

Sept. 12, 1967

H. T. WICKLUND

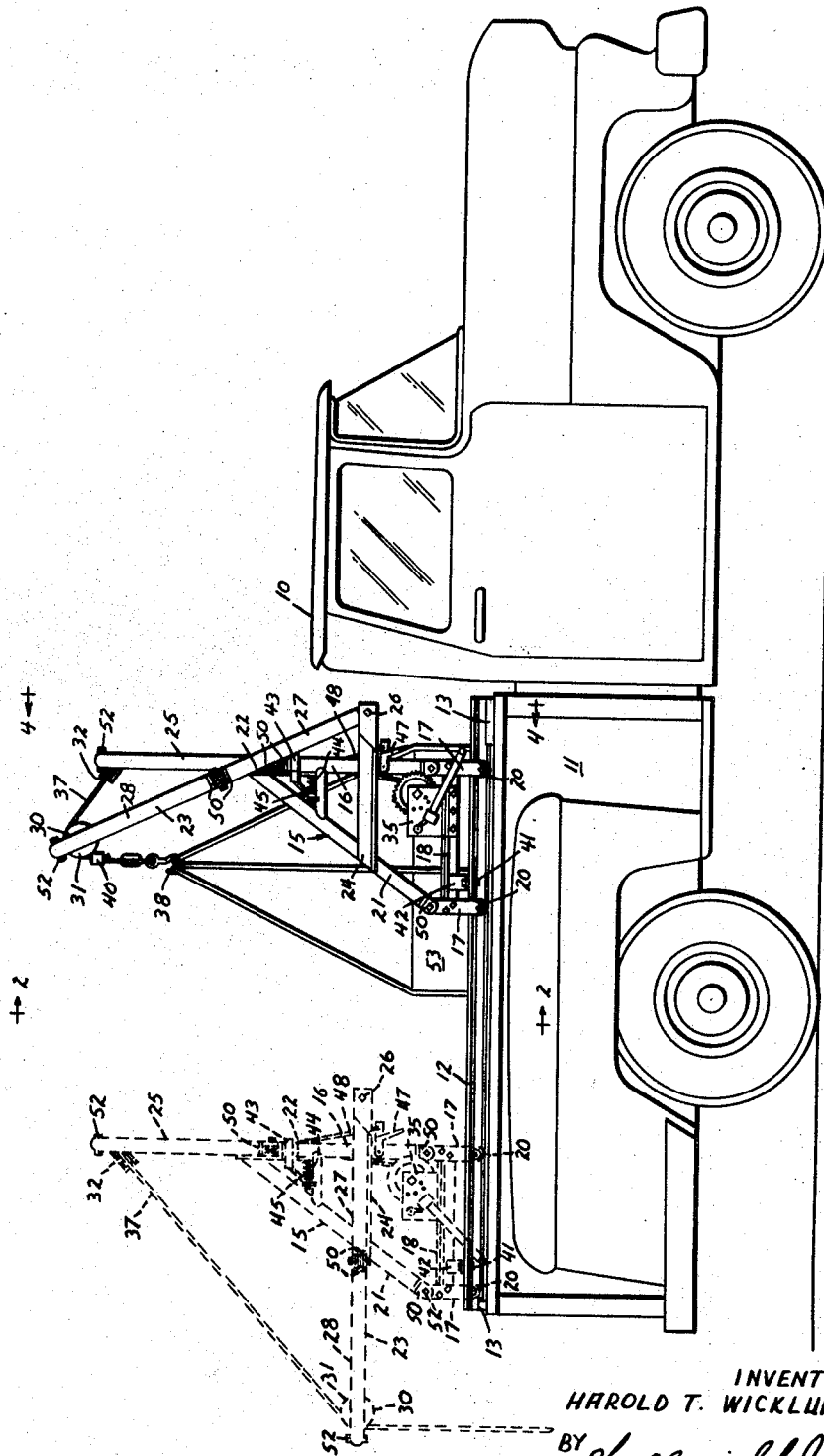
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TRUCK HOIST

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Fig. 1



INVENTOR
HAROLD T. WICKLUND

BY *Wells & St. John*
ATTYS.

Sept. 12, 1967

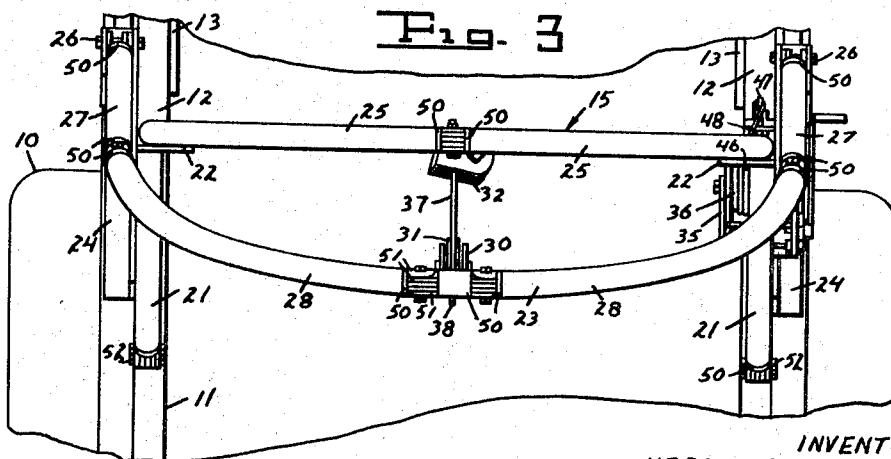
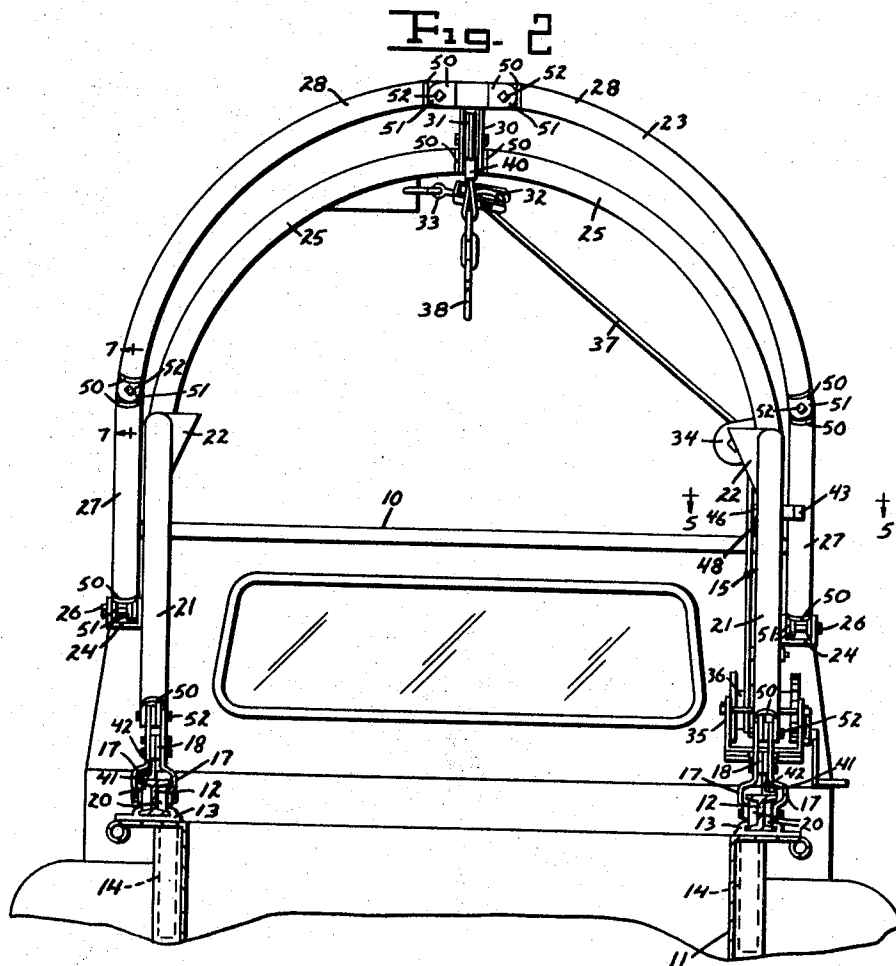
H. T. WICKLUND

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TRUCK HOIST

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INVENTOR
HAROLD T. WICKLUND
BY *Wells & Johnson*
ATTYS.

Sept. 12, 1967

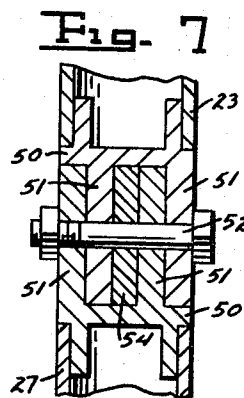
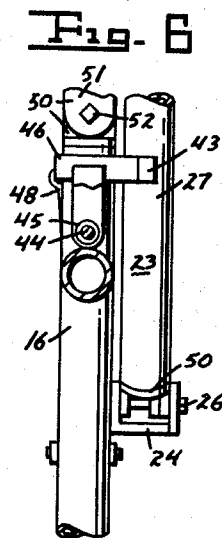
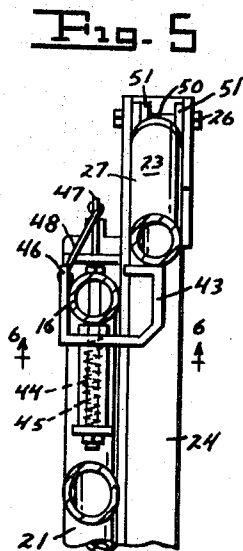
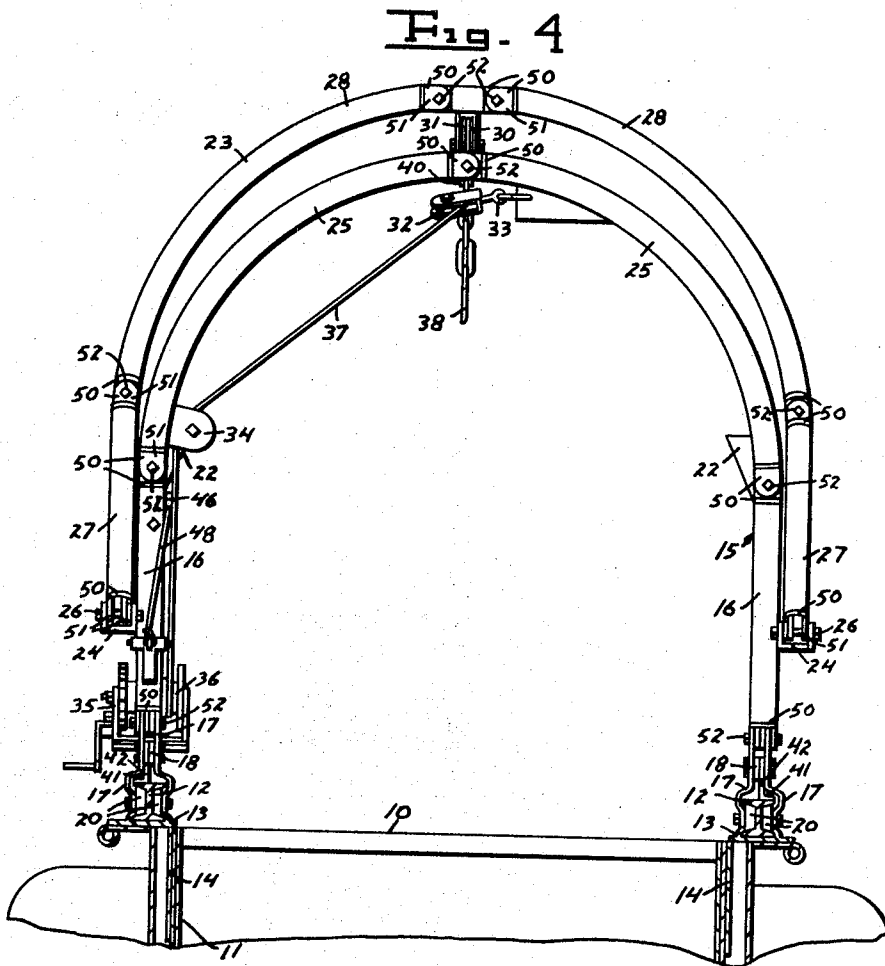
H. T. WICKLUND

3,341,038

TRUCK HOIST

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4 Sheets-Sheet 3



INVENTOR
HAROLD T. WICKLUND
BY *Kalla & St. John*
ATTYS.

Sept. 12, 1967

H. T. WICKLUND

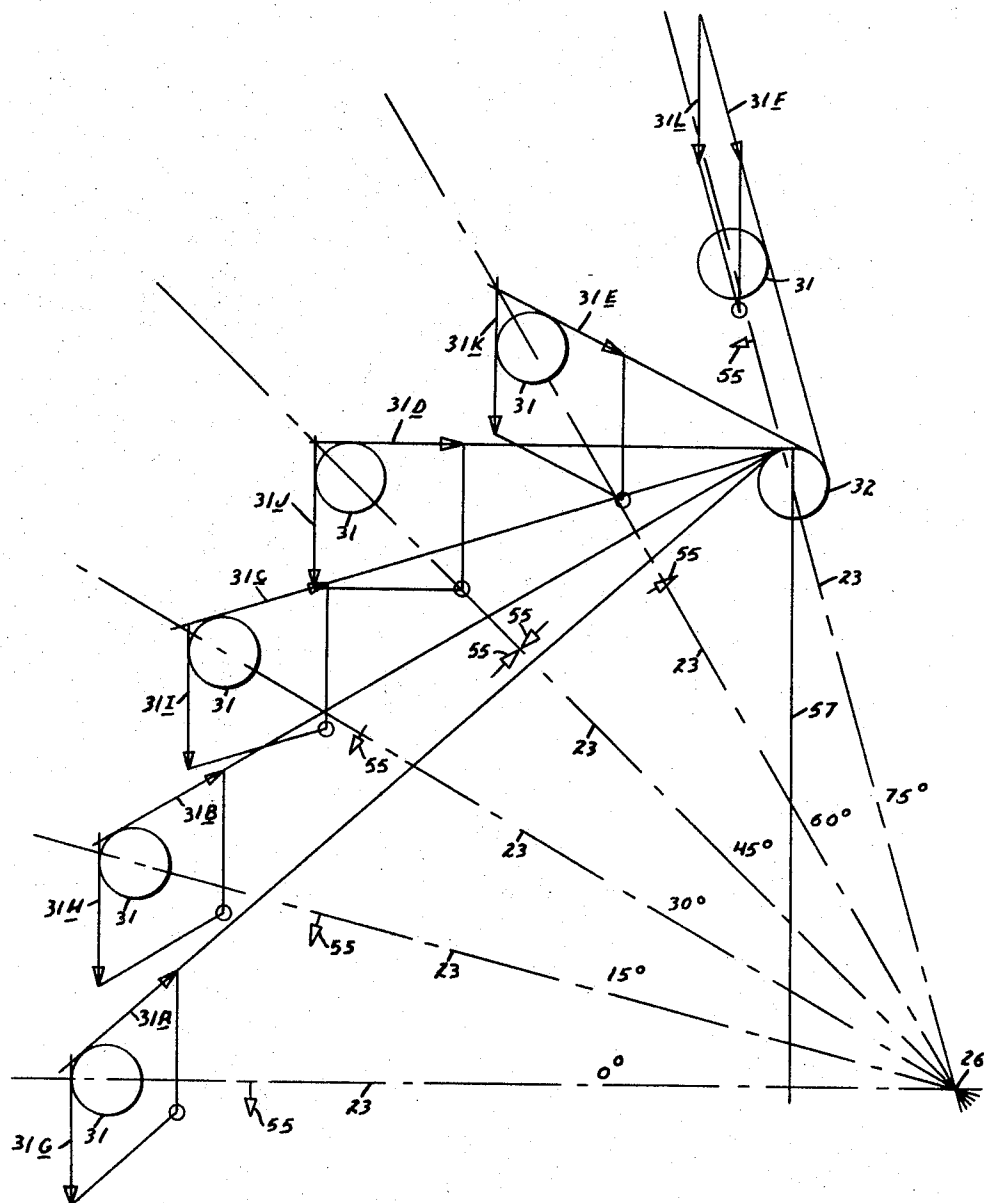
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TRUCK HOIST

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Fig. 8



INVENTOR
HAROLD T. WICKLUND
BY *Walla & John*
ATTYS.

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TRUCK HOIST

Harold T. Wicklund, 1520 S. 6th West,
Missoula, Mont. 59801

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This invention relates to a novel hoist for use in conjunction with a truck.

There are many instances when it is desirable or necessary to utilize a mechanical hoist to assist in loading and unloading articles in relation to a truck, where the article must be lifted at the rear of the truck and placed at its desired location thereon. Many mechanical devices have been previously mounted on trucks to accomplish this purpose, but these have either been restricted to a stationary location on the truck or, if movable, have been quite bulky permanent additions to the truck itself. The present invention provides a simple attachment that can be mounted on any truck to provide a portable hoist capable of reaching rearwardly from the truck and capable of positioning articles in the truck at any desired location.

It is a first object of this invention to provide such a hoist that is mechanically simple in structure. My preferred embodiment utilizes an arched design, incorporating high strength along with the simplicity of structure required.

Another object of this invention is to provide a hoist structure that will straddle the bed of a truck, providing no obstruction to normal use of the truck bed. It is capable of moving over articles positioned on the truck without disturbing them.

Another object of this invention is to provide an adjustable hoist, straddling above the truck bed and capable of being adjusted in width to fit any reasonable size of truck.

These and further objects will be evident from the following disclosure, taken together with the accompanying drawings, which illustrate a preferred form of the invention. It is to be understood that this form of the invention is not to limit or restrict the scope of the invention, which is set out in the following claims.

In the drawings:

FIGURE 1 is a side view of a truck equipped with the present hoist, the hoist being shown in full lines at a location adjacent to the truck cab and with the load in an elevated position, the hoist being illustrated in dashed lines at the rear of the truck bed with the hoist shown in a lowered condition;

FIGURE 2 is a rear sectional view taken along line 2-2 in FIGURE 1 at an enlarged scale;

FIGURE 3 is an enlarged fragmentary top view of the hoist shown in FIGURE 1;

FIGURE 4 is a front sectional view taken along line 4-4 in FIGURE 1 at an enlarged scale;

FIGURE 5 is an enlarged fragmentary sectional view taken along line 5-5 in FIGURE 2;

FIGURE 6 is an enlarged fragmentary sectional view taken along line 6-6 in FIGURE 5;

FIGURE 7 is an enlarged fragmentary sectional view taken along line 7-7 in FIGURE 2; and

FIGURE 8 is a diagram showing the force relationship that exists on the boom during movement thereof about its axis.

FIGURES 1 through 4 show the general arrangement of the hoist with which this specification is concerned. The hoist is shown mounted at the rear of a truck 10 of conventional construction. It is to be emphasized that the structure of truck 10 need not be modified in any manner in order to utilize this hoist apparatus. The hoist is mounted on the box 11 of truck 10, which is illustrated

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as a "pick-up" truck, but the hoist also is equally applicable to a flat bed truck or any other conventional type of open storage compartment on a truck or other platform.

The hoist itself comprises a pair of rails 12, a boom support 15 and a boom 23. These basic elements cooperate to guide a cable 37 on which the actual load 53 is carried.

Rails 12 are simply two I-beams transversely located on the rear of truck 10 and fastened by means of mounting brackets 13 that support and grip the lower portion of each rail 12. The mounting brackets 13 are provided with stems 14 (FIGURE 2) which fit into the conventional stake pockets along the sides of truck 10.

The boom support 15 rises from legs 16 made of tubular material having suitable strength characteristics. The upright legs 16 are carried by a horizontal T-shaped bar 18 at each side of the apparatus (FIGURE 1). The ends of the T-shaped bar 18 are fixed to roller brackets 17 that carry lower rollers 20. Rollers 20 ride along the lower surfaces of the rails 12 and serve to guide the hoist for longitudinal movement relative to the bed of truck 10.

The rear ends of the T-shaped bars 18 at the respective rear roller brackets 17 are structurally joined to the upper ends of the legs 16 by means of tubular braces 21. The upper end of each brace 21 carries an integral bracket 22 which in turn is fixed relative to the respective leg 16 at each side of the structure. The precise connection will be described below. The boom support 15 is completed by complementary arched support sections 25 that are joined at the center of the structure to produce an integral assembly that has a constant upright orientation relative to the load supporting bed of truck 10 regardless of its longitudinal position thereon.

The boom 23 is also formed in an arch configuration. It is mounted on horizontal support braces 24 at each side of the boom support 15. The pivotal axis of the boom 23 is indicated as 26 (FIGURE 1), being a horizontal transverse axis on boom support 15. Boom 23 also includes straight legs 27 at each of its sides and arched sections 28 that are joined at a central sheave block 30. The boom 23 is located outside of the arch formed by the boom support 15. The sheave block 30 includes a rotatable guide pulley 31 for the supporting load cable.

Mounted at the center of boom support 15 directly beneath the connection between the two arched support sections 25 is a central guide pulley 32 carried by a universal bracket assembly 33 which permits the pulley 32 to pivot to any required angular orientation. A side pulley 34, rotated about a longitudinal axis, is fixed to the boom support 15 (FIGURES 2 and 4). A cable 37 is entrained over the side pulley 34, the central guide pulley 32 and the pulley 31 upon sheave block 30. The outer end of cable 37 is provided with a hook 38 for engagement with a load and an enlargement 40 which cannot pass the rear surface of sheave block 30 and therefore must engage the sheave block 30 as an abutment.

The end of the cable 37 opposite to that entrained about pulleys 31, 32 and 34 is wound about a drum 36 on a conventional winch 35. The winch 35 can be either manually operated or motor driven.

The longitudinal position of boom support 15 relative to the box 11 of truck 10 can be at any desired position. Normally two locations required, one at the front of the box 11, and one at the rear thereof. While a more complicated braking arrangement might be used, I have shown a simple bracket 42 at the side of the T-shaped bar 18, which guides a vertical pin 41 received through matching apertures in the bracket 42 and the upper portion of the respective rail 12. By placing the pin 41 through these apertures at either of the two positions shown in FIGURE 1, the boom support 15 can be fixed relative to truck 10 so that it will not be displaced by movement of the truck.

It is necessary to releasably lock the position of the boom 23 in its upper position, shown in full lines in FIGURES 1 through 4. This is accomplished by a releasable stop mechanism shown in details in FIGURES 5 and 6. This stop mechanism is only exemplary, and can be replaced by any suitable stop apparatus. The illustrated example shows a stop 43 that is normally in the path of one of the legs 27 of boom 23. It has an angular rear surface so that the boom 23 can pass stop 43 when pivoting in a clockwise direction as seen in FIGURE 1. However, after the boom 23 has passed stop 43, it will remain in its path, blocking counter clockwise motion until stop 43 has been manually released.

The stop 43 is mounted on a pivot shaft 44 about which is wound a biasing spring 45 connected between the boom support 15 and stop 43 so as to urge stop 43 to the right as seen in FIGURES 5 and 6. The stop 43 is provided with a crank arm 46 located at the inner side of the leg 16 on boom support 15 that carries it, connected by means of a cable 48 to an operating lever 47. Downward motion of the operating lever 47, as shown in FIGURE 1, will cause the crank 46 to be pulled to the left as seen in FIGURES 5 and 6, thereby permitting downward movement of boom 23.

The various connections between the tubular members illustrated are preferably made by a simple cast socket assembly shown in detail in FIGURE 7. The socket 50 is suitably secured within the end of the tubular member and has two spaced ears 51 so located that ears 51 of a second socket 50 will intermesh therewith and be joined by a locking bolt 52. Suitable washers 54 are used to fill areas between intermeshing sockets or other brackets which are not filled by the intermeshing ears 51. This socket is used between the legs and arched sections of both the boom support 15 and boom 23 and also at the central connections between the arched support sections 25 and the arched sections 28 of the boom support 15 and boom 23 respectively. Socket 50 is also used at the base of the legs for the boom support 15 and a boom 23 being made to cooperate with the roller brackets 17 as can be seen in FIGURES 2 and 4.

The operation of this device is quite simple. When loading onto the bed of truck 10, the boom support 15 is positioned at the rear of the truck as shown in dashed lines in FIGURE 1. Release of the operating lever 47 causes the stop 43 to permit the boom 23 to be lowered as winch 35 plays out the cable 37. The horizontal limiting position of boom 23 is defined by engagement of the boom legs 27 with the horizontal support 24 on boom support 15. The load 53 can then be engaged by the hook 38 or other suitable attaching device and the winch 35 operated to raise the outer end of cable 37.

Initial motion of the cable 37 will simply raise the load, the boom 23 remaining in its horizontal position. When the enlargement 40 at the end of cable 37 abuts the sheave block 30, further movement of cable 37 will cause the boom 23 to pivot in a clockwise direction (FIGURE 1) about its pivotal axis 26. This will not only raise the load 53 but will swing it forwardly beneath the arched boom support 15. The final position of boom 23 is as shown in full lines in FIGURE 1, with load 53 extending forwardly beyond the boom support 15. When the boom 23 passes stop 43, counterclockwise movement of boom 23 is prohibited until release of stop 43 by movement of operating lever 47. The pin 41 can then be released and the boom support 15 and boom 23 can be manually or mechanically moved to the forward position shown in full lines.

When boom support 15 is in its forward position and locked by means of pins 41, the load can be lowered onto the bed of truck 10 directly beneath the boom support 15, by simply playing out the cable 37 without releasing the stop 43. Thus, this hoist permits loads to be positioned quite simply at a forward position on the truck 10.

Unloading of an article from the truck 10 involves the

reversal of the movements just described. The hoist is extremely versatile and does not obstruct the normal use of the truck. When use of the hoist is not desired, release of the two connections between the braces 21 and the forward roller brackets 37 permits the boom support 15 and the boom 23 to be pivoted forwardly after movement of the boom support 15 to a rear position on the truck, so that the apparatus will lie in a lower elevation.

In FIGURE 8 is illustrated the force relationship that exists on the boom 23 during pivotal motion of boom 23 between its horizontal position and its upper or raised position. In this diagram, the pivot axis 26 of the boom 23 is related to the position of the central guide pulley 32. Six different positions of the boom 23 are indicated, each being 15 degrees apart. The boom pulley 31 is shown at its position relative to move the pulley 32. A first line 31 A-F indicates the line of force on the pulley 31 and boom 23 resultant to the force applied thereto by the winch 35 pulling on cable 37. A second line 31 G-L indicates the resultant force on pulley 31 and boom 23 due to the load carried by the cable 37. Since these two forces will be of equal magnitude, the arrows indicative of the force magnitude are equal. By drawing lines parallel to these indicated forces, the resultant force on boom 23 is determined. The location of the resultant intersection is circled in each instance. Small indicative arrows 55 are used to indicate the general direction and magnitude of the forces involved.

In order to properly utilize the boom 23, it is important that there be little or no upward force resultant on boom 23. If a large upward force results, boom 23 will swing upwardly, allowing the outer end of the cable 37 to drop. It is important that the enlargement 40 at the end of cable 37 remain in contact with the sheave block 30 for proper load control. As shown in FIGURE 8, this can be effectively accomplished, and has been done in actual practice, by locating the position of the boom axis 26 to one side of a plane 57 drawn vertically through the center of the central guide pulley 32, and by maintaining the position of the pulley 31 at the opposite side of the plane 57. If the position of the axis 26 approaches too close to the plane 57, the resultant upward force will overcome frictional forces involved in the bearings and allow the boom 23 to swing upwardly without control.

As seen in FIGURE 8, the described embodiment positions the axis 26 forward of plane 57, the effective tangential radius of pulley 31 relative to axis 26 being greater than the effective tangential radius of pulley 32 relative to axis 26. In addition, when the radian through the center of pulley 31 relative to axis 26 subtends an angle of 45° relative to the horizontal, the reach of cable from pulley 31 to pulley 32 is horizontal.

The specific construction of the apparatus as described and shown in the drawings is not intended to confine the limits of this invention. The apparatus can be made with greater reinforcing and can be made of materials other than those shown, which are preferably tubular. The device is adjustable by means of the sockets 50 to fit varying widths of truck beds, but it is to be understood that other suitable arched arrangements could be substituted in place of those illustrated. Particularly the releasable stop 43 and the braking pin 41 are only examples of devices that might be used. Other equivalent structures could easily be substituted.

Having thus described my invention, I claim:

1. In combination with a truck having a longitudinal load supporting bed; a hoist assembly comprising:
 - a rigid arched boom support mounted on said bed in a constant upright orientation relative to said bed for selective movement in a longitudinal direction relative to said bed, said boom support being transversely oriented and extending upwardly and inwardly from both sides thereof over the bed;
 - an arched boom pivotally mounted on said boom support about a transverse axis;

- a load supporting cable guided on said boom support and by a pulley at the center of said boom; means on said cable selectively engageable with said boom to selectively pivot said boom about its axis on said boom support responsive to motion of said cable;
- and cable winding means on said boom support connected to said cable to selectively wind or unwind said cable.
2. In the apparatus defined in claim 1: locking means automatically engageable between said bed and said boom support responsive to predetermined upward pivotal motion of said boom to limit downward motion of said boom relative to said bed.
3. A hoist apparatus for trucks, comprising:
a pair of transversely spaced longitudinal rails;
a rigid arched boom support, said support being provided with supporting roller assemblies at its lower end in engagement with the respective rails, said boom support being transversely oriented in a constant upright orientation and extending upwardly and inwardly from both sides toward its center;
an arched boom pivotally mounted on said boom support about a transverse pivotal axis;
a load supporting cable having one end portion thereof guided on said boom support and by a support pulley at the center of said boom;
means on said cable selectively engageable with said boom to pivot said boom about its pivotal axis in response to motion of said cable;
and a winch mounted on said boom support having the remaining end portion of said cable wrapped about the drum thereof.
4. An apparatus as defined in claim 3, wherein said cable is guided by a central guide pulley at the transverse center of said boom support;
the location of said boom pivotal axis being longitudinally spaced from a vertical plane containing the pivotal axis of said central guide pulley;
the location of said support pulley on said boom being positioned at the side of said last-named plane opposite to said pivotal axis.
5. An apparatus as defined in claim 3, wherein said cable is guided by a central guide pulley at the transverse center of said boom support;
the location of said boom pivotal axis being longitudinally spaced from a vertical plane containing the pivotal axis of said central guide pulley;
the location of said support pulley on said boom being positioned at the side of said last-named plane opposite to said pivotal axis;
and releasable stop means on said boom support engageable with said boom responsive to predetermined upward pivotal motion of said boom to selectively prevent subsequent downward motion of said boom about its pivotal axis.
6. A hoist apparatus for trucks, comprising:
a pair of transversely spaced longitudinal rails;
a rigid upwardly arched boom support, said support being mounted at the lower ends thereof by said rails in a constant upright orientation and extending transversely therebetween;
an arched boom pivotally mounted on said boom support about a transverse pivotal axis;

- a central guide pulley mounted at the center of said boom support;
a sheave block mounted on said boom at the center thereof, said sheave block including a support pulley;
a cable having one end portion guided on said boom and engaged over said central guide pulley and said support pulley, the outer end of said cable having an enlarged abutment fixed thereto selectively engageable with said sheave block;
and a winch on said boom support, said winch including a cable drum about which is wrapped the remaining end portion of said cable.
7. An apparatus as defined in claim 6 wherein said support pulley and said boom pivotal axis are located at opposite sides of a vertical plane containing the axis of said central guide pulley.
8. In combination with a truck having a longitudinal load supporting bed, a hoist assembly comprising:
a rigid arched boom support mounted on said bed in a fixed upright orientation, said boom support being mounted on said bed for relatively longitudinal movement relative thereto and being transversely oriented across said bed, said boom support including members extending upwardly and inwardly toward the center thereof to form an unobstructed integral arch;
a pulley mounted on the arch of said boom support;
an arched boom mounted on said boom support about a transverse pivotal axis positioned forward of a vertical plane intersecting the center of said pulley, said arched boom being connected to said boom support at transversely spaced positions adjacent the sides of the boom support to form an unobstructed arch;
cable guide means on said boom at the center thereof;
a winch on said boom support;
and a cable wound about said winch and extending outwardly therefrom, said cable having a portion thereof entrained about said pulley and over said cable guide means and having means thereon adjacent its outer end to selectively engage said cable guide means to limit further upward motion of the cable relative to said cable guide means following such engagement.
9. An apparatus as set out in claim 8, wherein the effective tangential radial separation between the cable guide means and said axis is greater than the effective tangential separation between said pulley and said axis along said portion of said cable.
10. An apparatus as set out in claim 8, wherein said portion of said cable is horizontal when a radian through the center of said cable guide means relative to said axis subtends an angle of 45° relative to the horizontal.

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