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HOISTING DEVICE

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3 Sheets-Sheet 1

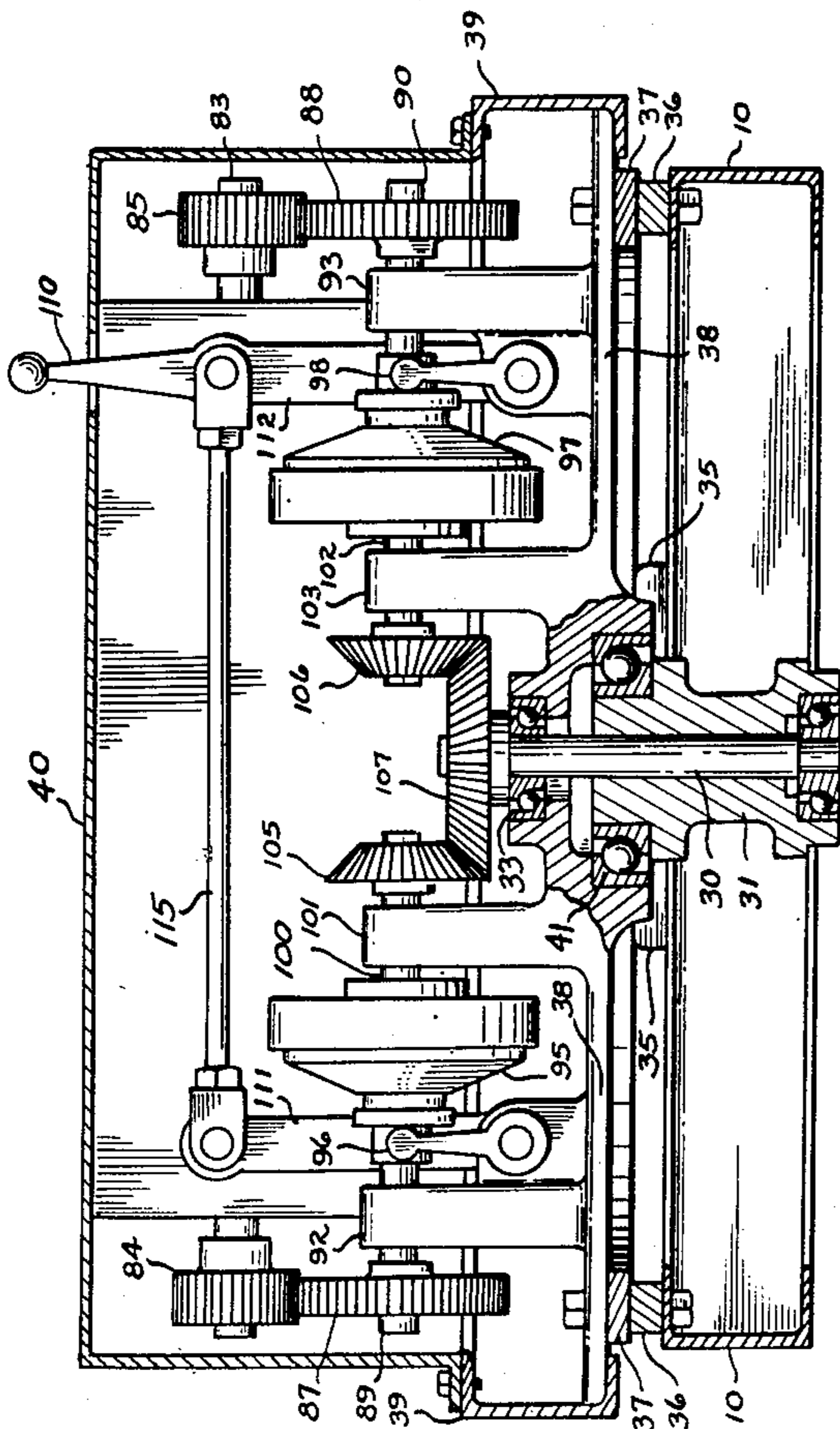


Fig. 5.

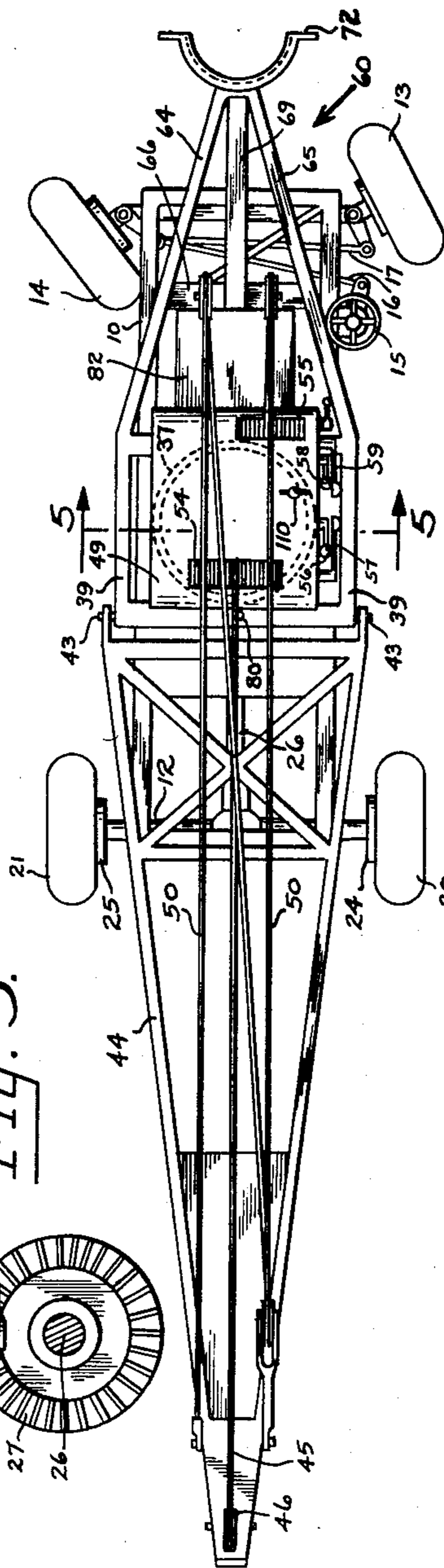


Fig. 1.

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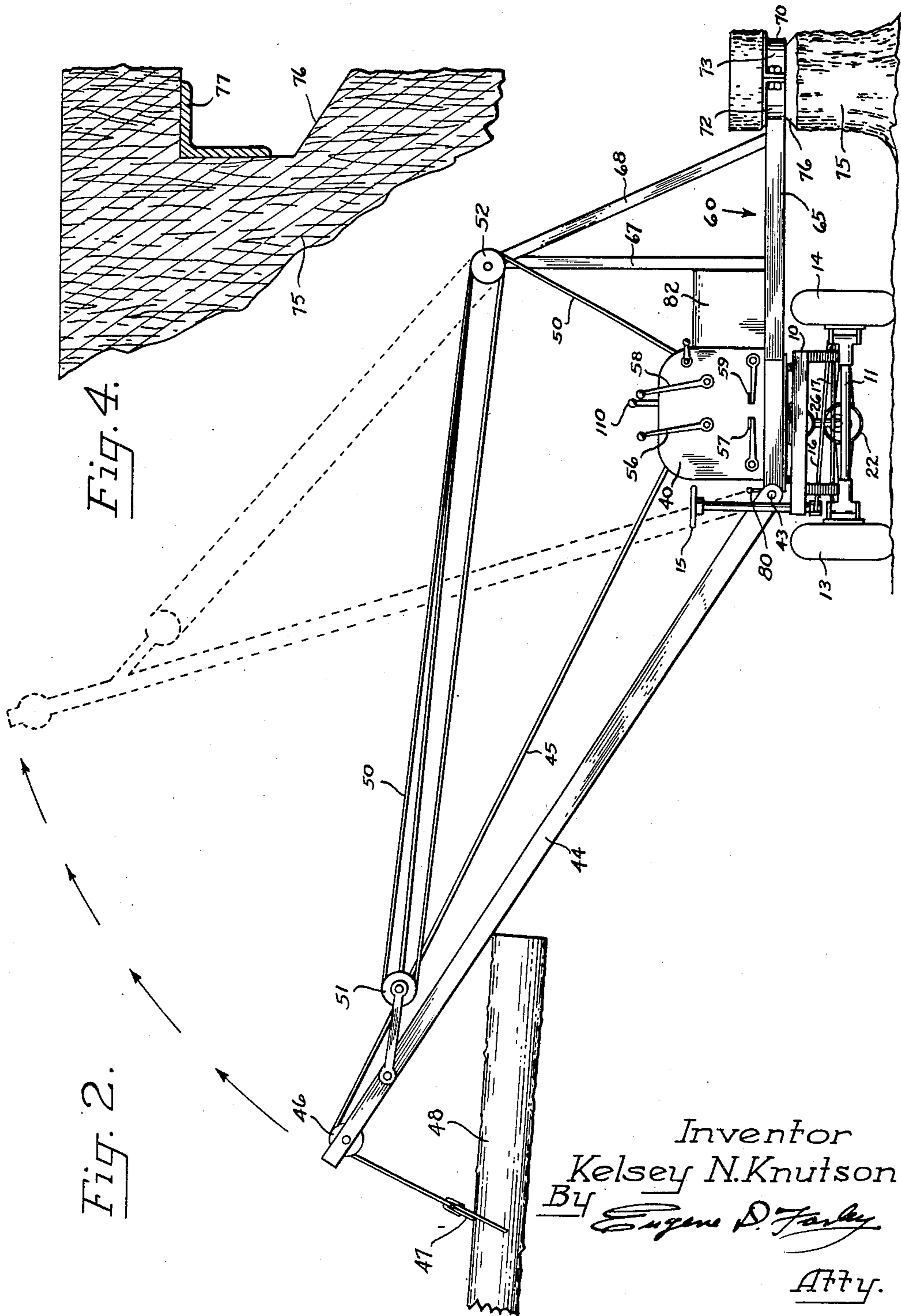
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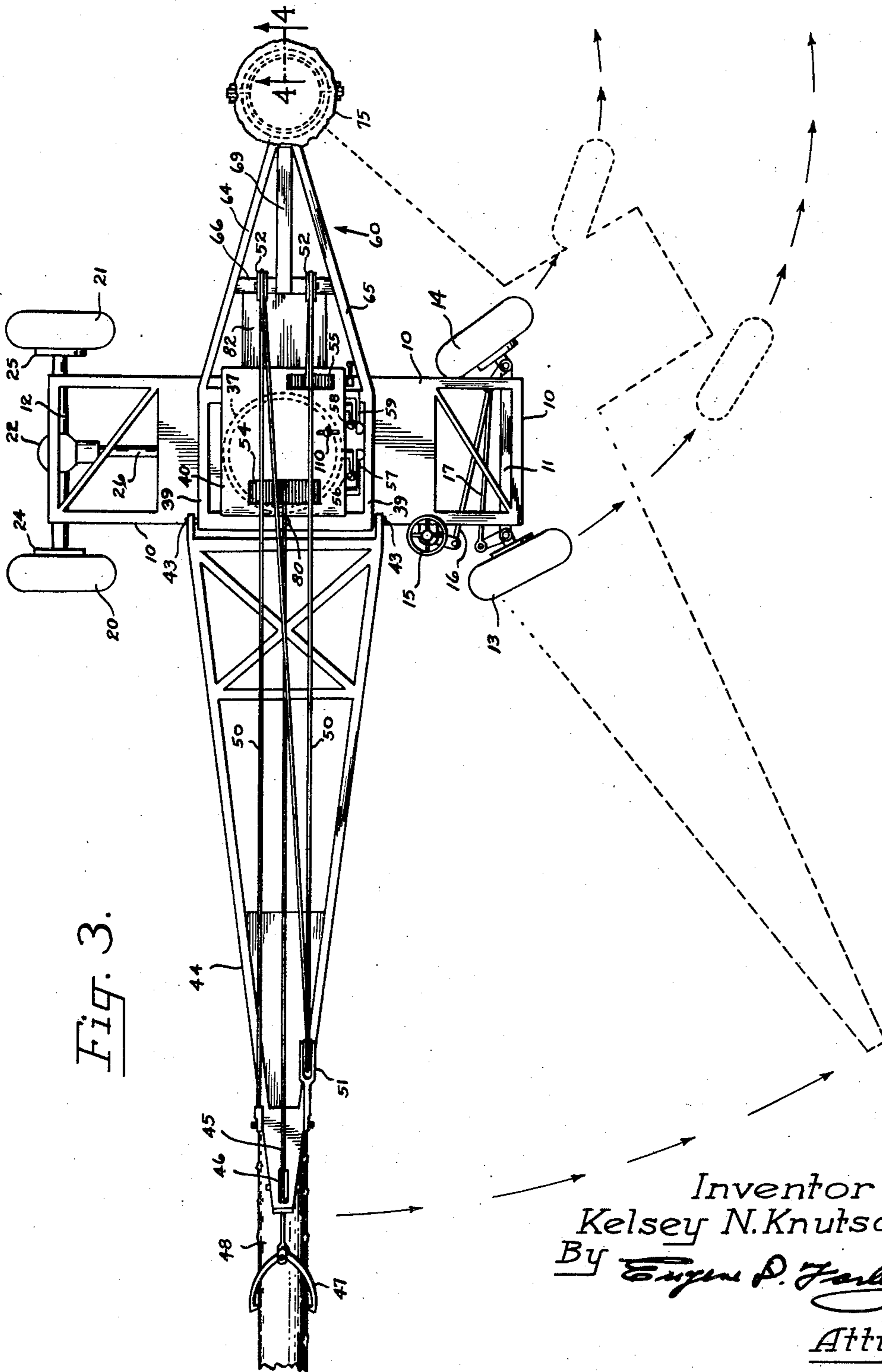
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2,710,102

## HOISTING DEVICE

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3 Claims. (Cl. 212—145)

The present invention relates to a hoisting device of the class designed for lifting and moving heavy objects or substances. It relates particularly to a log loader and yarder and is described herein with particular reference to this application, although it will be apparent that it also is applicable to other uses, e. g. pile driving, steel erection, clam shell and bucket work, and general hoisting and material handling.

In logging operations, it is conventional practice to convey the logs from the site of their cutting to the place of loading them, i. e. to yard them, by means of a cable rigged to the trunk of a tree. Similarly, it is conventional practice to load the logs on trucks, railway cars or other vehicles used to transport them away from the scene of logging by means of the same or another rigged tree used to anchor a suitably powered boom. The use of rigged trees in this manner has several disadvantageous features. In the first place, it often is difficult to find a suitable tree adjacent the logging operation. Secondly, even when such trees are available, a very large amount of work is necessary to rig them for the yarding and loading operation. This usually requires from two to five days' time of a five-man crew, since it is necessary first to top the tree, to support the trunk with heavy guy lines, and then to attach the boom and the supporting cables. Since the guy lines and cables are made from steel and are of the order of 1½ inches in diameter, their handling and transportation from place to place is a task of considerable magnitude. The problem is made even greater by reason of the fact that the site of the logging operation is changed from time to time, and the terrain is difficult of traversal.

To overcome the foregoing disadvantages at least in part, it also is conventional practice to employ a loader of the so-called shovel type. This comprises a derrick mounted on a tractor and hence readily movable from place to place. However, in order to accommodate heavy logs, the shovel loaders must be of large and heavy construction. They therefore are very expensive and entirely out of the reach of many operators having limited capital. Furthermore, even when the shovel loaders have considerable weight, there still is danger of their tipping over if swung in too wide an arc when carrying a heavy load. This limits their usefulness correspondingly.

It therefore is a principal object of my invention to provide a hoisting device which is relatively inexpensive, but which may be used to lift heavy loads and to move them in a complete circle without danger of overturning.

It is another important object of my invention to provide a hoisting device which is readily portable from place to place and which may be put into almost immediate operation, even on rough ground.

Still another object of my invention is the provision of a log loader and yarder having all the advantages of stability of a rigged tree, together with the advantage of portability offered by the shovel-type loader, but at only a fraction of the cost.

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Still another object of my invention is the provision of a hoisting device, the cables of which may readily be inspected, and which therefore is correspondingly safe in operation.

Still a further object of my invention is the provision of a hoisting device which may be used to handle logs or other heavy objects rapidly and precisely.

Still another object of my invention is the provision of a log loader which also may be used effectively as a log yarder.

The manner in which the foregoing and other objects of the present invention are accomplished will be apparent from the following specification and claims considered together with the accompanying drawings wherein:

Figure 1 is a plan view of the hoisting device of the present invention in travelling position;

Figure 2 is a side view in elevation of the hoisting device of the present invention illustrating its application to the lifting of a heavy object;

Figure 3 is a plan view of the presently described hoisting device illustrating its application to the loading of a heavy object which it has lifted;

Figure 4 is a fragmentary sectional view taken along the line 4—4 of Figure 3 and illustrating the manner of attachment of the presently described hoisting device to an anchor point; and

Figure 5 is a sectional view taken along the line 5—5 of Figure 1 and illustrating the driving mechanism of the hoisting device of the present invention.

Broadly stated, the hoisting device of my invention comprises a supporting vehicle, a hoisting boom, an anchor arm extending from the vehicle, means for pivotally attaching the anchor arm to an immovable object such as a stump, means for pivotally mounting the hoisting boom and the arm on the vehicle, and power means for operating the hoisting boom and for driving the vehicle about the immovable object. Thus when in use the arm extending from the vehicle first may be attached to the stump or other immovable object, the attachment being such that the arm and the vehicle to which it is attached may move freely about the object. This anchors the vehicle and prevents its tipping over, no matter what the position of the boom. Next the boom is adjusted to an upright position, in which it may be used to yard logs if such is desired. When it is desired to load the logs on a truck or railway car, the boom may be placed transversely of the supporting vehicle, a log attached thereto, and the boom raised until the log is lifted to the desired height. The entire vehicle then is driven in a circle about the stump, steering means being provided for this purpose. Even though the boom extends transversely of the vehicle during this operation, the entire assembly is maintained stable by reason of its being anchored to the stump. Hence the log may be swung in a complete circle about the stump and loaded on a truck or railway car spotted at any point along the circumference of the circle.

Referring now more particularly to the drawings, the hoisting device of my invention comprises a vehicle, preferably a wheeled vehicle having a frame 10 mounted through a suitable suspension on a front axle 11 and a rear axle 12. The frame is supported by the front wheels 13, 14 which may be adjusted to steer the vehicle by means of the steering wheel 15 connected to the wheels through the radius rods 16, 17.

The rear wheels 20, 21 preferably are employed to drive the vehicle, being driven through the differential 22 and equipped with brakes 24, 25 of sufficient strength to hold the vehicle against a substantial displacing force. Power is supplied to the rear or drive wheels through the drive shaft 26 which is connected through bevel gears 27, 28 to the central power shaft 30. The latter is con-

tained in the housing 31 and rotatably supported in a lower ball bearing assembly 32 and an upper ball bearing assembly 33. This construction makes possible driving the supporting vehicle and rotating the hoisting mechanism mounted thereon through a common power transmission means.

The hoisting mechanism of the herein described device is mounted rotatably on the frame 10 of the vehicle by providing a plurality of shoes 35, 36 which slidably engage a circular track 37 of substantial dimensions (Figure 5). To the latter is attached the supporting structure of the drive unit, including the floor plate 38 rotatably mounted about shaft 30 through bearing 41, the channel beams 39, 39 and the housing 40.

Pivotally attached to the forward end of the channel beams 39, 39 through the pins 43, 43 is a boom 44. This member may be of conventional construction and dimensions and is provided with a line 45 operating over pulley 46 and having at its end tongs 47 or other suitable means for engaging the log 48 or other object to be lifted or loaded. The boom illustrated is a conventional heel boom in which one end of the log engages the under surface of the boom as it is lifted thereby. Elevation of the boom is accomplished in the usual manner through the line 50 operating through pulleys 51, 52.

Also provided is a conventional donkey engine contained within the housing 40 and including drum 54 for operation of line 45 and drum 55 for operation of line 50. Drum 54 is operated in the usual manner through control lever 56 and foot brake 57, while drum 55 is similarly controlled through lever 58 and foot brake 59, the manner of operation being such that the drums are wound under power, but unwound by the weight of the objects connected thereto, the speed of unwinding being controlled through the foot brakes.

Also attached to the supporting member carrying the boom 44 is an outwardly projecting arm structure termed herein an anchor arm indicated generally at 60. This extends outwardly from the vehicle in a direction opposite to the boom. It is constructed of suitable structural members, including, for example, a pair of converging beams 64, 65 which may be affixed to the channel beams 39, 39, a transverse member 66, a standard 67, which supports the pulleys 52, and bracing members 68 and 69. The beams 64, 65 at their point of convergence are attached to a collar indicated generally at 70, and preferably are formed in two matching halves 72, 73. The halves are adapted to be bolted or otherwise fastened together to form a continuous collar of sufficient diameter to encircle the stump 75 of a tree or a similar object. This forms an anchor point for stabilizing the hoisting device.

Where a stump is used as an anchor means, it preferably is prepared prior to encircling it with the collar 70 by notching it to form a continuous groove 76 about its circumference at about the height of the anchor arm 50. The groove preferably is formed with a substantially flat, horizontal upper surface against which a bearing surface 77 of the collar 70 is adapted to bear. This distributes the pressure exerted by the collar over an appreciable area during the rotation of the collar about the stump.

As has been pointed out above, both the driving of the vehicle about the anchor point, and the rotation of the hoisting mechanism with respect to the frame of the vehicle may be accomplished through the central drive shaft 30. As has also been pointed out, the driving mechanism is rotatably mounted on the frame of the vehicle about shaft 30, the shoes 36 and track 37 being provided for this purpose. In addition, there are provided pins 80 disposed within appropriately spaced openings in the plate supporting the driving mechanism and the frame, thus locking these two members together when the pins are in place, but permitting their rotation relative to each other when the pins have been removed. It will be apparent that, when the pins are in place and the brakes

24, 25 on the wheels of the vehicle are released, the application of power to the central shaft 30 will result in the driving of the vehicle. However, if the brakes 24, 25 are set and the pins 80 are removed, then the application of a driving force to shaft 30 will result in the rotation of the hoisting assembly.

The direction of rotation of the hoisting assembly and the direction of movement of the vehicle are determined by the direction of rotation of the central shaft 30. This is controlled through a double clutch assembly such as is illustrated in Figure 5. Power from the engine 82 is transmitted to shaft 83 carrying at opposite ends thereof the spur gears 84, 85. The latter drive respectively gears 87, 88 which are keyed respectively to shafts 89, 90. Shaft 89 is supported in bearing 92, while shaft 90 is rotatably supported in bearing 93.

A conventional spider clutch 95 with clutch collar 96 is attached to shaft 89, while shaft 90 carries a similar clutch 97 with clutch collar 98. Interconnected with shaft 89 through clutch 95 is shaft 100 rotatably mounted in bearing 101. Interconnected with shaft 90 through clutch 97 is shaft 102 rotatably mounted in bearing 103. Shafts 100 and 102 carry at their opposed ends bevel gears 105, 106, respectively, these being keyed or otherwise rigidly affixed to their respective shafts and intermeshing with the bevel gear 107 keyed to the central drive shaft 30.

Clutches 95, 97 are controlled by means of the control lever 110 which operates simultaneously lever 111 attached to clutch collar 96 and lever 112 attached to clutch collar 98, the latter two levers being interconnected through the connecting rod 115. It will be noted that the arrangement of the control levers with respect to the clutches is such that, when one of the latter is engaged, the other will be disengaged. Both are adjusted to a neutral or disengaged position, except when it is desired to drive the vehicle or rotate the hoisting mechanism.

Thus the engine 82 normally is left running, this driving continuously shaft 83 and the interconnecting shafts 89, 90. When, however, the control lever 110 is adjusted either to the right or the left as viewed in the drawing, a corresponding one of the clutches is engaged, the other remaining disengaged. This drives the corresponding one of shafts 100, 102 and therefore drives central drive shaft 30 in a corresponding direction through the bevel gear assembly including gears 105, 106, and 107. However, when the control lever 110 is moved in the opposite direction, the other clutch is engaged, this driving the shaft in the opposite direction.

#### Operation

When applying the hoisting device of the present invention to the yarding and loading of logs, the vehicle in travelling position (Figure 1) is driven or pulled to the site of the logging operation. There a suitably located stump is found and grooved to provide an annular groove at substantially the elevation of the anchor arm 60. The ground then is levelled off to form a circular track about the stump with a bulldozer or other suitable mechanism.

Next the boom 44 is elevated, if it is not already in elevated position, the brakes 24, 25 set on the vehicle, and locking pins 80 removed. Suitable adjustment of the control lever 110 then engages the appropriate clutch to rotate the hoisting mechanism until it is positioned substantially transversely of the vehicle. In this position, the anchor arm 60 extends toward and approaches the grooved stump 75. The collar 70 then is placed about the groove in the latter and adjusted until a sliding fit is obtained between the collar and the stump, thus permitting the free rotation of the former about the latter. In this position, the device is ready for operation.

When it is to be used as a log yarder, the boom 44 is maintained in elevated position as shown in dotted outline in Figure 2. Line 45 then is run out until a log is reached, whereupon the latter is engaged by the tongs and dragged to the vicinity of the hoisting device by winding the line on drum 54.

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Where the device is to be used as a loader, a truck, or other transporting vehicle is stationed at a convenient location on the circle about the stump. Boom 44 then is lowered over the log, the tongs engaged, and the log lifted in such a manner that the end thereof abuts against the boom. The boom and the log which it carries then are elevated to the desired height by operation of drum 55. Next the vehicle is driven through lever 110, the interlocking pins 80 being in place between the mounting platform and the frame of the vehicle. Thereupon the entire assembly, including the vehicle, the hoisting mechanism and the log move in a circle about the stump to which the anchor arm is fastened (Figure 3), the latter preventing upsetting of the device even though a heavy load is being carried by the boom. When it reaches the station at which the transporting vehicle is located, the boom may be lowered, thereby depositing the log on the vehicle. This sequence then may be repeated until the loading operation is complete.

When it is desired to move to another location, all that is necessary is to elevate the boom, disengage the collar from the stump, set the brakes, remove the interlocking pins, disengage the anchor arm from the stump, and rotate the hoisting mechanism until it is aligned with the frame of the vehicle. It then may be hauled or driven to another selected location where a stump has been prepared in similar manner. The foregoing sequence then is reversed, the brakes being set, the interlocking pins removed, and the boom rotated until it is perpendicular to the frame. This bringing the anchor arm adjacent the stump, the collar on the anchor arm is engaged with the stump, and the interlocking pins returned to their locking positions, whereupon the device again is ready for use as a log loader or yarder or other hoisting operation.

Hence it will be apparent that, by the present invention, I have provided a hoisting device of simple construction which may be used to lift heavy loads and move them in a complete circle without danger of overturning. Furthermore, I have provided a hoisting device which is readily portable from place to place and which may be put into almost immediate operation even in difficult terrain. Still further when the hoisting device of my invention is applied as a log loader and yarder, it has all the advantages and stability of a rigged tree, together with the advantage of portability offered by a shovel-loader, which is safe and efficient in operation but which is available at comparatively a very small cost.

Having now described my invention in preferred embodiments, I claim:

1. A hoisting device comprising a wheeled vehicle, brakes for maintaining the vehicle in a given location, a supporting platform rotatably mounted on the vehicle, lock means for releasably interlocking the supporting

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platform and the vehicle, a hoisting mechanism on the supporting platform, and power transmission means interconnecting the vehicle wheels and the supporting rotary platform, whereby to enable driving of the vehicle upon releasing the brakes and setting the lock means, and to enable swivelling of the mounting member with respect to the vehicle upon setting the brakes and removing the lock means.

2. The hoisting device of claim 1 wherein the power transmission means includes a vertical shaft extending through the supporting platform and the frame of the vehicle, the vertical shaft being connected at one of its ends to a source of power mounted on the platform, and at the other of its ends to a substantially horizontal drive shaft attached to the wheels of the vehicle.

3. A hoisting device comprising a wheeled vehicle, a supporting platform, means for pivotally mounting the supporting platform on the vehicle, an anchor arm attached to and extending rearwardly from the platform, means for pivotally attaching the anchor arm to an immovable object, a hoisting boom attached to and extending forwardly from the platform, power means for driving the vehicle about the immovable object, thereby contemporaneously swinging an object carried by the hoisting boom in a circle of which the immovable object is the center, and power transmission means interconnecting the power means and the wheels of the vehicle, the power transmission means including a vertical shaft connected at one of its ends to the power means and geared at the other of its ends to a substantially horizontal shaft and means for drivingly connecting the horizontal shaft to the wheels of the vehicle.

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