This invention relates to hoisting apparatus and is particularly intended for use in changing heavy or weighty tires as used on earth moving equipment. These tires are very large and heavy and special crane or hoist facilities are necessary for expeditions handling in the field. Tires of the character being considered are normally carried in an upright position and in servicing the equipment the boom or hoist must be high enough to clear the equipment and the hoist must be located for direct vertical lift with the boom in a horizontal position so that a tire can be handled without danger of swing or oscillation.

One of the objects of this invention is to provide a tire servicing hoist having an extensible mast so that the mast can be extended to a horizontal position and the mast can be easily maneuvered and moved to any desired angular relationship thereto.

Another object of the invention is to provide an adjustable support for a mast so that the mast can be placed without levelling the truck body in the field.

With the general objects in view and others as will appear to those skilled in the art, the invention consists in certain new and useful features of construction and arrangement of parts hereinafter described and claimed; and in order that it may be fully understood, reference is to be had to the accompanying drawings, in which:

FIG. 1 is an end elevation of a truck chassis equipped with outriggers for the support and levelling of the truck in a transverse plane.

FIGURE 2 is a vertical section taken through an extensible adjustable mast and hoist apparatus embodying the invention.

FIGURE 3 is a fragmental top plan view of the same.

FIGURE 4 is a fragmental end view of the boom and supporting mast.

FIGURE 5 is a diagrammatic view of the control apparatus for the mast and boom.

FIGURE 6 is a side elevation of a mast plumbing support.

FIGURE 7 is a top plan view of the mast extension shown in FIGURE 6.

FIGURE 8 is a cross section through the drum to illustrate use of a pin to interlock the drum and upper mast section for concurrent rotation.

In the said drawings, where like reference characters identify corresponding parts in all of the figures, 1 represents a truck chassis which is provided with a pair of outriggers 2 which may be used on uneven terrain to level the truck body and hold same against tipping when the hoist is used to lift a heavy load.

Mounted on the truck body is a tubular mast 3 within which a tubular mast extension 4 reciprocates, said mast 4 being rotatable at its lower and upper ends by flanges 5 and 6 respectively secured to the masts 4 and 3. Supported on the upper end of the mast 3 and normally rotating around the mast 4 is a drum 7, said drum, however having means hereinafter described so that its rotation can be imparted to the mast 4. Encircling the drum 7 is a cable 8 which is looped around guide rollers and may be pulled in either direction by manipulation of fluid operated cylinders 9.

For safe highway movement the masts 3-4 are normally lowered but when the working site is reached the mast 4 may be extended by operation of a fluid-pressure cylinder 10 centered within the masts and having its piston rod connected to a pin 11 carried by mast 4. Upward movement of the mast 4 finally brings a pair of openings 12 in alignment with notches 13 in the upper edge of the drum 7 so that a pin 12a or the like, can be passed through the openings 12 and notches 13 to interlock mast 4 with the drum so that rotation of the latter will effect rotation of mast 4.

Prior to elevation of the mast, if the ground is very uneven, the truck body may be aligned fore-and-aft by blocking up the front or rear wheels. The truck body is then levelled horizontally by manipulation of the outriggers 2.

However, in most cases the terrain is such that it is only necessary to level the boom and this is preferably accomplished by a sensing switch carried on the boom, as follows: Welded or otherwise secured to the upper end of the mast 4 is a superstructure comprising a pair of plate sides 13 and pivoted on a bolt 14 carried by said plate 15, shown as of I-beam shape in cross section. This boom may be rocked on the bolt 14 by extension of the piston of a fluid operated cylinder 16 carried by the superstructure or plate sides 13.

The boom is provided with a rack bar 17 enmeshed with a gear 19 which may be rotated by a manually operable endless cable 18, said gear and cable being carried by a chain hoist mechanism 20 so that the hoist may be moved back and forth along the boom to center it over a load to be handled.

In order to operate the parts as described reference is to be had to FIGURE 5 in which 26a is a storage tank for hydraulic fluid, said tank being connected by a line 21 to a pump 22. The pump 22 discharges through a line 23 to a relief valve 24 into an operating line 25. If back-pressure develops in line 25, the relief valve opens to feed the fluid back to the pump through a bypass line 26. The operating line 25 leads through a manually controlled valve 27 to operate the elevating cylinder 16. When mast 4 has been fully elevated it is interlocked with the rotating drum 7.

The next operation is preferably the levelling of the boom and line 25 is connected by a line 28 through a check valve 29 to a manually controlled valve 30 feeding the cylinder 16. Manual valve 30 is opened and fluid pressure will enter cylinder 16 and move the boom. When the boom is horizontal the manual valve 30 may be closed and the boom will remain horizontal as long as valve 30 is tight. However, if the boom is to be automatically held horizontal, valve 30 may be left open and if the boom goes above horizontal, a solenoid valve 32 is opened through the operation of a sensing switch 31 on the boom to permit excess pressure to bleed off and permit the boom to return to horizontal position.

At this time the mast rotating cylinders 9 may be manipulated to rotate the mast in the desired direction to center the boom over the work. As a safety means the mast rotating mechanism cannot be actuated until the boom has reached a horizontal position as actuated by the sensing switch on the boom. Connected to the fluid pressure line 21 is a branch line 34 leading to a normally closed solenoid valve 35 which is connected to a manually operated four-way valve 36 whereby the cylinders 9 may be connected selectively to pressurize either of cylinders 9 and exhaust the other cylinder back through bypass line 37 to the storage tank.

In some cases it may be desirable to plumb the mast independently of the truck body and in such cases the following mechanism may be used: A base plate 38 is pivoted along one side on a rod 39 carried by a pair of
upstanding ears 40 resting on the tank bed or other support. Underlying the edge of plate 38 opposite that pivoted to rod 31 is a fluid pressure actuated cylinder 41. With this arrangement it will be evident that the plate 38 may be levelled in a plane at right angles to rod 39. The upper edge of plate 38 at right angles to rod 39 carries a rod 42 to which one edge of a second base plate 43 is pivoted so that said plate 43 may be levelled by a fluid pressure actuated piston 44 resting on the truck bed. By manipulation of cylinders 41 and 44, it will be evident that the mast may be readily plumbed regardless of the angle of the truck bed in relation to the ground plane.

From the above description and drawings, it will be apparent that we have produced a construction embodying all of the features of advantage set forth as desirable; and while we have described and illustrated the preferred construction it is to be understood that we reserve the right to all changes within the spirit and scope of the appended claims.

We claim:

1. In combination, a hydraulic elevating device to be mounted on a vehicle, comprising an extensible mast having a fixed and an extensible section mounted in a vertical position on the vehicle, the extensible section being rotatable within the fixed section, a drum journaled on the fixed section and detachably keyed to the extensible section, a pair of hydraulically operated pistons mounted on the fixed mast to simultaneously move in opposite directions, an endless cable encircling the drum and operable by the pistons to effect rotation of the drum, a superstructure mounted on the extensible mast section, a boom pivoted at one end to the superstructure for movement in a vertical plane, a manually operable valve for selectively hydraulically feeding one of the pair of pistons to rotate the drum in the desired direction, a normally closed solenoid valve controlling the hydraulic supply to said manual valve, and a sensing switch on the boom for opening said normally closed solenoid valve only when the boom is horizontal.

2. In combination, a hydraulic elevating device to be mounted on a vehicle, comprising a fixed mast, an extensible mast carried by the fixed mast and axially rotatable in relation thereto, a drum journaled on the fixed mast and keyed to the extensible mast to rotate the same, a pair of hydraulically operated pistons to simultaneously move in opposite directions, an endless cable attached to the pistons and encircling the drum to rotate the same, a boom pivoted at one end to the extensible mast and adjustable toward and from a horizontal plane, a manually operable valve to selectively feed to actuate the hydraulic pistons, a normally closed valve controlling the supply of hydraulic feed to the manual valve, and a sensing switch on the boom for opening the normally closed solenoid valve only when the boom is in horizontal position.

3. A hoist mechanism comprising, a support, a mast mounted on the support, said mast including a rotatable portion mounted for rotation on a substantially vertical axis of the mast, a boom pivotally mounted on the rotatable portion of the mast for up and down swing movement relative thereto, said boom extending outwardly from said mast, a power source, power means actuated from said power source and operatively connected to said rotatable portion of the mast for rotating same for swinging the boom in a circle, power means on the mast and operatively engaged with the boom and operable by application of power from said power source for effecting upwardly and downwardly swing movement thereof, a level responsive means on the boom, means actuated by said level responsive means for shutting off the power means to stop rotation of the rotatable portion of the mast when the boom is inclined, and means actuated by said level responsive means for controlling application of power to the boom raising and lowering means to swing said boom to substantially level position.

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