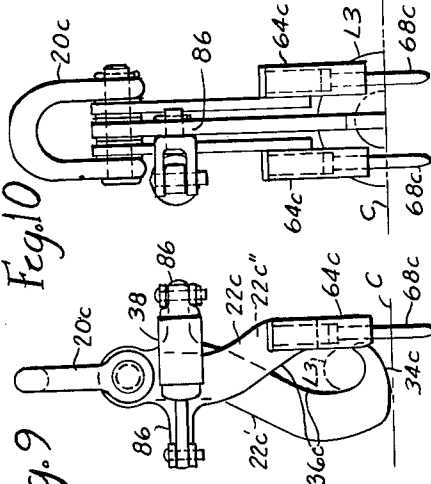


Fig. 10



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Fig. 13

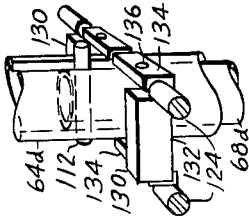


Fig. 14

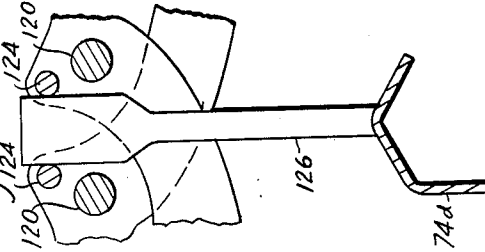


Fig. 12

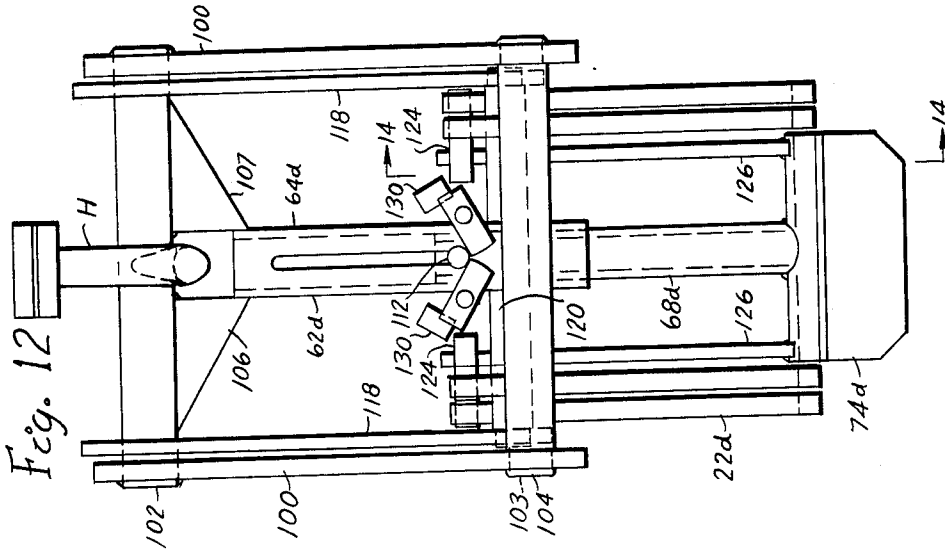
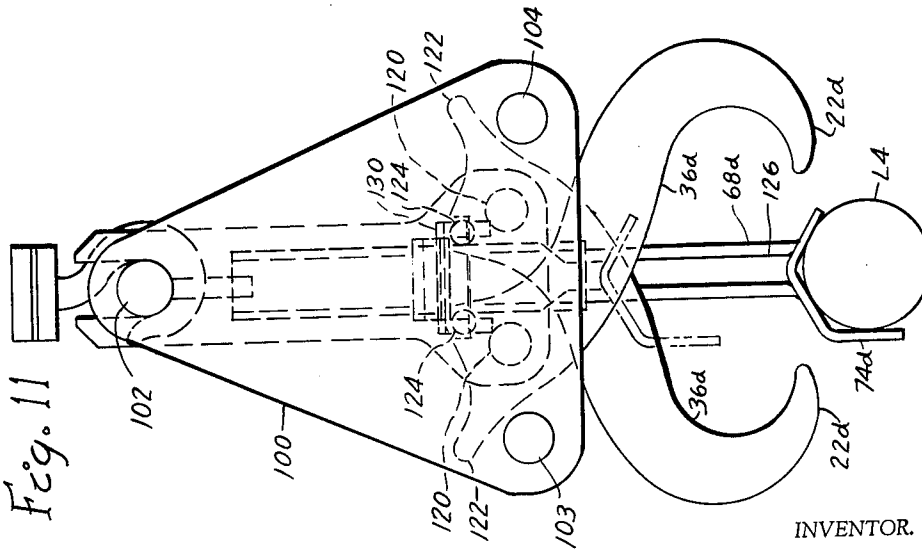


Fig. 11



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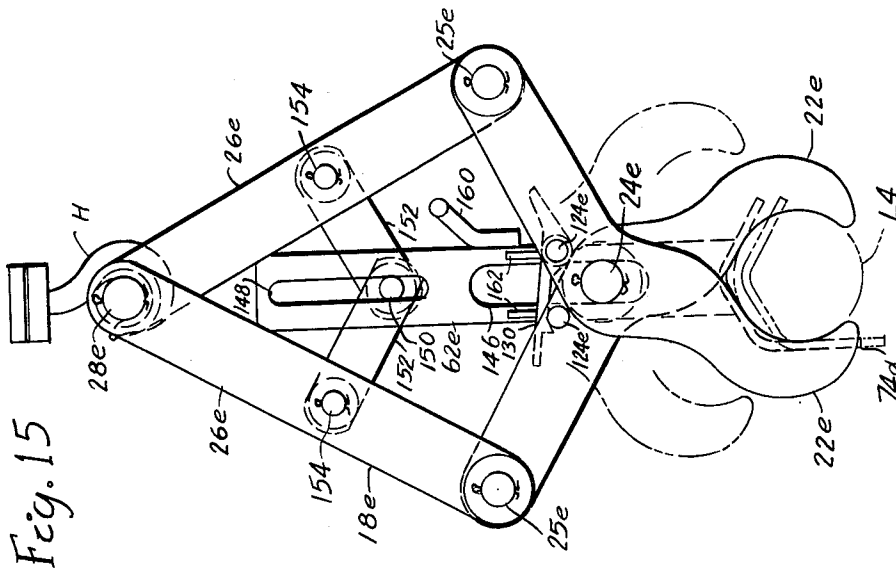
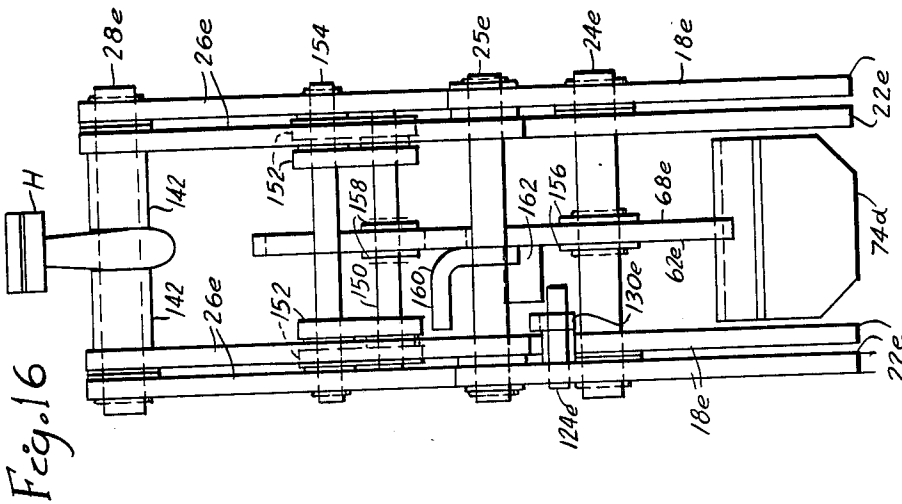
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11 Claims. (Cl. 294-110)

This invention relates to self-engaging lifting devices and in particular to improvements in automatic grabs including hooks, tongs and clamps for mounting on the swivel hook or cable of a hoist, derrick, or the like.

This is a continuation-in-part of my patent application Serial Number 153,282, filed November 20, 1961, which is a continuation-in-part of an earlier application, and is directed to improvements to broaden the utility of the lifting devices.

It is an object of this invention as of the one identified above to provide a lifting device so arranged as to rotate into alignment when engaged with the load. In the preceding identified application this is accomplished using a central finger on which the device pivots when swung by the hoist against the load. While this serves well in some applications there are others wherein the depending locator interferes with clamping or hooking as seen in FIGURES 8 and 9 of the above identified application. It is therefore an object to provide a locator which vertically retracts as the grab is lowered on the load. It is a further object to provide a locator which can more accurately align the grabs, so as to reduce the size of or eliminate the lower cams which latch the grabs on the load and which interfere with some loads. It is therefore now preferred to provide a broad locator or two locators spaced apart to set up a torque on the lift when engaged obliquely against the load as a preferred alternative to the round central locator shown in the identified preceding application. Since most loads can be engaged from either side the need to rotate the lifting device more than 90 degrees to engage is not often encountered. It is a further object to control the engagement and release of the grab with a locator to completely eliminate the lower cams to pick up loads such as round bars off the ground.

It is an object to provide an arrangement for aligning a plurality of hooks, tongs, or grabs over a load for engagement together to hold the load. It is an object to provide a holding device for mounting on the hook of a crane for engaging and lifting long slender objects such as rail and structural members at points spaced apart each side of center to eliminate the need for exactly centering the load and so to expedite aligning the load. It is a further object to provide an arrangement whereby the operator of a hoist can conveniently align and engage for lifting sections of railroad track.

Other objects and features of this invention including simplification, improved operation, safety, dependability, and cost reduction should be apparent from the specification wherein a few of the many possible embodiments of this invention are described with reference to the drawings wherein:

FIGURES 1 and 2 are respectively face and side views of automatic tongs engaging a rail.

FIGURE 3 is an enlarged view of the dashpot cylinder with part cut away to show the interior.

FIGURE 4 is a face view of the tongs in full closed position with the locator shown in solid engaging one side of the rail and in phantom on the other side to locate the tongs above the rail by engaging the rail from either side.

FIGURE 5 is a face view of the tongs rested on the rail to open full.

FIGURE 6 is a perspective view of a frame supported on the boom of a derrick and having a rail tong at each

corner and two locators spaced along one side engaging a section of track.

FIGURES 7 and 8 are side views of two variations of the arrangement of locating devices and holding devices on a beam.

FIGURES 9 and 10 are respectively face and side views of an automatic hook according to this invention and engaged with a loop handle shown in phantom.

FIGURES 11 and 12 are respectively face and side views of a variation of the grab shown aligned for lowering to engage a round bar.

FIGURE 13 is a perspective view of the central portion of FIGURE 12 showing the latches dropped between the ends of the pins which hold the grabs open and a portion of the locator tube which supports the latches and the top of the locator which lifts them.

FIGURE 14 is a partial section on line 14-14 of FIGURE 12.

FIGURES 15 and 16 are respectively face and side views of another variation of the grab shown engaging a round bar and mounted on a swivel hook.

Referring to the drawings and in particular to FIGURES 1 and 2, a load such as rail L is preferably engaged by two tongs 18 spaced apart and pivotally secured at each end of a yoke or frame, I-beam 20, having a U-rod eye 21 secured at the center for engaging on the hook H of a crane or hoist. Rail tongs 18 have three tong or grab lever plates 22 pivotally secured together on a pin 24. The central lever 22 is faced opposite to the other two to engage under the head of rail L from opposite sides. The upper or outer ends of the levers are pivotally secured by pins 25 to links 26 forming with the tong plates a quadrangle which is pivotally suspended on pin 28 between legs of angles 30 welded to the bottom of beam 20. The tongs have lower cams 34 which spread them to latch under the rail head and upper cam faces 36 which spread the tongs wide open, as shown in FIGURE 5, when rested on the rail. The tongs are held open by a dashpot so they can be lifted off the load. The dashpot is pivotally secured between a link 26 and a lever 22 on the same side of the tongs and is preferably pivoted between the fork of a yoke 39 at both the rod and head ends to compensate for sidewise shifting between the plates and links.

As seen in FIGURE 3, dashpot 38 has a piston 40, an inner cylinder 41, an outer protecting cylinder 32, end caps 43 and 44 which screw on the ends of the inner cylinder and support the outer cylinder on concentric grooves. The piston of the dashpot has a shoulder 46, a flat washer 47, a cupped washer 48 of leather or other flexible material lubricated and having a low coefficient of friction on the wall of cylinder 38 and turned flange to the rod end, a flat washer 50 for supporting the leather washer, a lockwasher 51, and a nut 52, all in order on the end of the rod of the dashpot. When the piston is pressed in the leather washer flexes to pass air freely, but when pulled out it draws a vacuum. Air also is passed freely through the rod guide hole 54 in cap 43 and through holes 56 and 57 in the inner cylinder. Holes 56 and 57 are located respectively at the rod end and at a point near the middle to complete a passage for air around the piston when in latching positions on the tongs. A bleed screw 58 is provided for adjustment of the vacuum drawn in the head end of the cylinder by the weight of the plates to control the closing rate from open position. The dashpot does not substantially delay latching, since the head end of the cylinder remains open through hole 56 during hooking.

A locator 62 is centered under eye 21 and comprises tube 64 pivotally secured on pin 65 between depending angles 66 welded to the bottom of beam 20 so as to center the locator, shaft 68 to slide up and down in tube 64,

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nut 69 welded over a hole in tube 64, bolt 70 screwed in nut 69 and extending into a keyway 72 in shaft 68 to limit the vertical travel of the shaft, and a flat vertical plate 74 welded in a slot in the end of shaft 68 parallel beam 20 and extending below the tong levers, as shown in FIGURE 4, to align the tongs over the load. The movement of the locator on pin 65 is limited by the length of tube 64 above the pin to stop the locator just far enough in both directions to align the tongs above the rail when the locator is pushed against either side of the rail by the hoist operator before lowering the tongs to latch the rail, see FIGURE 4.

In operation, the tongs are swung over the top of the rail so that only the paddle plate 74 strikes the rail. If the paddle hits the rail at an angle there is a torque between the center of eye 21 and the edge of plate 74 resting against the rail, which swings yoke 20 parallel rail L until plate 74 is flat against the rail, spotting the tongs over the rail. The tongs are then lowered and latch under the head of the rail. The operator can then lift the rail. When the rail is set down and the weight of the tongs rested thereon, the tongs open wide as shown in FIGURE 5, and the paddle telescopes so as not to interfere. The piston of dashpot 38 is then at the head end and holds the tongs open when lifted, by drawing a vacuum in the head end of the cylinder. Screw 58 is set to regulate the closing of the tongs to enable the hoist time to lift them high enough above the rail before the piston passes hole 57, breaking the vacuum, dropping the tongs closed.

These tongs can also lift various other loads such as structural members and be used singly preferably mounted on a shackle whose pin replaces pin 28 or in any desired number and arrangement to lift a load.

Referring to FIGURE 6, tongs 18 are mounted on the four corners of a rectangular frame 20' to pick up a length of track L2. The frame has diagonal bars 78 run up to a central eye 80 through which the hook of derrick 82 is engaged to lift the track. Along one side of the frame two locators 62 are secured preferably near the tongs to align the tongs even on a curved rail. The locators can either be welded to the frame or pivotally mounted as in FIGURES 1-5 to engage either side of the rail. It can be seen from FIGURE 4 that the locator could be welded central to the beam and still locate the tongs because of the alignment tolerance provided by the cams on the bottom of the tongs. The number of paddles and tongs or grabs located on the beam is determined by load requirements, curvature of the rail, length and flexing of the load.

In FIGURE 7 the grabs are mounted on the ends of the yoke or frame and a paddle in the middle. This arrangement is used for engaging a load close to another, since no matter which way the grabs are turned one paddle can always be dropped between items a paddle's length or more apart. If the loads are farther apart the arrangement as in FIGURE 6 is preferred for more accurate alignment. In FIGURE 8 the grab or tongs are between the locators. The type of tongs, grabs, clamps and locators can be varied considerably within the scope of this invention. Where two locators are used, bottom plates 74 can be omitted as on locators 62b, FIGURE 8.

Referring to FIGURES 9 and 10 for the preferred hook, three plates 22c, 22c', and 22c'' are pivotally mounted in order on the pin of shackle 20c. Plate 22c' is a hook and has a lower cam 34c for engaging a load such as hook eye L3 for lifting a machine or the like. Plates 22c and 22c' have arms 86 between which a dashpot 38 is pivotally secured to delay the closing of the hook. Plates 22c and 22c'' each have a vertical tube 64c welded to their outer face at the tip of the hook in closed position. Each tube has therein a locating pin 68c extending down therefrom beyond the bottom of the hook and free to slide up therein. Pin 68c is held in the tube by any suitable means such as a head on the pin engaging the top of a ledge in the tube and a cap secured

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over the top of the tube. The load is engaged between the locating pins and the hook plate by swinging the hook on a hoist over the load so that only the ends of pins 68c engage the eye. Then when the hook is lowered on the load it latches. Plates 22c, 22c' and 22c'' have upper cams 36c which spread the plates open when the weight of the hook is rested on the load. Dashpot 38 delays closing while the hook is lifted from the load. Line C shows how close the top of the container or load can come to the hook for the hook to engage. Two of these hooks or hook plates can be mounted on a yoke or several on a frame for engaging a plurality of eyes, the locators all engaging from the side opposite the hooks. Various locating means can be provided for these hooks to center on the eye.

Referring to FIGURES 11 and 12 for a variation of the clamping device especially suited for picking up round stock off the floor, two corresponding isosceles triangular plates 100 are spaced apart superposed on parallel round bars 102, 103, and 104, one through a hole at each corner. The bars are welded or otherwise secured to these plates to form a locking frame or link. The bar 102 between the equal sides is placed horizontal at the top. Two gussets 106 and 107 are welded to the bottom of this bar and depend toward the center. Between these gussets is welded the top of depending tube 64d of locator 62d. An opening between the gussets and the tube provides a central hole for swivel hook H. Rod or tube 68d slides in and depends from tube 64d has diametrically opposite slots 110 in which ride a pin 112 secured through a hole in the top of tube 68d. A formed plate channel 74d welded to the bottom of the tube 68d has a bend at the middle of tube 68d and depends at about 30 degrees in both directions therefrom for approximately equal distance to form a pocket on which to center the load. A bend along one side of plate 74d carries the plate straight down below the opposite side to serve as the paddle in catching the load, shown as round bar L4.

Four hook or grab plates 22d are supported on an inner frame comprising two parallel plates 118 spaced apart and welded or riveted on ends of two parallel pins 120. Two hook plates are pivotally secured on each pin 120 to latch or clamp one side of the load. Pins 120 are located between and parallel to pins 103 and 104. Plates 118 extend up and fork at the top around pin 102 between plates 100. Each hook plate has a cam lever arm 122 extending out above a pin 103 or 104 to operate. Each hook plate 22d has a pin 124 secured through a hole therein above pin 120, FIGURE 14. A vertical cam bar 126 is secured to each end of the top of channel 74d of locator 62d. The cam bars 126 are wide at the top to hold pins 124 of opposite hook plates apart to hold the hook plates open for engaging a load and narrow at the middle for releasing the hooks to engage the load. The plates have upper cams 36d which are rested on the load to spread the hooks wide open to the position shown in phantom in FIGURE 1. The pins 124 on opposite plates 22d are then farthest apart. A latch 130 drops between the pins 124 to hold the grabs open. Each latch 130 comprises a block 132, FIGURE 13, for dropping between pins 124 when spread apart, and a lever arm 134 secured to each end of the block. Both lever arms 134 of each latch are pivotally secured near the middle on a pin 136 each welded parallel pin 112 on opposite sides or tube 64d. The ends of levers 134 opposite the block straddle tube 64d to near midway and face those of the opposite latch in position for engagement by pin 112, which lifts latches 130 when the locator extends down (as shown in FIGURE 12) releasing blocks 132, but cam bars 126 hold the hooks open to engage the load.

The grabs are engaged by the operator swinging them over the load so that the depending inside of channel 74d strikes the load. If paddle 74d strikes at an angle it sets up a torque which rotates the lifting device into

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alignment with the load. The grab is then lowered until pin 124 ride off cams 126 along the stem of bars 126, releasing the hook plates to swing in against and under the load. The operator then reverses the hoist, lifting the outer locking frame which engages bars 103 and 104 against locking cams 122, forcing plates 22d against the load until the load is clamped; or if desired, pins 124 can engage the stem of cam 126 to limit the closed position so as not to crush the load.

Referring to FIGURES 15 and '16 for another variation of the grab for engaging a load such as L4 at points spaced apart, two tongs 18e are spaced apart and pivotally secured on pins common in both. Hook H is held central on the top pin 28e by such as spacers 142. Each of the tongs has two corresponding lever plates 22e pivotally secured on each end of pin 24e. Four links 26e are pivotally secured at the top on pin 28e, two at each end, and each pivotally secured to the outer end of a lever plate 22e by a pin 25e. The locator 62e shown between the tongs 18e has a channel 74d with depending side and peaked top parallel the pins and a vertical flat 68e welded crosswise and central on the top of channel 74d. Flat 68e has a lower slot 146 through which pin 24e is run and an upper slot 148 through which pin 150 is run. Pin 150 is supported central and parallel the other pins by four links 152 each pivotally secured at 154 to a link 26e so as to guide pin 150 vertically above pin 24e as the linkage extends and compresses. Washers 156 and 158 backed with cotter pins hold flat 68e axially on center of pins 24e and 150 respectively. Two lever plates 22e at one end of pin 24e each have a cam pin 124e extending therefrom between pins 24e and 25e, near the top edge of the plate, and nearest pin 24e. A latch 130e is pivotally secured to one pin 124e and rests on top of the other. Latch 130e is designed to latch over pin 124e when plates 22e are opened wide as by resting the grab on the load. An arm 160 extends from flat 68e to lift latch 130e when the locator is extended out beyond engaging position of the tong plates. Two parallel flats 162 extend from one face of flat 68e to hold pins 124e apart when latch 130e is lifted by arm 160.

When the locator is engaged on the load and the hoist hook H lowered, the grab plates are held open by pins 124e sliding on flats 162 until the pins drop under the flats when the load is in position for engagement. The operator then lifts the grabs with the hoist clamping the grabs under the load. When the load is set down and the grab rested thereon, the cam edges of the plate swing them open, and latch 130e drops between pins 124e, holding them apart so that the operator can lift the grabs from the load. The locator extends as the grab is lifted, and arm 160 releases latch 130e, dropping plates 22e slightly as pins 124e come in the flats 162.

The ends of the grab plates can be of any desired shape to engage the load such as tongs for rail or structural members, hooks for containers, clamps for upstanding plate, etc.

Having thus described some of the preferred embodiments of this invention, other modifications and forms will be apparent to those skilled in the art which also come within the spirit and scope of this invention as defined by the following claims.

I claim:

1. A grab comprising in combination: a plurality of grab levers, means pivotally securing said levers to swing in parallel planes to support a load therebetween, linkage means for lifting said levers and for forcing said levers to engage upon the lifting of said linkage, locator means for aligning said grab on the load, means for supporting said locator means on said grab in horizontal alignment therewith and so said locator can vertically move from a point below to a point above the bottom of said grab levers as the weight of the grab is rested on the load, said levers camming open when rested on the load, latch means for holding said grab levers wide open after the weight

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of the grab is rested on the load, and means for actuating said latch means to release said levers as said locator extends below the grab levers as the open grab is lifted from the load, cam means controlled by said locator for holding said grab levers open when released by said latching means to hold the levers open to receive a load when said locator is extended, said cam means being designed to release said levers to engage the load as the locator is pushed in to engaging position of the load.

2. A grab as in claim 1, said locator means having a channel-shaped end for engaging the load, one leg of the channel depending to engage one side of the load, and the base and other leg forming an angle peaking up above the load between the levers to center the grab on the load.

3. In combination, a lifting device comprising a plurality of opposed holding members and means connecting said members to move to and from each other to support a load therebetween, said members being biased to close on the load; and, extending retractable locator means for engaging the load to control the closing of said members, latching means for holding said members open when opened (as by resting on the load), means on said locator means for releasing said latch means when said locator means is extended below the engaging position of said members and the load (as by the lifting of the device off the load) and cam means then positioned by said locator to hold said members open less wide than when latched open, said cam means being controlled by said locator means to release said members to engage the load when said locator means is retracted (as by resting on the load) to engaging position of said members and the load.

4. In a combination as in claim 3, said locator means having a lower end shaped to engage both the top and one side of the load for locating said device in position to lower on the load.

5. In a combination as in claim 3, said locator means having its lower end sloped down each side of the middle between said members to center the device above the load.

6. In a combination as in claim 3, said cam means including extensions on said members for engaging therebetween said locator which is the cam therefor.

7. In a combination as in claim 3, said members having substantially parallel pins extending at right angles to their planes of movement, said latching means being a latch pivotally secured on one said pin and riding on the other said pin, said latch having an extension beyond the latching point to ride on the other said pin when latched, and an arm extending from said latch opposite said extension, said arm being engaged by said locator when extended to lift the latch.

8. In a combination as in claim 3, said device being tongs pivotally secured together and linkage means connecting the upper end of each tong to a central point above for engaging on a hoist, said locator comprising at least one vertical flat member in a plane parallel to the tongs, links and pins connecting the linkage means and the flat member and together with the pivot for the tongs providing a vertical guide for the locator.

9. A lifting device comprising in combination, opposed lifting members which have lifting ends which move to and from each other to engage a load therebetween and biased to close, and a vertically guided locator for aligning the device on the load and supported on said device free to move up and down relative to said lifting members when rested on the load, an extension on each said member for engaging opposite sides of said locator means for holding said members open, said locator releasing said members to engage the load when in position.

10. A grab comprising at least two sets of grab levers spaced apart and aligned to engage a load between them, suspending means, linkage means connecting the outer ends of said levers to said suspending means to close said levers when lifted, locator means having means for aligning on the load in line with said levers, means for guiding said locator means to move in and out relative to the load

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engaging portions of said levers, latch means for locking said grab levers open when opened wide, means on said locator means for releasing said latch means when said locator means moves out beyond load engaging positions of said levers, and cam means controlled by said locator means for holding said levers open when said latch means is so released until said locator means is moved in to load engaging position of said levers.

11. In a grab as in claim 10, said means for suspending being free to rotate horizontally, said locator means being between said sets of grab levers and comprising means for contacting the side of the load at points spaced apart horizontally for rotating the grab into alignment on the load when engaged therewith.

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