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T. R. HALL

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TRUCK DERRICKS

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3 Sheets-Sheet 1

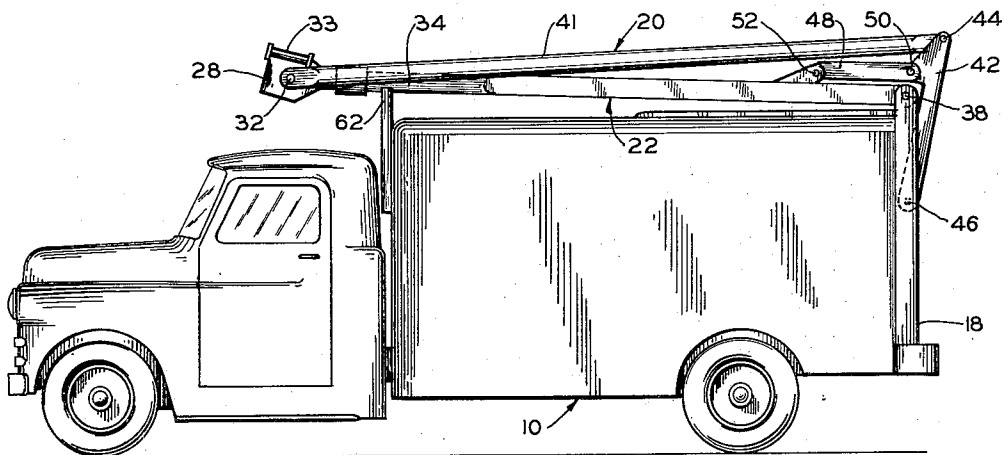


FIG. 1

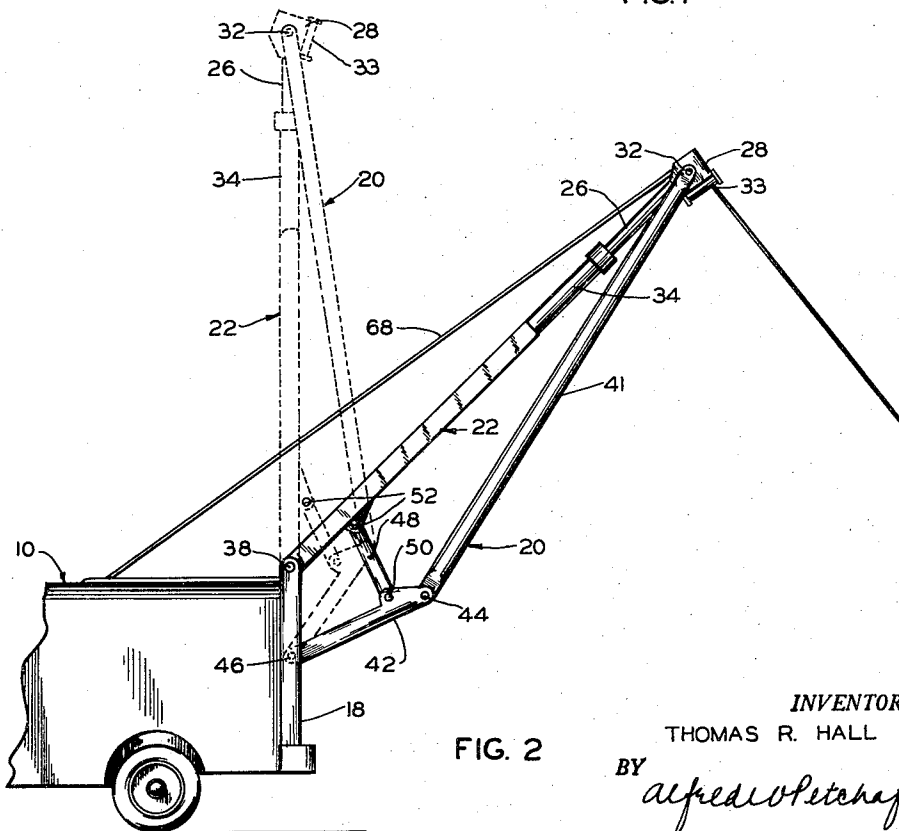


FIG. 2

INVENTOR.  
THOMAS R. HALL  
BY *alfredo vetchaft*  
ATT'Y.

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T. R. HALL  
TRUCK DERRICKS

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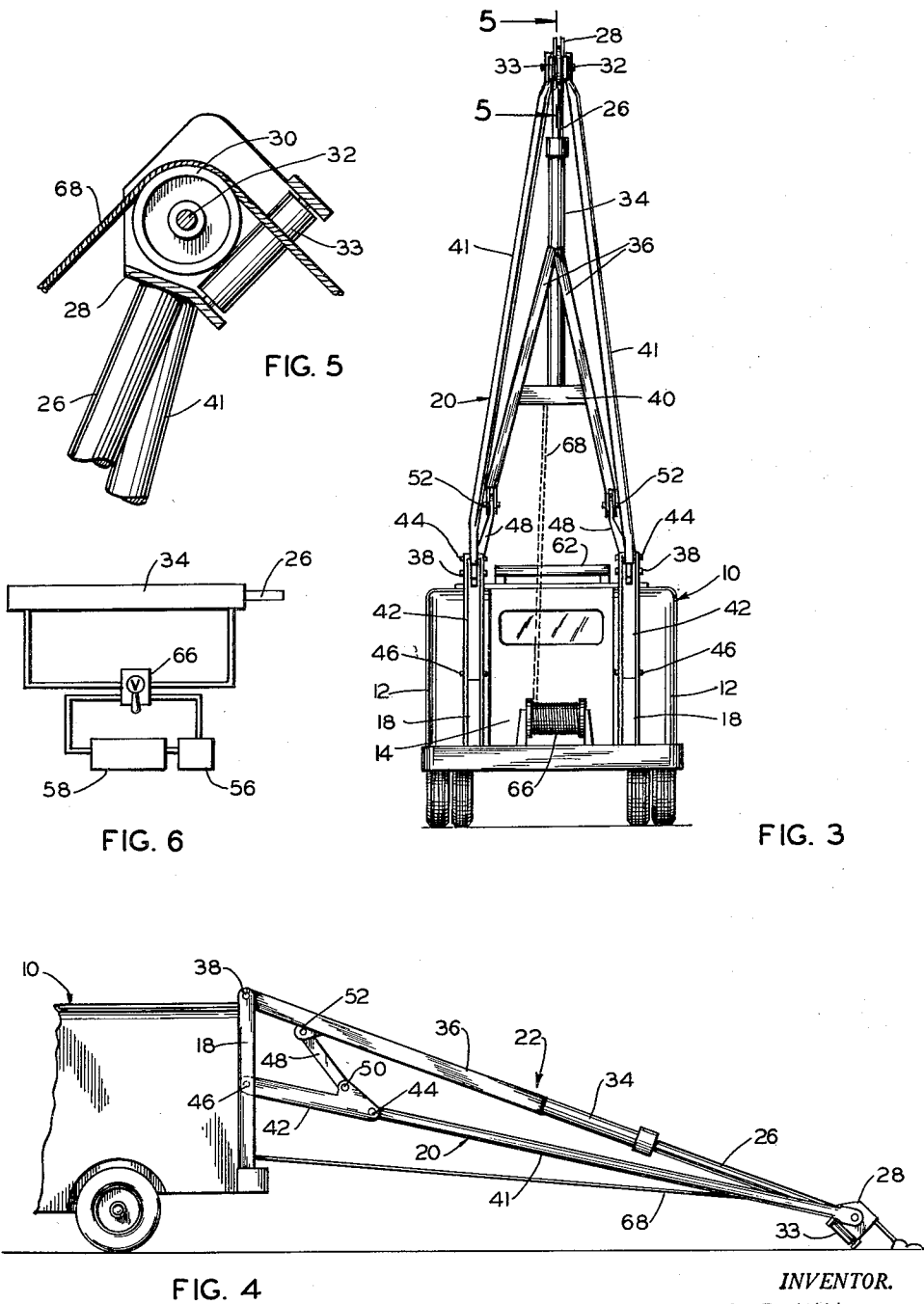


FIG. 6

FIG. 3

FIG. 4

INVENTOR.  
THOMAS R. HALL  
BY *Alfred W. Satchett*  
ATT'Y.

July 10, 1962

T. R. HALL  
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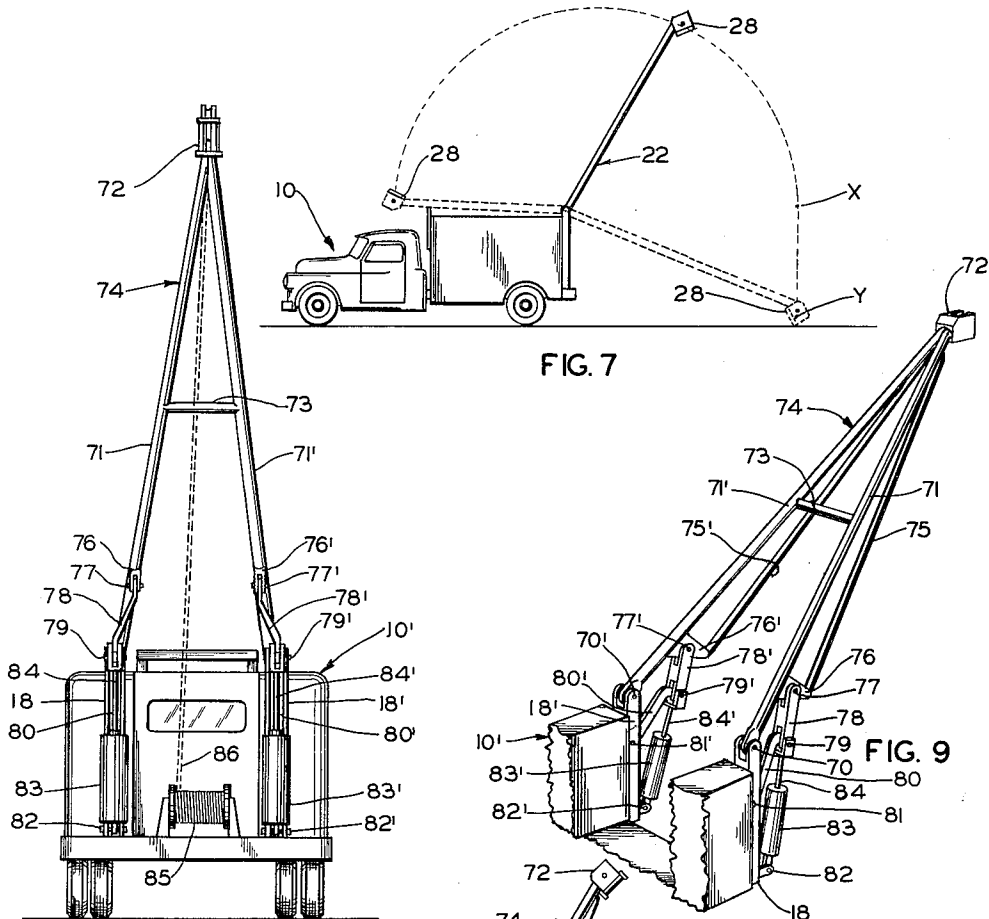


FIG. 7



FIG. 8

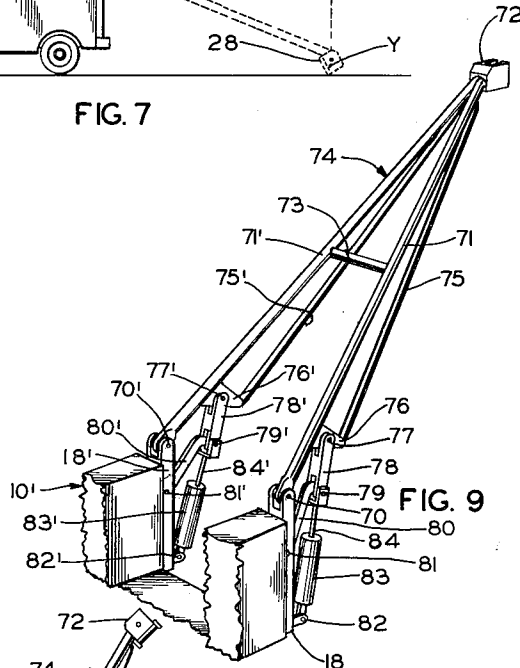


FIG. 9

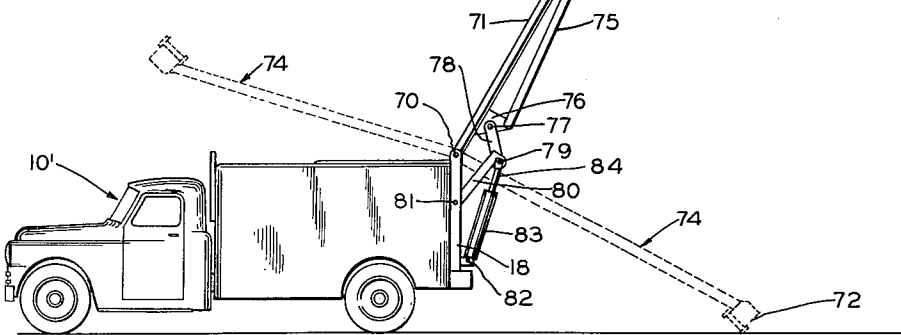


FIG. 10

INVENTOR.  
THOMAS R. HALL  
BY  
*Alfred W. Pritchett*  
ATT'Y.

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3,043,443

**TRUCK DERRICKS**

Thomas R. Hall, Portland, Oreg., assignor to McCabe-Powers Body Company, a corporation of California  
 Filed Dec. 12, 1958, Ser. No. 780,032  
 11 Claims. (Cl. 212-8)

The present invention relates to a derrick and, more particularly, to a so-called "folding" derrick adapted to be mounted on a vehicle. The present application is a continuation-in-part of my copending application Serial No. 610,570, filed September 18, 1956.

The derrick of the invention is particularly adapted to be mounted on one end of a vehicle and to overlie the top of the vehicle when not in use and to be raised to an operative position extending outwardly from one end of the vehicle when it is to be used. Such derricks are used for many purposes including, for example, setting or removing telephone and power poles and the like. Numerous derrick structures of this type have been proposed heretofore. Certain of these prior derricks included members which folded or unfolded as the derrick was moved from one position to another and which required the use of locking elements such as pins to secure the folding members in desired position. The necessity of installing or removing such locking elements often required numerous personnel during raising or lowering of the derrick and frequently difficulty was encountered in inserting or removing the locking elements because of misalignment of the derrick parts. Also, some of the prior derricks have a limited range of usefulness, that is, the derrick could only be used within an arc of a prescribed angle of about 45 degrees. In setting utility poles, hole-digging tools are often suspended from the derrick and lowered gradually as the hole is dug or driven downwardly into the ground. Subsequently, the pole is lowered into the hole and held in upright position until the hole can be back-filled. For such purposes, the conventional types of derricks encounter some difficulty due to the fact that the sheave or "head-block," as it is sometimes called, will swing only along a circular arc and, therefore, all lifts or adjustments which must follow a truly vertical path must be accomplished through the winch and cable. This latter mechanism is reasonably satisfactory at the upper ranges of the arc of travel of the boom; that is to say, when the boom is more or less vertical. However, when it is necessary to use a conventional boom in a somewhat horizontal position, as, for instance, in the removal of short or broken poles, the cable is not very effective and the boom itself cannot supply efficiently powered lift or operate in a substantially vertical line.

It is a principal object of the invention to provide a new and improved truck mounted derrick that does not present the difficulties enumerated above.

More particularly, it is an object to provide a truck derrick of the class described that may be positioned easily and simply in any desired operative position by a single operator.

Specifically, it is an object to provide a new and improved derrick construction utilizing a single hydraulic motor to swing the derrick between its inoperative and operative positions.

A further object of the invention is to provide a new and improved truck mounted derrick having a boom which may be positioned in any operative position between horizontal, vertical and intermediate oblique angular positions in which the boom extends outwardly over one end of the truck with the boom head resting on the ground.

Another object is to provide a derrick of relatively simple, inexpensive construction.

Still another object is to provide a derrick that may be simply and easily mounted on a truck and which, when

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mounted, will not interfere with other usages of the truck.

It is an additional object of the present invention to provide a derrick of the type stated in which the sheave or head-block will travel in a substantially straight vertical line during a portion of its total path of movement.

It is also an object of the present invention to provide a derrick of the type stated in which the boom is effectively powered for more or less vertical lifts in the lowermost rearwardly extended positions of its path of travel.

Other objects and advantages of the invention will become more apparent hereinafter.

In accordance with the illustrated embodiment, the invention comprises a derrick having a boom including a pair of elongate legs pivotally mounted at one end of the truck in spaced relation, the opposite ends of the legs being pivotally connected together. One of the legs is hinged intermediate its ends while the other is non-folding and one of the legs is also provided with an extensible portion. The two legs are connected together at intermediate points thereon by link means whereby extension or retraction of said extensible leg portion will effect swinging of said boom about their mountings on the truck.

For a more detailed description of the invention, reference is made to the accompanying drawings wherein:

FIG. 1 is a side elevation of a truck showing the derrick of the invention mounted thereon and positioned in its inoperative position overlying the truck;

FIG. 2 is a slightly reduced fragmentary view of the truck showing successive positions of the derrick boom in moving the same to operative position;

FIG. 3 is a rear elevation of the truck showing the boom in a vertical position;

FIG. 4 is a further fragmentary side elevation of the truck showing the derrick boom in its fully lowered position;

FIG. 5 is an enlarged, sectional view taken along line 5-5 of FIG. 3 showing details of the derrick head;

FIG. 6 is a schematic layout of a hydraulic circuit which may be used for operation of the hydraulic cylinder incorporated in the derrick boom;

FIG. 7 is a schematic view showing the path of movement of the derrick boom;

FIG. 8 is a rear end elevational view of a modified form of derrick constructed in accordance with and embodying the present invention;

FIG. 9 is a fragmentary perspective view of the modified form of derrick; and

FIG. 10 is a schematic side elevational view of the modified form of derrick illustrating various positions which it will assume and the general path of travel of its boom.

Referring to the drawings, while the usefulness of the derrick of the invention is not so limited, it is particularly adapted for use with the conventional service trucks, such as indicated at 10, utilized by utility companies. Such trucks comprise a body having compartmented side walls 12 spaced on opposite sides of a center aisle 14 which provides access to the side wall compartments in which spare parts, tools, gear and the like may be stored. The top of the aisle is in some instances open, as shown, and in other instances provided with a removable top.

As will be apparent, the derrick of the invention may be mounted on either the front or rear end of a vehicle but is shown as mounted on the rear end of the truck 10 by means of a pair of vertical mounting bases or posts 18 secured by suitable means (not shown) to the side walls 12.

The posts 18 support the derrick boom which includes a pair of converging, hinged side legs 20 pivotally connected at their apex or top ends to a longitudinally extensible center leg 22. In the illustrated embodiment of the invention, the center leg includes a hydraulic ram

comprising a piston rod 26 suitably secured at one end, as by welding, to the frame of a conventional derrick head 28 which supports a sheave 30 on an axle 32 extending through the ends of the side legs 20. The derrick head may be provided with line guide rollers 33. The piston 26 operates within the cylinder 34 of a double acting hydraulic motor, the cylinder being mounted on and supported by an A-frame including a pair of diverging legs 36 pivotally secured one to each to the top of the mounting posts 18 by pivot pins 38 at a point slightly above the roof line of the truck body. A bracing member 40 may be provided between the A-frame legs 36 to brace the same and to help support the cylinder 34.

The side legs 20 each comprise a top part or member 41 and a base or bottom part or member 42 pivotally secured together at adjacent ends by a pivot pin 44. Each of the base members 42 is pivotally secured at its opposite end to one of the posts 18 by a pivot pin 46 at a point spaced below the pivot pin 38 by a distance less than the length of the base member 42 so that in the inoperative position of the boom as it is shown in FIG. 1, the pivot point 44 of the side legs 20 will be positioned above the center leg pivots 38.

Extending between each of the side legs 20 and the adjacent A-frame leg 36 is a control or spacer link 48 which in the illustrated embodiment is connected at one end to the base member 42 adjacent the pivot point 44 by a pivot pin 50 and at its opposite end to an intermediate point of the A-frame side leg 36 by a pivot 52.

It will be observed that all of the pivot connections of the derrick are arranged so that the pivotal movements occur about horizontal axes parallel to one another. It should also be understood in this connection that, if the truck body is built strongly or is heavily reinforced, the mounting bases or posts 18 can be eliminated and the pivot pins 38, 46, mounted directly upon the truck body itself.

The cylinder 34 may be conventionally connected to a hydraulic circuit such as shown schematically in FIG. 6, including a pump 56, a tank 58, and a manual control valve 60. To support the boom in its inoperative position, a bracket 62 is provided on the forward end of the truck body and immediately behind the truck cab. The truck may be provided with the conventional cable winch 66 mounted in the forward end of the truck body between the side walls 12, the cable 68 of which may be trained over the sheave 30 in the derrick head 28.

As will be observed with reference to FIGS. 1, 2 and 4, in movement of the boom from inoperative to operative position, the center leg 22 of the boom continually lengthens. Thus, when the valve 60 is operated to supply fluid to the cylinder 34 to extend the piston rod 26, the lengthening of the center leg 22 causes the boom to swing upwardly and outwardly of the back of the truck. The boom may, if desired, be swung completely over until the top thereof touches the ground so that the cable 68 may be threaded over the sheave 30 and through the cable rollers 33. In this connection, it should be noted that in the lower portion of its path, i.e. between the points x, y, as shown in FIG. 7, the derrick head 28 moves along a straight vertical line.

In the initial stages of raising the boom from inoperative to operative position, the spacer links 48 serve as compression members to hold the base leg members 42 and the upper leg members 41 from simply following the movement of the piston rod 26. When fluid is supplied to the cylinder 34 to retract the piston rod 26 and move the boom from its operative to its inoperative position, the spacer links act as tension means to hold legs 20 outwardly and prevent their merely scissoring.

The boom may be arrested and held in any desired position by simply moving the manual control valve 60 to neutral position. Thus, the boom may be easily, rapidly and accurately controlled by one man. Moreover, the boom consists of relatively few parts of uncomplicated

form and thus can be easily manufactured at a minimum of expense. Also, as is evident, the boom may be easily mounted on a truck and when mounted does not interfere with access to the truck aisle 14.

It is also possible to provide a modified form of derrick, as shown in FIGS. 8, 9, and 10, upon a truck 19' provided at its rear end with a pair of vertical mounting bases or posts 18'. Rockably mounted upon the upper ends of the posts 18', by means of pivot pins 70, 70' are converging leg-members 71, 71', which are rigidly connected at their upper ends by a sheave or head-block 72 and are cross-connected a short distance downwardly from the head-block 72 by a transverse bracing member or strut 73 in the formation of an A-frame or boom 74. Also rigidly mounted at their upper ends to the head-block 72 and extending downwardly therefrom in coplanar alignment with the legs 71, 71', are brace-legs 75, 75', respectively, the latter being connected at their lower ends to the legs 71, 71', by gusset-plates 76, 76'.

Pivotally secured to the gusset-plates 76, 76', by means of pivot pins 77, 77', are links 78, 78', which are, in turn, pivotally secured by pivot pins 79, 79', to secondary links 80, 80', and the latter extend angularly downwardly being, in turn, pivotally secured at their lower ends by pivot pins 81, 81', to the posts 18 and 18', in downwardly spaced relation to the pivot pins 70, 70'. Pivotally mounted by means of pivot pins 82, 82', upon the lower ends of the posts 18 and 18' are hydraulic cylinders 83, 83', having piston rods 84, 84', which are, in turn, pivotally mounted at their upper ends upon the pivot pins 79, 79'. In this embodiment, the winch 85 and cable 86 are applied in the same manner as the previously described winch 66 and cable 68.

As shown in FIG. 9, the head-block 72 will move along a substantially circular arc and, therefore, in this sense is not as ideal a form of movement as the previously described embodiment. However, in this modified form of the invention, the hydraulic cylinders are connected to the boom by a linkage whereby the application of power in the lower rearwardly presented positions is highly effective for lifting and lowering operations without use of the winch 85 and cable 86.

It should be understood that changes and modifications in the form, construction, arrangement, and combination of the several parts of the truck derricks may be made and substituted for those herein shown and described without departing from the nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A supporting structure and a boom mounted thereon for movement between an inoperative position overlying said structure and an operative position extending angularly outwardly from one end of said structure, said boom comprising an A-frame including two converging legs connected together at their outer ends and being pivotally mounted at their lower ends on said structure adjacent the top thereof, each of said legs being pivotally connected adjacent its lower end to the upper end of a rearwardly extending first link, a second link pivotally connected at its upper end to the lower end of each first link outwardly from the point of pivotal connection between the first link and its associated leg, each of said second links being, in turn, pivotally connected at its lower end to said structure at a point vertically beneath the pivotal connection between said structure and said leg, extensible hydraulic ram means connected at its lower end to said supporting structure at a point vertically beneath the pivotal connection between said structure and said second link, and means operatively connecting the upper end of said hydraulic ram means to said supporting structure at a point adjacent the pivotal connection of said first and second links whereby extension of said extensible hydraulic ram means effects movement of said boom from inoperative to operative position and retrac-

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tion of said hydraulic ram means effects return of said boom to inoperative position.

2. A supporting structure and a boom mounted thereon for movement between an inoperative position overlying said structure and an operative position extending angularly outwardly from one end of said structure, said boom comprising an A-frame including two converging legs connected together at their outer ends and being pivotally mounted at their lower ends on said structure adjacent the top thereof, each of said legs being pivotally connected adjacent its lower end to the upper end of a rearwardly extending first link, a second link pivotally connected at its upper end to the lower end of each first link outwardly from the point of pivotal connection between the first link and its associated leg, each of said second links being, in turn, pivotally connected to said structure at a point vertically beneath the pivotal connection between said structure and said leg, extensible hydraulic ram means connected at its lower end to said supporting structure at a point vertically beneath the pivotal connection between said structure and said second link, and means operatively connecting the upper end of said hydraulic ram means to the A-frame and to said second link at a point adjacent the point of pivotal connection between the first and second link.

3. In combination a vehicle having a body and a derrick mounted thereon for movement from a substantially forward transport position up through various upright positions to a rearwardly extended position, said derrick including a boom pivotally mounted at its lower end upon the body adjacent to the top of said body, a first link pivotally connected to the boom and extending rearwardly and downwardly therefrom when the boom is in upright position, a second link pivotally connected at its upper end to the lower end of said first link and extending downwardly therefrom being pivotally mounted at its lower end upon the body in vertically spaced relation below the connection of said boom to said body, and lengthwise extensible hydraulic means operatively connected at its lower end to said supporting structure at a point vertically beneath the pivotal connection between said structure and said second link, said hydraulic means further being connected at its upper end adjacent to the pivotal connection of the lower end of said first link and the upper end of said second link for imparting motion to said links and through them causing the boom to move relative to the body.

4. In combination a vehicle having a body and a derrick mounted thereon for movement from a substantially forward transport position up through various upright positions to a rearwardly extended position, said derrick including a boom pivotally mounted at its lower end upon the body adjacent to the top of said body, a first link pivotally connected to the boom and extending rearwardly and downwardly therefrom when the boom is in upright position, a second link pivotally connected at its upper end to the lower end of said first link and extending downwardly therefrom being pivotally mounted at its lower end upon the body in vertically spaced relation below the connection of said boom to said body but at a distance less than the length of said second link, and lengthwise extensible hydraulic means operatively connected at its lower end to said supporting structure at a point vertically beneath the pivotal connection between said structure and said second link, said hydraulic means further being connected at its upper end adjacent to the pivotal connection of the lower end of said first link and the upper end of said second link for imparting motion to said links and through them causing the boom to move relative to the body.

5. In combination a vehicle having a body and a derrick mounted thereon for movement from a substantially forward transport position up through various upright positions to a rearwardly extended position, said derrick

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including a boom pivotally mounted at its lower end upon the body adjacent to the top of said body, a first link pivotally connected to the boom and extending rearwardly and downwardly therefrom when the boom is in upright position, a second link pivotally connected at its upper end to the first link and extending downwardly therefrom being pivotally mounted at its lower end upon the body in vertically spaced relation below the connection of said boom to said body, and lengthwise extensible hydraulic means operatively connected at its lower end to said supporting structure at a point vertically beneath the pivotal connection between said structure and said second link, said hydraulic means further being connected at its upper end to the point of pivotal connection between said first and second links adjacent to their point of pivotal interconnection for imparting motion to said links and through them causing the boom to move relative to the body.

6. In combination a vehicle having a body and a derrick mounted thereon for movement from a substantially forward transport position up through various upright positions to a rearwardly extended position, said derrick including a boom pivotally mounted at its lower end upon the body adjacent to the top of said body, a first link pivotally connected to the boom and extending rearwardly and downwardly therefrom when the boom is in upright position, a second link pivotally connected at its upper end to the first link and extending downwardly therefrom being pivotally mounted at its lower end upon the body in vertically spaced relation below the connection of said boom to said body but at a distance less than the length of said first link, and lengthwise extensible hydraulic means operatively connected at its lower end to said supporting structure at a point vertically beneath the pivotal connection between said structure and said second link, said hydraulic means further being connected at its upper end to the point of pivotal connection between said first and second links adjacent to their point of pivotal interconnection for imparting motion to said links and through them causing the boom to move relative to the body.

7. In combination a vehicle having a body and a derrick mounted thereon for movement from a substantially forward transport position up through various upright positions to a rearwardly extended position, said derrick including an A-frame pivotally mounted at its lower end upon the body adjacent to the top of said body, a first link-means pivotally connected to the A-frame and extending rearwardly and downwardly therefrom when the A-frame is in upright position, a second link-means pivotally connected at its upper end to the lower end of said first link-means and extending downwardly therefrom being pivotally mounted at its lower end upon the body in vertically spaced relation below the connection of said A-frame to said body, and lengthwise extensible hydraulic means operatively connected at its lower end to said supporting structure at a point vertically beneath the pivotal connection between said structure and said second link, said hydraulic means further being connected at its upper end to the point of pivotal connection between said first and second links for imparting motion to said link-means and through them causing the A-frame to move relative to the body.

8. A supporting structure and a boom mounted thereon for movement between an inoperative position overlying said structure and an operative position extending angularly outwardly from one end of said structure, said boom comprising an A-frame including two converging legs connected together at their outer ends and being pivotally mounted at their lower ends on said structure, rearwardly extending first links pivotally connected at their upper ends respectively to said derrick legs adjacent the lower ends thereof, second links pivotally connected at their upper ends to the lower ends respectively of said

first links, each of said second links being, in turn, pivotally connected at its lower end to said structure at a point vertically beneath the pivotal connection between said structure and said leg, winch means mounted on the structure and having a cable operatively connected to the A-frame, extensible hydraulic ram means connected at its lower end to said supporting structure at a point vertically beneath the pivotal connection beneath said structure and said second link, and means operatively connecting the upper end of said hydraulic ram means to the A-frame and to said structure at a point adjacent the pivotal connection of said first and second links whereby extension of said extensible hydraulic ram means effects movement of said boom from inoperative to operative position and retraction of said hydraulic ram means effects return of said boom to inoperative position.

9. In combination a vehicle having a body and a derrick mounted thereon for movement from a substantially forward transport position up through various upright positions to a rearwardly extended position, said derrick including a boom pivotally mounted at its lower end upon the body, said derrick boom comprising a pair of converging leg members rigidly connected at their upper ends and cross-connected at a distance downwardly from the upper connection by a strut, said legs being hingedly connected at their lower ends to the vehicle body, a first link pivotally connected to the boom and extending rearwardly and downwardly therefrom when the boom is in upright position, a second link pivotally connected at its upper end to the lower end of said first link and extending downwardly therefrom being pivotally mounted at its lower end upon the body in vertically spaced relation below the connection of said boom to said body, and lengthwise extensible hydraulic means operatively connected at its lower end to said supporting structure at a point vertically beneath the pivotal connection between said structure and said second link, said hydraulic means being connected at its upper end adjacent to the pivotal connection of the lower end of said first link and the upper end of said second link for imparting motion to said links and through them causing the boom to move relative to the body.

10. In combination a vehicle having a body and a derrick mounted thereon for movement from a substantially forward transport position up through various upright positions to a rearwardly extending position, said derrick including a boom pivotally mounted at its lower end upon the body adjacent to the top of said body, said derrick boom comprising a pair of converging leg members rigidly connected at their upper ends by a head block and cross-connected at a distance downwardly from the upper connection by a strut, said legs being hingedly connected at their lower ends to the vehicle body, a first link pivot-

ally connected to the boom and extending rearwardly and downwardly therefrom when the boom is in upright position, a second link pivotally connected at its upper end to the lower end of said first link and extending downwardly therefrom being pivotally mounted at its lower end upon the body in vertically spaced relation below the connection of said boom to said body, and lengthwise extensible hydraulic means operatively connected at its lower end to said supporting structure at a point vertically beneath the pivotal connection between said structure and said second link, said hydraulic means being connected at its upper end adjacent to the pivotal connection of the lower end of said first link and the upper end of said second link for imparting motion to said links and through them causing the boom to move relative to the body.

11. In combination a vehicle having a body and a derrick mounted thereon for movement from a substantially forward transport position up through various upright positions to a rearwardly extending position, said derrick including a boom pivotally mounted at its lower end upon the body adjacent to the top of said body, said derrick boom comprising a pair of converging leg members having brace legs in coplanar alignment with said legs rigidly connected at their upper ends by a head block and cross-connected at a distance downwardly from the upper connection by a strut, said legs being hingedly connected at their lower ends to the vehicle body, a first link pivotally connected to the boom and extending rearwardly and downwardly therefrom when the boom is in upright position, a second link pivotally connected at its upper end to the lower end of said first link and extending downwardly therefrom being pivotally mounted at its lower end upon the body in vertically spaced relation below the connection of said boom to said body, and lengthwise extensible hydraulic means operatively connected at its lower end to said supporting structure at a point vertically beneath the pivotal connection between said structure and said second link, said hydraulic means being connected at its upper end adjacent to the pivotal connection of the lower end of said first link and the upper end of said second link for imparting motion to said links and through them causing the boom to move relative to the body.

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