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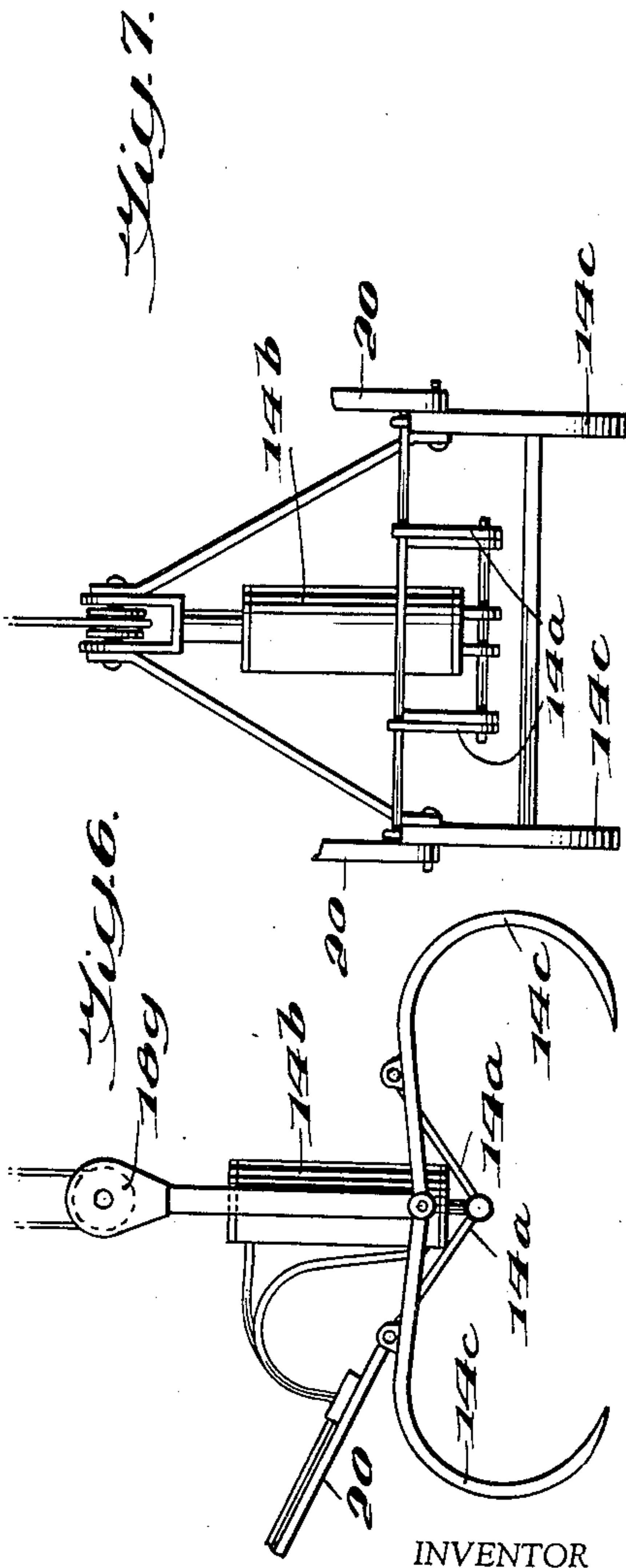
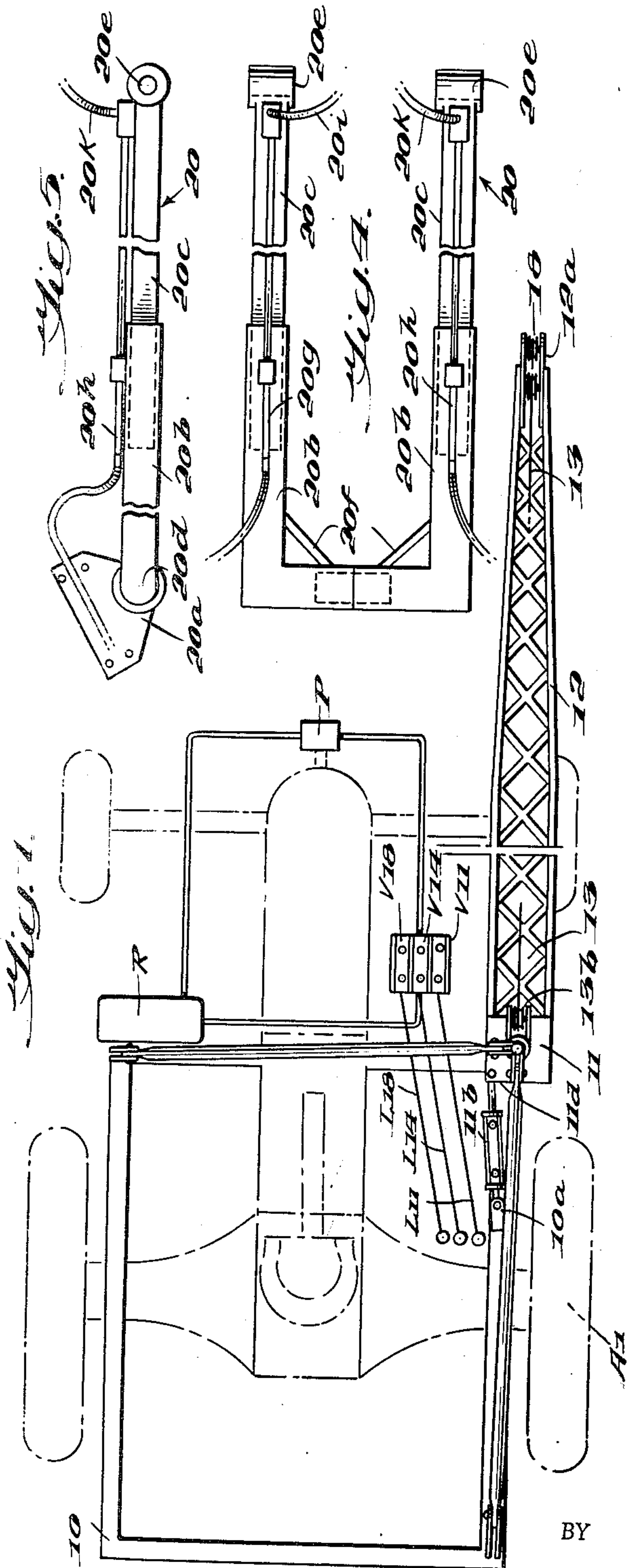
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2 Sheets-Sheet 1



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UTILITY LOADER

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This invention relates to utility loaders and aims generally to improve the same.

Particular objects of the invention, severally and interdependently, are to provide a loader readily adapted for loading of sugar cane and hay or other materials; a loader simply and easily attachable to tractors of the farm type, such as "Ford" tractors; a loader comprising the combination of a rotatable mast carrying a swinging boom with means for raising and lowering the boom, the boom carrying a suspended hoist type material engaging means or grab and means for raising and lowering such grab, the boom carrying telescoping grab steadying means and grab operating means associated with the steadying means; a loader comprising such combination and including a double, telescoping hinged grab-guide or stabilizer that maintains the grab in the plane of the boom while allowing the grab to swing in that plane and while compensating both for lifting and lowering of the boom and for lifting and lowering of the hoist; and a combination as stated in which the grab is hydraulically operated and in which the grab guide or stabilizer comprises slidably mounted hydraulic conduit means for operating the grab and compensating for lifting and lowering of the boom and hoist; and in the provision of particular combinations of parts and constructional features contributing to the realization of the aforesaid objects, as well as further objects and advantages which will appear from the following detailed description of illustrative embodiments of features of the invention.

The invention resides in the new features of the utility loader constructed as indicated above, and is more particularly pointed out in the appended claims.

In the accompanying drawings of illustrative embodiments:

Fig. 1 is a plan view of the loader attached to a small farm tractor, generally indicated in broken lines.

Fig. 2 is a side elevation of the same.

Fig. 3 is a detail of the boom and hoist operating means in the rotatable mast base.

Figs. 4 and 5 are plan and elevation views of the grab guide or stabilizing elements and slidably mounted hydraulic conduits.

Figs. 6 and 7 are side and end elevations of the hydraulically operated grab, and Fig. 8 is a side elevation of an alternative grab or bucket construction.

Referring to Figs. 1 and 2, the loader as there shown preferably is constructed as an attachment for an ordinary small farm tractor A¹, and com-

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prises a base or bed 10 made up of front and side frame members, preferably boxed channels, and formed as a rigid rectangular frame adapted to be secured to the axle housing in any suitable manner as by use of U-bolts, with its forward end secured to the chassis just behind the engine, so that the frame surrounds the driver's seat and controls. This arrangement is particularly desirable for placing controls carried by the frame within easy reach of the operator.

A vertical mast 11 rotatable through a suitable angle, say 90°, is pivotally mounted at one forward corner of the frame 10, and preferably braced to the adjacent rear corner and opposite forward corner as shown. A vertically swingable boom 12 is hinged to the lower end of the mast with its outer end or head 12a supported by an adjustable cable means 13 extending thereto from a sheave 13b at the upper end of the mast.

The material engaging means, shown as a grab 14, is suspended from the head 12a of the boom 12 by an adjustable cable hoist 18, the operating cable of which passes down the boom 12 to a hoisting drum 18a, carried by and rotatable with the mast 11 (Fig. 3).

The grab guide or stabilizing means 20 is hinged to the boom 12, at some little distance from the mast 11 and moves in the vertical plane of the boom, and at its outer end is attached to the grab 14.

To eliminate mechanical drives, clutches, brakes, etc., and render the operation of the equipment easy, in the form shown, hydraulic elements are employed for rotating the mast, operating the hoist, and operating the grab, and may also be used for raising and lowering the boom. As indicated in Fig. 1, the hydraulic means may comprise a pump P driven from the tractor engine, that receives oil from a reservoir R and pumps it under pressure to control valves V11, V14 and V18, with return to the reservoir from the valves as is usual in hydraulic systems. The valves, as shown, are located under the front frame member of the base or bed 10 and are remote controlled by operating levers L11, L14 and L18, respectively, each of which preferably has three positions, for drive, hold, and retract, respectively.

Mast rotating means

As is clearly shown in Figs. 2 and 3, the valve V11 controls the admittance and release of oil to and from the opposite ends of a hydraulic cylinder 11b that rotates the mast 11 and hence traverses the boom 12. For this purpose, in the form shown, the cylinder 11b is hinged for horizontal

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swinging relative to the frame 10 by a pivotal connection at 10a and its piston rod is pivotally connected at 11d to one corner of the base of mast 11. With the arrangement shown, when the piston rod is retracted the boom 12 is extended forwardly of the tractor A¹, and when the piston rod is extended, the boom extends sideways from the tractor A¹, at right angles to its forwardly extending position. By admitting more or less oil to either end of the cylinder 11, the traverse of the boom 12 may be adjusted as desired, and positioning of the valve V11 in its "hold" position closes the oil conduits leading to the opposite ends of piston 11b and locks the boom at the chosen traverse position.

Grab operating means—(Figs. 6 and 7)

The grab operating valve V14 controls the supply of hydraulic fluid to the opposite ends of the hydraulic cylinder 14b of grab 14. The pivoted grab members are suspended from the travelling sheave 13g, to which one end of the hydraulic cylinder 14b is also connected, and the other end of the cylinder 14b is pivotally connected to the grab operating links or arms 14a, the arrangement constituting, in effect, a toggle joint, for opening and closing the grab jaws 14c. The conduits leading from the valve V14 to the opposite ends of the hydraulic cylinder or motor 14b are specially associated with the grab guide or stabilizer 20, as hereinafter described, and the valve V14, which primarily operates only to open wide, or close tightly, the grab jaws, may nevertheless be provided with a "hold" position if desired.

Grab hoisting means—(Fig. 3)

The valve V18, in the form shown, controls the cable hoist 18, 18a that raises and lowers the grab 14 relative to the head 12a of the boom 12, by controlling the supply of fluid under pressure to the respective ports of a reversible hydraulic motor 18b, shown as mounted to rotate with the mast 11, and driving the cable drum 18a through a chain and sprocket drive 18c. The drum 18a, as above noted, is mounted to rotate with the mast 11, herein by being carried on a transverse shaft 21 that extends between the spaced sides of the box-like housing forming the lower end of the mast. The chain and sprocket drive 18c, in the form shown, further comprises chain adjusting or tightening means which may be provided by movably mounting the hydraulic motor, but is preferably in the form of a swingably mounted idler (not shown) for displacing one of the runs of the chain between the motor sprocket and driver sprocket of the drive 18c. With this arrangement mere manipulation of the lever L18 admits oil to one side or the other of the motor 18b and controls the winding and unwinding of cable 18 on the drum 18a, which cable passes up the boom 12, over sheave 18f carried by the boom head 12a, downwardly and through the travelling sheave 18g, to which the grab 14 is attached in the form of Figs. 1-7, and upwardly again to an attachment to the boom head. While a two pass hoist is thus provided in the illustrative embodiment, any multiple pass hoist or even a simple one strand hoist may be employed, as will be understood by those skilled in the art.

The hydraulic lines 18h and 18i leading from valve V18 to the motor 18b are extended in hanging loops or bights to the base of the mast 11, to prevent damage thereof on 90° rotation of the mast. The valve V18 of course, is provided with a "hold" position for holding the hoist at any

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desired position of adjustment during transportation or operation of the grab.

Boom adjusting means—(Figs. 1-3)

The boom adjusting cable 13, in the form shown, is connected to the boom head 12a and extends over the sheave 13b carried at the head of the mast 11 and thence to a cable drum 13a mounted to rotate with the mast. Any suitable manual or other means may be employed to operate the cable drum 13a, such means being exemplified in the form shown by a worm and wheel drive 13c, which is desirable because its inherent irreversible nature enables it to mechanically hold the boom 12 in any adjusted position. Since adjustment of the boom angle is relatively infrequent, the worm shaft may be rotated by hand crank means 13d, but in more elaborate installations, it may be driven by a hydraulic motor, like the motor 18b, under control of a valve similar to the valve V18.

Grab stabilizing means—(Figs. 2, 4 and 5)

The grab guide or stabilizing means 20, as shown particularly in Figs. 4 and 5 is hinged to swing in a vertical plane under the boom 12 by hinge plate means 20a secured to the boom 12 at about one-third its length from the mast 11. The grab guide comprises two parallel telescoping members 20b, 20c, shown as tubular in cross-section, the stationary sections 20b of which are hinged to the hinge plate 20a on a common horizontal axis 20d. The movable section 20c of these telescoping guide arms carry horizontal journals 20e at their outer ends, that are pivotally connected to the opposite sides of the grab unit 20. Suitable braces 20f may be employed to rigidify the structure. The grab guide thus in effect comprises a horizontal fork or U, with its bend hinged to the boom, and its tines hinged to the grab 20.

Disposition of hydraulic grab operating conduits

The hydraulic operation of the hoist and swinging boom supported grab presents a problem of disposition of the hydraulic lines so that they will not become fouled or be subjected to sharp bends and other damage. Special use of the telescoping grab guide or stabilizer is employed to solve this problem while also effecting a shortening or economy in the hydraulic conduits as compared to a conventional dropping thereof from the boom head 12a.

In this new arrangement the hydraulic lines 14d and 14f (Fig. 2) that connect to the grab operating cylinder are extended from the valve V14 in hanging loops to the bottom end of the boom 12 to prevent damage thereto on rotation of the mast and boom, and are secured along the boom 12 to the hingeplate 20a. At this point they are provided with free loops that connect to rigid pipe or copper tubing elements 20g-20h (Fig. 6) paralleling the grab guide elements 20b-20c. At the other ends of the rigid tubing elements 20g-20h further loops of flexible conduit 20i-20k (Fig. 6) are arranged leading to the hydraulic cylinder 14b of the grab 14. The rigid pipe or tubing elements 20g-20h are fastened to one of the sets of telescoping guide members 20b or 20c and held rigid therewith, but are slidable relative to the cooperating telescoping elements 20c or 20b. The loops of flexible conduit extending from the slidably related ends of the rigid pipe or tubing elements 20g-20h are made of sufficient size to accommodate the telescopic extension and

contraction of the grab guide 20, as well as the variation of angle thereof relative to the associated structure. In the form of Figs. 1-6, as is preferred, the loops at each end of the rigid section extend upwardly or upwardly and outwardly, from the grab guide assembly 20b-20c, 20g-20h, and the rigid pipes are fixedly connected to the movable portions of the telescoping members that are connected to the grab, the loops adjacent the grab being short loops merely accommodating the changes of angle of the grab guide relative to the grab, and the loops adjacent the hinge plate 20a being the large loops for accommodating the telescoping action of the guide 20 as well as changes of its angle with the boom. This arrangement avoids the placing of hanging loops of hydraulic conduit in the vicinity of the grab or hoist, where they could become fouled with the work or with the hoisting mechanism, and at the same time economizes on quantity of conduit and minimizes the flexing thereof, incident to the operation of the boom adjusting and grab hoisting mechanism.

Alternatives

From the foregoing description it will be clear that various changes and modifications in details of construction and arrangement of elements and components may be made within the scope of this invention. For example various forms of hydraulically operable material engaging means or grab may be employed. In this connection Fig. 8 shows another arrangement in which the pivoted grab operating levers or links 114a extend upwardly from the grab jaws 114(c) to the cable supported suspension elements 118g and in which the cylinder 114b is connected between the grab-jaw hinge 114(i) and the suspension element 118g. This arrangement has certain advantages, among which are the fact that the spaces within the grab jaws 114c are clear at all times, so that grab buckets 114k, indicated in broken lines, may be fastened within, or substituted for, the grab jaws 114c for the handling of grain, pulled corn, earth, manure and other such materials. In addition, Fig. 8 illustrates the connection of a simple, single cable hoist 118 to the grab suspending element 118g, and shows the connection of the grab guide 120 to the hinge axis 114i of the grab jaws 114c.

As these and similar modifications are contemplated, the invention is not limited to the particular forms herein set forth to illustrate its features. It is therefore to be understood that the exemplary embodiments are illustrative and not restrictive of the invention, the scope of which is defined in the appended claims, and that all modifications that come within the meaning and range of equivalency of the claims are intended to be included therein.

I claim:

1. A device of the class described comprising a hollow rectangular base proportioned for securement to the frame of a farm tractor in surrounding relation to the driver's seat thereof, a mast extending vertically from one forward corner of said rectangular base and rotatable about its vertical axis, diagonal bracing means extending from the top of said mast to the opposite forward corner and adjacent rear corner of said base, a boom hinged to said rotatable mast adjacent the lower portion thereof for swinging movement in a vertical plane, boom supporting cable means including a cable drum carried by said rotatable mast, a sheave at the upper end of said mast and a cable connecting the outer end of said boom to said drum via said sheave, a hoist suspended from the outer end of said mast comprising hydraulically operable grab means, a telescoping fork pivoted at one end to said boom and at its other end to said grab means and raisable and lowerable by said hoist in the vertical plane underlying said boom, said grab means comprising a hydraulic operating cylinder with conduits and valve means for connecting the same to a source of fluid pressure, said conduits being carried along said telescoping fork and boom and said valve means being carried by said rectangular base, a drum carried by said mast for raising and lowering said hoist, hydraulic motor means carried by said mast for operating said drum, a control valve for said motor means carried by said rectangular base, hydraulic means for rotating said mast, boom, fork and grab assembly, a control valve for said last named hydraulic means carried by said base, and means for operating said several valve means carried by said base within easy reach of one occupying a tractor driver's seat within said rectangular base.

2. A combination according to claim 1, said grab means comprising parallel tong jaws and detachable bucket means securable within said tong jaws.

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