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LOADING CONVEYOR FOR VEHICLES

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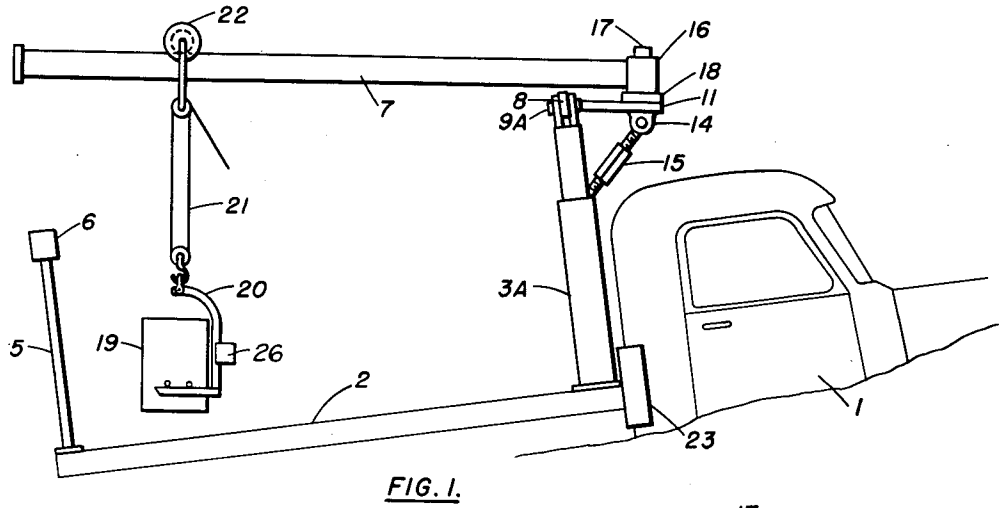

FIG. 1.

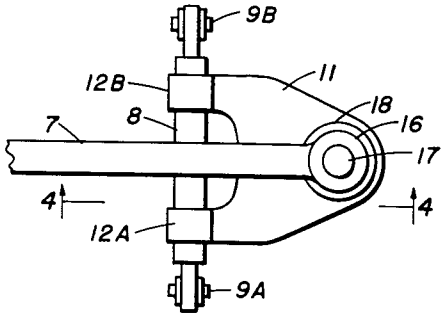

FIG. 3.

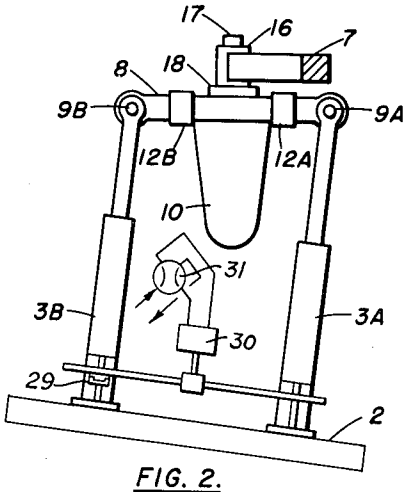

FIG. 2.

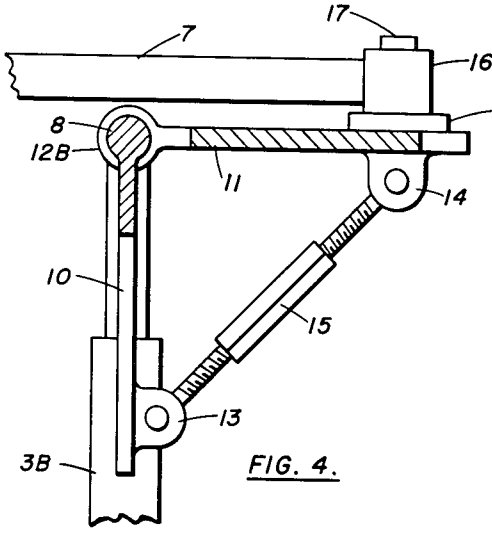

FIG. 4.

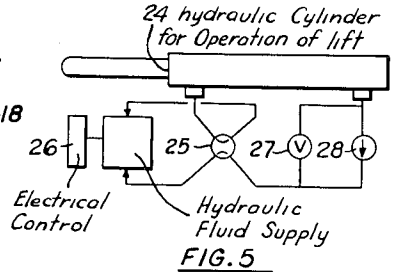

FIG. 5

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LOADING CONVEYOR FOR VEHICLES

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This invention relates to a conveyor or hoisting rig, particularly to a loader suitable for loading and unloading heavy objects from trucks which may be parked on sloping terrain. The conveyor is adapted to be mounted on a movable base such as a truck bed, and be operated with equal facility no matter what slope is assumed by the movable base.

The use of hoisting rigs on truck beds is not in itself new. Various types of derricks or other hoisting rigs have been used in the past. Where heavy loads are to be lifted or transferred to or from the truck bed, mechanically or electrically operated machines have been used. In a typical installation, for example, a boom may be equipped with electrically controlled means for (1) lifting the load from the ground, (2) moving the lifted load transversely to a position over the truck bed and (3) moving the lifted load longitudinally along the length of the truck bed. It is apparent that rather complicated controls are necessary for controlling all three of these movements. It is one object of this invention to eliminate the necessity for two of these three types of control equipment without sacrifice of efficiency.

In the rigs of the prior art, it has also been necessary either that two people operate the loader, or that one operator move alternately to the load and/or lifting controls and back to the controls for moving the lifted load transversely or longitudinally. It is another object of this invention to facilitate the entire operation by permitting the single operator to stay with the load at all times during the loading. Further objects will appear in the following description of the invention.

Briefly, the invention involves mounting on a truck bed or other movable base, a horizontal boom adapted to rotate around a vertical axis or spindle, and providing means for adjusting the spindle to an exactly vertical position no matter what slope the movable base has assumed. Thus the truck for example, may be stopped at any convenient loading point, whether level or not; the spindle is then adjusted to an exactly vertical position, and thereafter the boom will maintain an exactly horizontal position at every point in its rotation around the vertical spindle. This permits a block and tackle or other hoising equipment to be suspended from a pulley which is free to travel along the length of the boom. The operator may then stay with the load while he fastens it to the hoist or block and tackle and lifts it from the ground therewith, and then pushes or pulls it manually in or out along the boom and rotates the boom around its vertical axis to put the load in position for descent and unfastening. No matter how heavy the load, the movement of it in or out along the boom and around the axis of rotation of the boom can always be accomplished and controlled manually with relative ease because the boom is horizontal and the only forces to be overcome are minor frictional ones. This is in marked contrast to the use of non-adjustable booms, since whenever the boom is not horizontal, movement of the load in or out along its length or rotation of the boom around its axis must necessarily involve lifting of the load as well as overcoming of frictional forces.

The invention may be understood more thoroughly by reference to the attached drawing, in which Figure 1 is a side view of a truck having the hoisting rig of this invention mounted on its bed in operating position. Figure 2 is a view from the rear of the truck bed, omitting the rear part of the boom and the boom rest. It may be noted that in Figure 1 the truck is parked on an incline from front to back, and in Figure 2 the truck is parked on an incline from side to side, so as to better illustrate the principles of the invention. Figure 3 is a plan view of the rig, omitting part of the boom, Figure 4 is an enlarged section through 4—4 of Figure 3, and Figure 5 is a diagrammatic sketch of the electric and hydraulic systems for operation of the lifting mechanism described in the specific example. All of the figures employ the same numbers to designate the same parts of the equipment.

Referring to the drawing, truck 1 has mounted on its bed 2 a pair of screw jacks 3A and 3B at the front thereof, and a boom rest 4 at the rear. The boom rest consists simply of a support 5 for a nest 6 in which the boom 7 is cradled when not in use, for example when the truck is traveling. The two screw jacks support the ends of a yoke 8, being fastened rotatably thereto by pins 9A and 9B so that by the independent adjustment of each jack, the yoke may be made to assume a laterally horizontal position regardless of the slope of the bed 2. Rigidly fastened to yoke 8 is vertical arm 10, which is in substantial alignment with the plane of jacks 3A and 3B and dependent at right angles from yoke 8. When yoke 8 is adjusted to a horizontal position, arm 10 will be vertical as seen in Figure 2.

To permit boom 7 to be adjusted to a horizontal position when the truck bed is on a slope as in Figure 1, a platform 11 is fastened to yoke 8 by means of a pair of bearings 12A and 12B located near the ends of yoke 8 and rotatable around it, in a plane perpendicular to the axis of the yoke. From the outer extremities of vertical arm 10 and platform 11 extend hinges 13 and 14 respectively, to which the two ends of the turnbuckle 15 are fastened. Thus by adjustment of the turnbuckle the platform 11 may be made to assume a longitudinally horizontal position, regardless of the inclination of the truck bed 2 as in Figure 1, and since the inclination of the bed in the other vertical plane can be corrected for by adjustment of the jacks as in Figure 2, the bed 11 may always be adjusted to assume a horizontal position, regardless of the terrain on which the truck is parked.

The boom 7 is mounted on platform 11 so that it may be revolved in a horizontal plane to any point of the compass. Thus it may be mounted as illustrated, fastened to a sleeve 16 which fits around spindle 17 and rests on bearing 18. The load 19 may be hoisted by means of hook 20 and block and tackle 21 after table 11 and boom 7 are adjusted to horizontal. The load may then be pushed manually in or out along the boom 7 by means of pulley 22, while boom 7 is rotated manually to the desired position for unloading. This obviates the need for mechanical power other than that necessary to operate the jacks or the lifting equipment. These are operated by conventional means illustrated diagrammatically as control box 23.

As a specific example of a conveyor of this invention, the following is a description of one which was built recently for the purpose of moving beehives from place to place in fields, loading platforms, etc. where the truck on which the conveyor is mounted may necessarily be parked on a slope while being loaded or unloaded. In this case, boom 7 was about 20 feet long, made of ⅛ inch aluminum side and top plates in the form of an

inverted U about 4 inches wide and 6 inches deep at the far end and 12 inches deep at the end attached to sleeve **16**. The lower side of the boom was at right angles to the axis of sleeve **16**. Pulley **22** was in the form of a pair of pulley wheels of about 4 inch outer diameter, each mounted between a pair of steel plates so that their centers or axles were spaced about 2 feet apart along the length of boom **7**. These pulleys were adapted to ride in such spaced relationship inside the boom, the plates carrying the pulleys being supported by two pair of flanged trolley wheels riding on tracks along the underside of the boom, so that the plates, pulley wheels and trolley wheels were always within the hollow boom and protected by it.

The lifting mechanism took the form of a hook **20** substantially as illustrated, having arms adapted to engage projections on the sides of the hive. This hook was fastened to the axle of a 3 inch traveling pulley or block as illustrated. One end of the lifting cable was attached to the inside of the outer end of boom **7**, and the cable was then threaded over the nearer pulley within the boom, under the traveling pulley, over the other pulley inside the boom, and passed from there through the boom, under and over two more pulleys, down through spindle **17**, and under and over two more pulleys to a block and tackle operated by a double-acting hydraulic cylinder **24**. The hydraulic fluid to and from the cylinder flowed through a 4-way valve **25** electrically controlled to drive the cylinder in either desired direction. Remote control electrical switches **26** were located not only in box **23**, but also at the traveling pulley just above the hook **20**, so that the operator could operate the lift while staying with the load. A manually adjustable flow control valve **27** was located in the line between the 4-way valve **25** and the hydraulic cylinder **24** to control the rate at which the load could be lowered. A bypass line around this flow control valve was provided with a check valve **28** to permit the hydraulic fluid to bypass this flow control valve while the load was being lifted. The high pressure hydraulic fluid was supplied from a low pressure sump by a pump operated by the truck engine.

The boom **7** was rotatable around spindle **17** through roller bearings, and the pulleys inside the boom were also mounted so as to move along the track through ball bearings, making the movements of the load, once lifted, easily accomplished and controlled manually as long as the boom was in horizontal position.

To adjust the boom to a horizontal position with its vertical axis of rotation or spindle **17** in a vertical position, and at the same time permit elevation of the boom to any desired height, substantially the screw jack and turnbuckle arrangement illustrated was employed. The two screw jacks were spaced about 3 feet 4 inches apart and had approximately 3½ inch plungers operating on screws so that when in the desired position, they would not move either up or down. It is desirable if not essential, that the plungers of the jacks or boom-elevating mechanisms be resistant to movement up as well as down when in position, since when boom **7** is rotated to a position in which it is not above yoke **8** or either jack, one of the jacks will not be exerting a lifting force, but a depressing force, i. e., its plunger will not be in compression, but in tension. In this example, the jacks were driven through a clutch **29** permitting independent operation or simultaneous operation, by a hydraulic motor **30** operated by fluid from the same truck-engine powered pump referred to above. A second 4-way valve **31** permitted reversal of the fluid flow to drive the packs either up or down.

The yoke **8** was of about 4½ inch diameter, and 40 inches long. Vertical arm **10** was formed from two triangular pieces of steel plate welded at their bases to the yoke, and welded to side pieces holding them parallel and about 3 inches apart. The distance from the center of yoke **8** to a pad-eye at the apex of the triangular arm **10** was about 18 inches. A pin through the pad-eye passed through a clevis fastened to the end of turnbuckle **15** to form a hinged connection between the arm **10** and the turnbuckle. The turnbuckle itself was a pair of 1½ inch diameter screws threading into a hexagonal sleeve 2½ inches in length. The opposite end of the turnbuckle was fastened by a similar hinged connection to platform **11**.

Platform **11** was made of parallel steel plates welded about 4 inches apart, and equipped with the mentioned hinge **14** at the outer end, and with sleeves fitting around yoke **8** so as to form bearings **18** on which to rotate about the yoke. The horizontal distance between the axis of yoke **8** and hinge **14** was about 18 inches.

With the above arrangement, it was found that loads as great as 500 pounds at the end of the boom could be handled with great ease. A 250-pound load of beehives could be lifted and loaded in place on a truck by one operator in a matter of a few minutes, once the boom was adjusted to the horizontal position, and the latter adjustment, together with adjustment of the height of the boom required only a few minutes.

While the above arrangement is preferred, other arrangements of similar equipment may be used, and other means may be employed for supporting the spindle and adjusting it to a vertical position so as to permit the boom to rotate in a horizontal plane. Modification of the invention which would occur to one skilled in the art are to be included within the scope of the following claims.

We claim:

1. A conveyor which comprises a truck, two jacks laterally spaced from each other and mounted on the truck bed, a yoke each end of which is rotatably attached to the upper end of the plunger of each jack, means for operating each plunger independently so as to adjust the yoke to the desired height above the truck bed and to a laterally horizontal position regardless of the lateral slope of the truck bed, a vertical arm fastened immovably to said yoke and depending therefrom at a point approximately midway between said jacks, a platform attached to said yoke so as to be rotatable around its horizontal axis, a rigid turnbuckle the ends of which are rotatably attached to the lower extremity of said vertical arm and the outer extremity of said platform respectively so that said platform may be adjusted by said turnbuckle to assume a longitudinally horizontal position regardless of the longitudinal slope of the truck bed, a spindle mounted on top of said platform at its outer extremity with its axis at right angles to said platform, a boom one end of which is rotatably mounted on said spindle so as to permit the boom to remain horizontal at any point in its rotation about said vertical spindle, lift means for suspending a load from said horizontal boom, and means for moving the lift means along the length of the boom.

2. A conveyor according to claim 1 in which the two jacks are each mounted just behind the cab of the truck, so that the platform extends over the cab of the truck.

3. A conveyor according to claim 1 in which the lift means is equipped with electrical control means operable from a point immediately adjacent to the load, and the means for moving the lift means along the length of the boom comprises at least one pulley.

4. A hoisting rig adapted to be mounted on a truck bed which comprises a pair of upright jacks mounted in spaced relationship to each other, a yoke connecting the upper ends of the jacks, a platform rotatable around said yoke, a spindle mounted to extend vertically from the platform, means for adjusting the elevation of each jack and the rotation of the platform independently so as to adjust the spindle to a vertical position, a horizontal boom one end of which is equipped with a sleeve at right angles thereto, said sleeve being adapted to fit rotatably around said spindle, lift means for suspending a load from said

boom, and pulley means for moving the lift means along the length of said boom.

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