

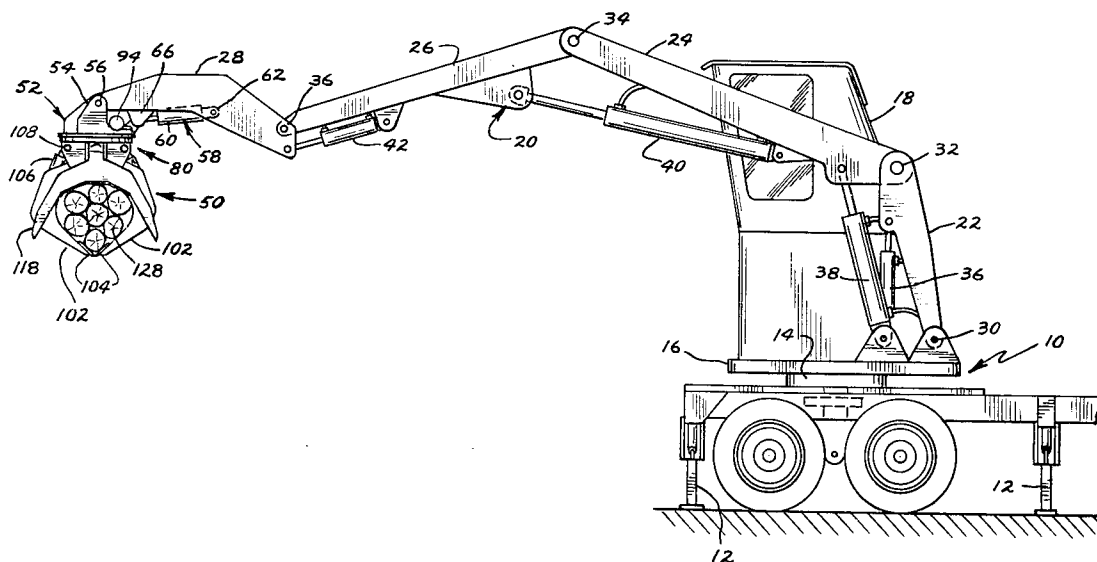
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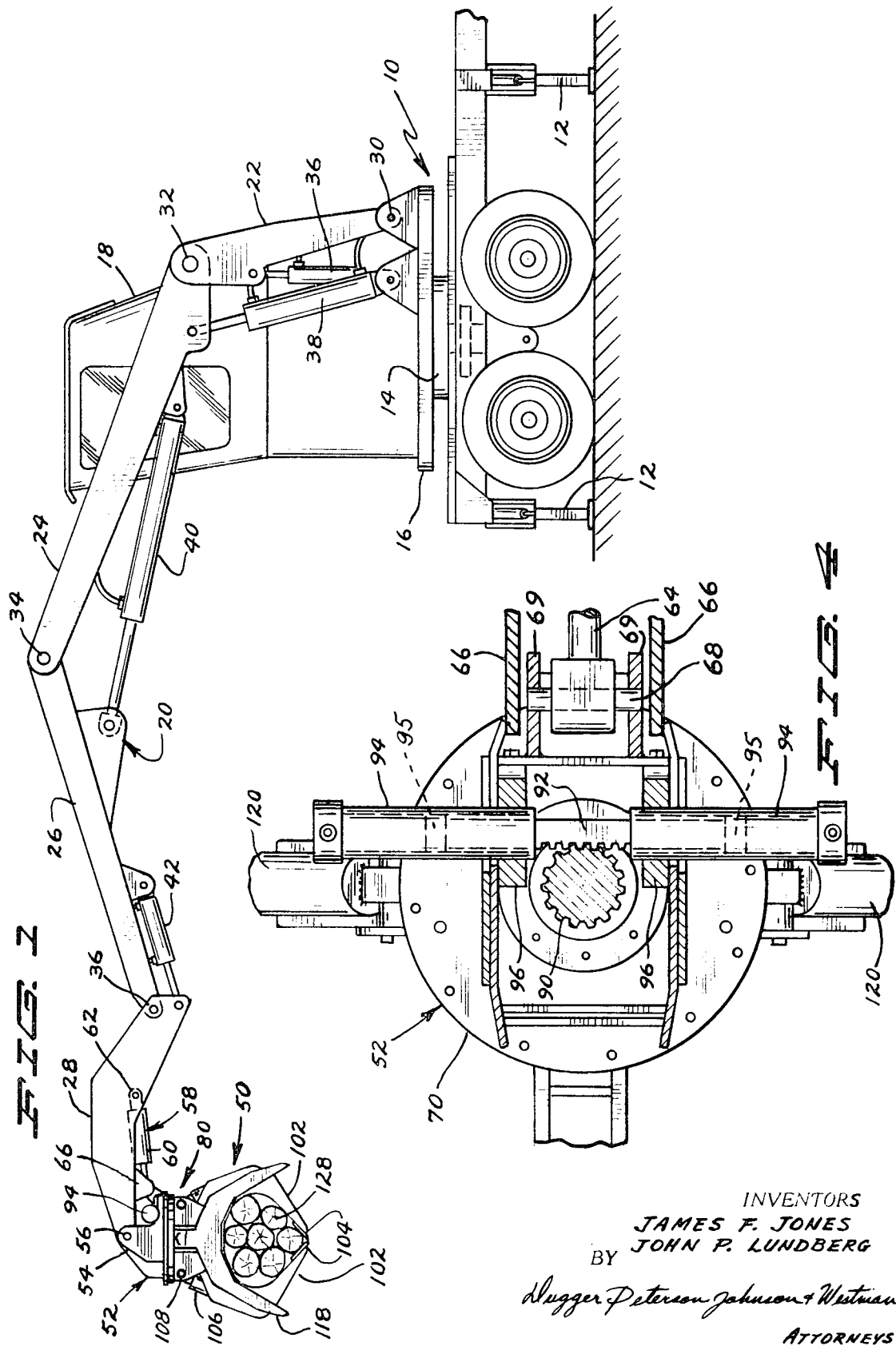
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 3,501,035 3/1970 Whiting..... 294/106 X
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[54] **ROTATABLE GRAPPLE WITH INDIVIDUALLY
 ACTUATED OUTRIGGERS**
5 Claims, 5 Drawing Figs.

[52] U.S. Cl.....**214/147 AS,**
294/106
 [51] Int. Cl..... **B66c 1/32**
 [50] Field of Search..... **294/87,**
106; 214/147 R, 147 G, 147 AS

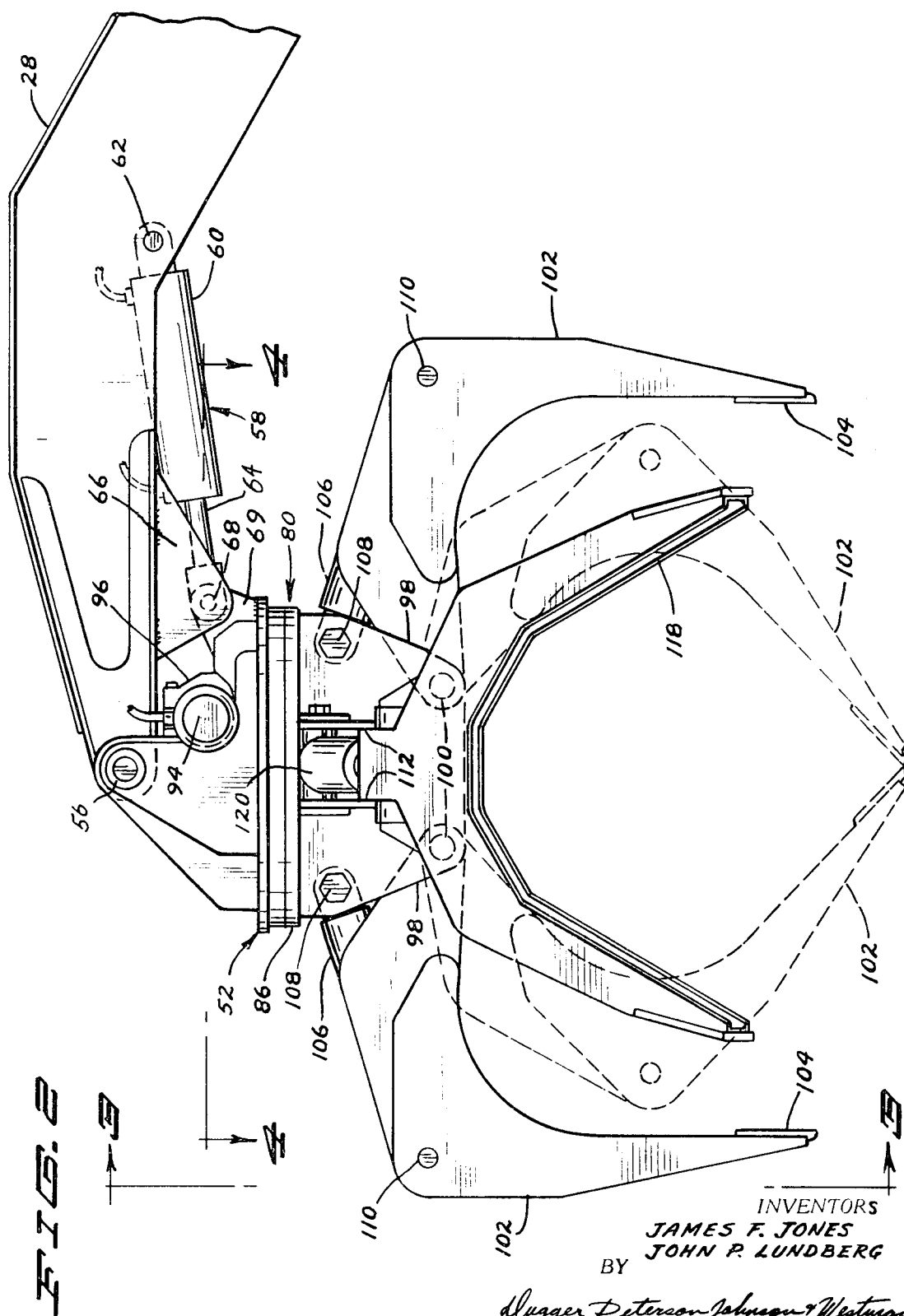
ABSTRACT: Carried at the free end of a boom member is a combined pole grapping and stabilizing unit. The grapple is rotatable into various angular positions and the individually actuated outrigger arms providing the stabilizing action extend at 90° with respect to the plane of the grapple jaws so that the outrigger arms are continually in alignment with the axis of the grapple opening.





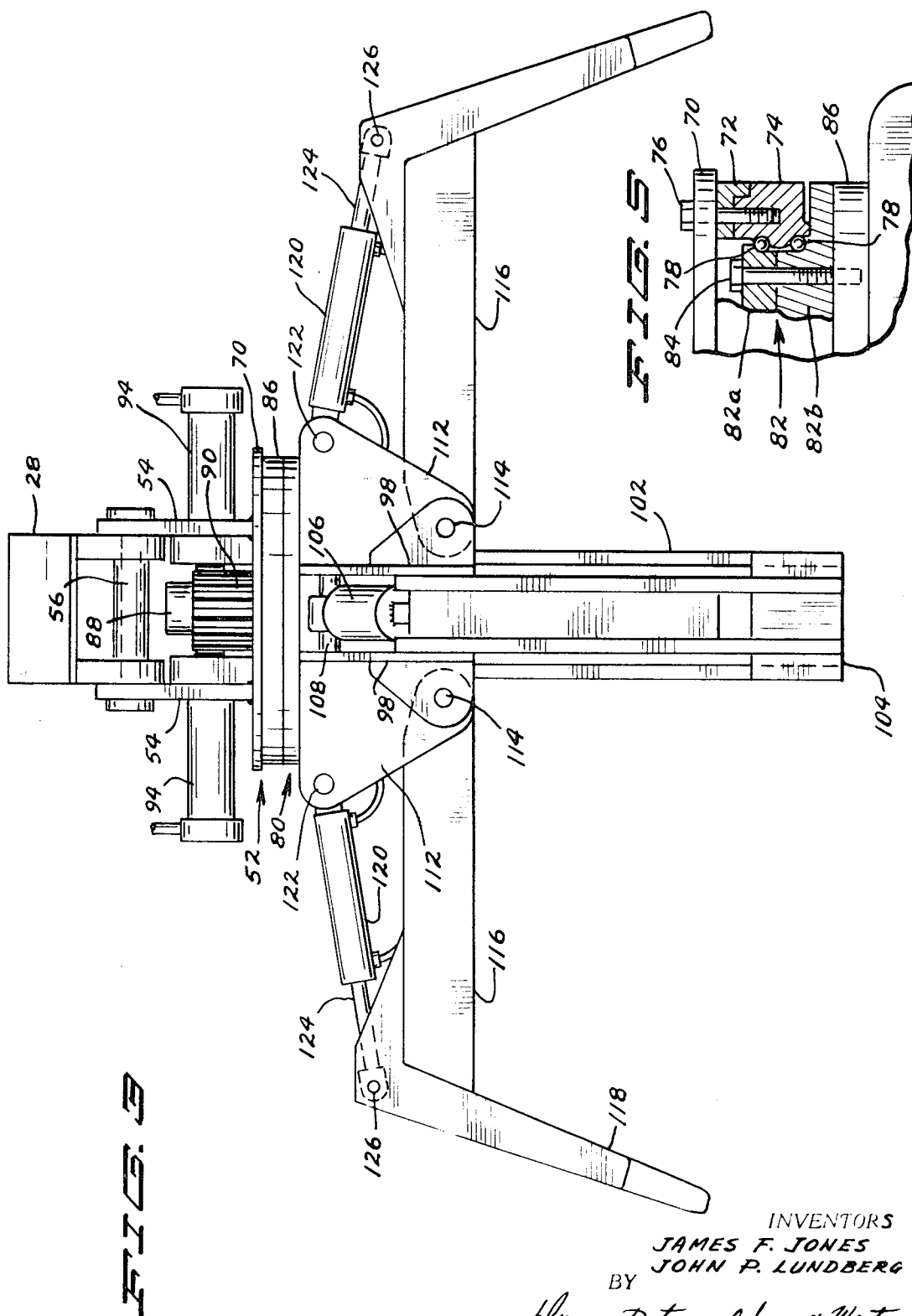
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ROTATABLE GRAPPLE WITH INDIVIDUALLY ACTUATED OUTRIGGERS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to grappling apparatus for handling poles and other elongated objects, and pertains more particularly to a combined grappling and stabilizing unit that can level such objects without first angularly orienting the grapple jaws with respect to the stabilizing outrigger arms or the arms with respect to the jaws.

2. Description of the Prior Art

U.S. Pat. No. 3,501,035 issued Mar. 17, 1970 in the name of Charles L. Whiting for "POLE GRAPPLING APPARATUS WITH HEEL MEANS AND LATERAL STABILIZERS," which patent has been assigned to the present assignee, relates to a grappling apparatus in which the grapple jaws must first be angularly oriented so as to be moved into alignment with the stabilizing arms. While in actual practice the alluded-to invention has performed admirably well, the speed with which poles and the like can be handled is at times reduced due to the fact that the poles must first be grappled and then the grapple jaws swiveled in order to swing the poles into alignment beneath the stabilizing arms.

SUMMARY OF THE INVENTION

A general object of the present invention is to increase the speed of handling elongated objects, namely poles which term will be used in a generic sense to embrace both pipes and tree-length legs and other items of a similar nature. In this regard, an aim of the invention is to grapple such poles irrespective of the position they assume when resting on the ground and automatically have the stabilizing outrigger arms oriented with respect to the axis of the grapple opening so that either or both outriggers can be readily employed to provide the desired leveling action.

Another object of the invention is to provide grappling apparatus of the above character that can handle more than one pole. More specifically, it is within the purview of the present invention to accommodate a plurality of poles which will require various sizes of grapple openings and still be able to level or stabilize the plurality of poles irrespective of the size of grapple opening.

Quite briefly, the invention relates to a combined grappling and stabilizing unit having an upper head carried at the free end of a boom member. The lower head is rotatably mounted with respect to the upper head. A pair of grapple jaws are pivotally connected to the lower head for opening and closing movement in any vertical plane determined by the rotative position of the lower head. Also pivotally connected to the lower head are a pair of outrigger arms that extend at right angles to the plane in which the grapple jaws move, thereby automatically causing the outrigger arms to assume the proper angular relation with respect to the jaws irrespective of the angular orientation of the jaws.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view depicting a portion of a vehicle on which is mounted an articulated boom assembly, the combined grappling and stabilizing unit exemplifying our invention being suspended from the free end of the boom assembly;

FIG. 2 is an enlarged side elevational view of the grappling and stabilizing unit illustrated in FIG. 1 but with the grapple jaws in an open position, the closed position thereof which corresponds to the relationship appearing in FIG. 1 being set forth in phantom outline;

FIG. 3 is a front elevational view taken in the direction of line 3—3 of FIG. 2;

FIG. 4 is a horizontal sectional view taken in the direction of line 4—4 of FIG. 2 for the purpose of showing a typical means for rotating the grapple jaws about a vertical axis, and

FIG. 5 is a sectional detail setting forth the bearing construction employed in achieving the rotative positioning of the grapple jaws.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Considering the construction depicted in FIG. 1, it will be perceived that the apparatus there shown includes a fragmentarily depicted vehicle 10 having any preferred number of leveling jacks 12 that can be adjusted so as to furnish the required amount of support for the chassis of the vehicle. The vehicle 10 has a baseplate 14 on which is rotatably mounted a turntable or swing platform 16. As is conventional, an operator's cab 18 has been illustrated and is mounted on the swing platform 16 so as to rotate in unison with the platform.

Although the precise construction of the boom assembly is not important to a practicing of the invention, a suitable boom arrangement has been pictured so that the benefits to be derived from the present invention will be better appreciated. Accordingly, the boom assembly appearing in FIG. 1 has been indicated in its entirety by the reference numeral 20 and comprises a first boom member 22, a second boom member 24, a third boom member 26 and still another boom member 28. The first boom member 22 is pivotally supported on the turntable or swing platform 16 by means of a pin 30; similarly, the second boom member 24 is pivotally connected to the first boom member 22 through the agency of a pin 32, whereas the third boom member 26 is connected to the boom member 24 by a pin 34 and likewise the fourth boom member 28 is pivotally attached to the boom member 26 by still another pin 36. A hydraulic motor or ram 36 functions to impart a reaching action to the entire assembly 20. A second hydraulic motor or ram 38 contributes to the elevating of the free end of the boom assembly, being connected to the second boom member 24. An additional hydraulic motor 40 is connected between the boom members 24, 26, and still another hydraulic motor 42 serves to angularly shift the fourth boom member 28 with respect to the boom member 26.

Attention is now directed to the grapple and stabilizing unit, which has been designated in its entirety by the reference numeral 50. The unit 50 includes a top or upper head 52 having upwardly extending, laterally spaced ears 54 providing a clevislike connection with the fourth boom member 28, there being a transverse pin 56 passing through the ears 54 and the free end of the member 28 so as to suspend the unit 50 for pivotal swinging in the general plane of the boom assembly 20. A hydraulic motor 58 which includes a cylinder 60 having a transverse pin 62 at the closed end thereof functions to pivotally anchor the cylinder 60 at one end to the boom member 28, the hydraulic motor further including a piston rod 64 that has its distal end guided between spaced ears 66 integral with the underside of the boom member 28. A transverse pin 68 (FIG. 4) pivotally connects the piston rod 64 to additional ears 69 fixedly anchored, as by welding, to the upper side of a plate 70 to which the ears 54 are also welded so that the unit 50 can be shifted or rocked about the transverse pin 56. It will be appreciated that the plate 70 is included as part of the upper head 52.

Referring to the detailed sectional view FIG. 5, it will be discerned that the circular plate 70, the circular configuration being readily seen from FIG. 4, has therebeneath an annular spacer 72 that is L-shaped when viewed in cross section. The spacer 72 confronts the upper edge of an outer race 74, the race 74 being fixedly held with respect to the plate 70 by means of a preferred number of bolts 76 that extend downwardly through the plate 70, the spacer 72 into said race 74. A number of ball bearings 78 are partially received in conventional fashion in annular grooves formed on the interior on the outer race 74.

Having described the top or upper head 52, it will now be seen that a bottom or lower head indicated in its entirety by the reference numeral 80 is employed. The lower head 80, it can be pointed out at this stage, is rotatably mounted with

respect to the upper head 72. In order to provide for the relative rotation of the two heads, an inner race 82 composed of sections 82a and 82b (FIG. 5) is employed, any preferred number of bolts 84 passing downwardly through both sections 82a, 82b into a plate or disc 86.

From FIG. 3 it will be seen that a shaft 88 extends upwardly. This shaft 88 is integral with the plate 86, the inner race 82 being of annular configuration to permit the upward projection of the shaft 88 therethrough. Also, as visible in FIG. 3, there is a gear 90 formed on the shaft, although it in actual practice would be keyed thereto; this gear 90 also appears in FIG. 4. Through the agency of a rack 92 having its teeth in mesh with those of the gear 90, it will be appreciated that when the rack 92 is reciprocated the shaft 88 is rotated through the intermediary of the gear 90 so as to rotate the lower head 80 with respect to the upper head 52. To effect this, a pair of cylinders 94, which are fixedly held with respect to the circular plate 70 of the upper head 52, receive therein pistons 95 at the opposite ends of the gear rack 92. Only a portion of the teeth on the rack 92 are visible in FIG. 4, the cylinders 94 forming concealing skirts for additional teeth. Thus, a sufficient number of teeth on the rack 92 are provided in order to obtain the requisite degree of rotation of the lower head 80. Actually, it is planned that a full 360° rotation be realized and the section of the rack 92 having teeth thereon would be adequate to achieve a full revolution. However, it should be understood that a rotary motor could be employed instead of the reciprocating mechanism depicted in FIG. 4 for achieving the desired amount of rotation of the lower head 80 with respect to the upper head 52.

Reference is now made to a plurality of mounting plates or gussets 98, these gussets 98 having their upper edges secured to the underside of the plate 86 constituting a portion of the lower head 80, as by welding. More specifically, there are four such plates or gussets 98 and these are arranged in pairs so that they form two sets of laterally spaced members. By means of a pair of transverse pins 100 extending through each pair of gussets 98, the upper ends of two curved grapple jaws 102 are pivotally connected to the plate 86. The lower ends of the grapple jaws have thereon teeth or tips labeled 104. Hydraulic motors or rams 106 each have one end thereof anchored between a pair of gussets 98 by means of a pin 108. The other end of the hydraulic motor 106 in each instance is connected by means of a pin 110 to outwardly spaced portions of the jaws 102. In this way, the introduction of fluid under pressure to the hydraulic motors 106 will be responsible for opening and closing the jaws 102, the direction depending upon which end of the hydraulic motor the fluid is caused to enter.

Additional mounting plates or gussets 112 are quadrantly spaced with respect to the gussets 98, these gussets 112 likewise being fixedly secured to the underside of the plate 86 of the lower head 80. The right-angle or perpendicular relationship existing between the gussets 112 and the gussets 98 is important to the practicing of the present invention. By means of a pair of pins 114 a pair of stabilizing outrigger arms 116 having integral cradle portions 118 at their extremities are mounted for pivotal movement upwardly and downwardly in a vertical plane perpendicularly oriented with the plane in which the grapple jaws 102 move. In other words, the arms 116 project in opposite directions in alignment with the axis of the grapple opening. To effect individual movement, each arm 116 is provided with a hydraulic motor or ram 120 which has a pin 122 extending transversely between each pair of gussets 112. A piston rod 124 extends from the ram 120 and a pin 126 for each of the two piston rods 124 connects its particular piston rod to an outwardly spaced portion of the arm 116 with which it is associated and which it is designed to control.

It will be understood that the term "poles" is intended to be embrative of virtually any type of elongated object. Clearly, the invention contemplates the handling of both tree-length logs and pipes. In this regard, poles which have been pictorially presented in FIG. 1 have been indicated by the reference numeral 128. It will further be appreciated that the hydraulic

motors or rams are appropriately supplied with fluid in order to obtain retraction or extension of their particular piston rods. For the sake of drafting simplicity, however, the hoses that supply the hydraulic fluid have not been depicted. Likewise, the controls for controlling the flow of fluid to the various rams have not been presented.

Having given the foregoing description, the operation of our equipment should be readily comprehended. Nonetheless, a brief outline of what occurs probably will be of assistance in appreciating the benefits to be derived from a practicing of the invention. Thus, where the poles 128 rest on the ground, the boom assembly 20 can be operated through the agency of any or all of the rams 36, 38, 40 and 42 to position properly the grapple and stabilizer unit 50 thereover. If the poles 128 happen to be oriented transversely with respect to the plane of the boom assembly 20, then no relative rotation of the lower head 80 with respect to the upper head 52 is needed. This would be the angular position of the unit 50 as it appears in FIG. 1. If needed, the ram 58 can provide angulation of the unit 50 in a vertical plane, that is in the same general plane of the boom assembly 20.

Assuming the situation as described above prevails, then the unit 50 is simply lowered by means of the articulated boom assembly 20 with the jaws 102 open or spread apart as they appear in FIG. 2. When the jaws 102 have been lowered and are in an embracing position with the number of poles 128 to be picked up, operation of the rams 86 will close the jaws, moving them into the phantom outline position shown in FIG. 2 and the solid outline position of the jaws 102 as they appear in FIG. 1. Immediately thereafter, either or both of the outrigger stabilizing arms 116 can be actuated by means of the appropriate hydraulic ram 120 associated therewith to lower the arms 116 to the extent necessary to cause the cradle portions 118 to bear against the upper poles 128 as illustrated in FIG. 1. Frequently, the actuation of just one outrigger arm 116 will be all that is necessary to effect the requisite amount of stabilization. However, when the poles 128 are picked up at substantially their center of gravity, it frequently is advantageous to operate both of the arms 116 to assure that the necessary stabilization is indeed obtained.

When the poles 128 reside on the ground in an angular direction with respect to the plane of the boom assembly 20, then the lower head 80 must be rotated into whatever angular position is necessary so as to bring the grapple jaws 102 into a straddling relationship with the poles that are to be picked up. This action is readily achieved through the agency of the rams 94. The rack 92, due to its being in mesh with the gear 90, produces the rotation. However, any rotation imparted to the lower head 80 which in turn correctly angles the jaws 102 will cause the outrigger arms 116 to be automatically angularly positioned so as to permit their immediate use in providing the stabilization. Once again, either or both of the rams 120 can be actuated so as to lower the particular arm 116 to make contact with the poles 128 via the cradle portion (or portions) 118.

Consequently, the need for first grappling the poles 128 by the jaws 102 and then rotating them, which is frequently difficult to do when one end thereof continues to rest on the ground, is completely obviated. It is extremely important to recognize that this is a highly advantageous feature in equipment of the type herein described because the stabilizing action is immediately available irrespective of the angulation of the grapple jaws. Stated somewhat differently, irrespective of the axis of the opening provided by the jaws 102, the stabilizing outrigger arms 116 are in alignment with this axis. There is never any deviation from the right angle relationship that has been provided between the vertical plane in which the jaws 102 move and the quadrantly or 90° spaced vertical plane in which the outrigger arms 116 move. Thus, the arms 116 are always available for performing their stabilizing function.

We claim:

1. In combination with the free end of a boom member, a grappling and stabilizing unit comprising an upper head at-

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tached to said boom member, a lower head rotatably mounted to said upper head, first power means for rotating said lower head relative to said upper head through an angle of at least 90° and to also at the same time rotate said lower head relative to said boom member, a pair of grapple jaws pivotally connected at their upper ends to said lower head for opening and closing movement, second power means carried by said lower head for actuating said jaws to provide said opening and closing movement, a pair of oppositely directed stabilizing outrigger arms pivotally connected at their inner ends to said lower head for movement at right angles to said grapple jaws so that said stabilizing arms are always oriented perpendicularly to said grapple jaws in all angular positions of said lower head, said pair of stabilizing arms constituting the only stabilizing arms in the combination, and third power means car-

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ried on said lower head for actuating said stabilizing arms, said third power means including a hydraulic ram for each arm operable independently of said first and second power means.
2. The combination of claim 1 including a downwardly facing cradle portion integral with the distal end of each arm for engaging one or more poles grasped by said grapple jaws.
3. The combination of claim 1 in which said second power means includes a hydraulic ram for each jaw.
4. The combination of claim 3 in which said each hydraulic ram connects between a quadrantly related, fixedly located pivot point beneath said lower head and a spaced pivot point on the jaw or arm with which it is associated.
5. The combination of claim 4 in which the hydraulic rams for the stabilizing arms are individually actuated.

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