Nov. 6, 1923.

1,473,248

A. E. NORRIS

HOISTING DEVICE

Filed Nov. 1, 1919

3 Sheets-Sheet 1

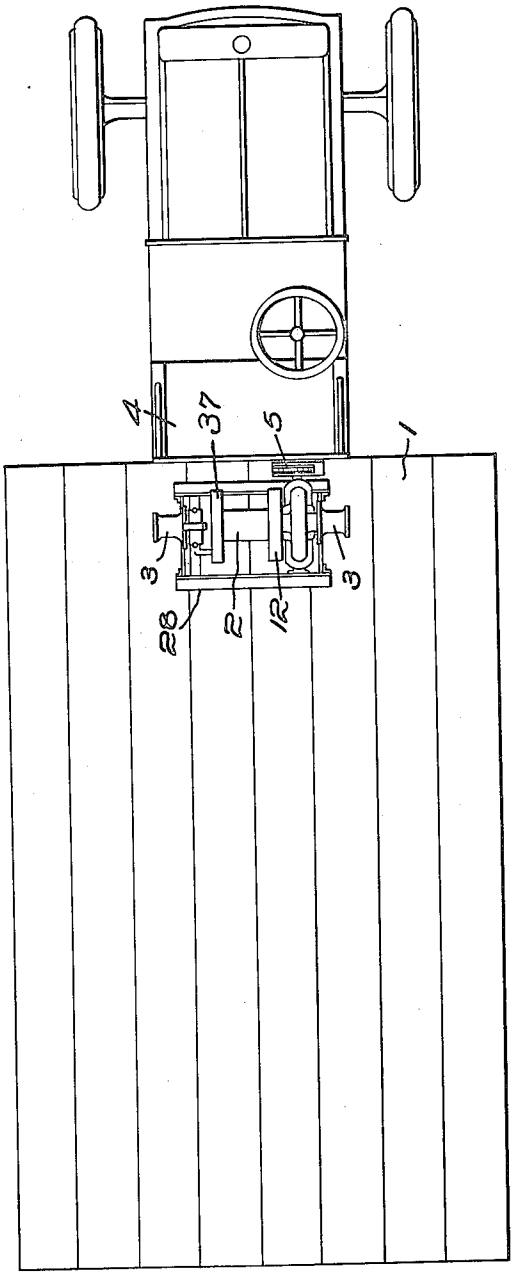


Fig. 1.

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3 Sheets-Sheet 2

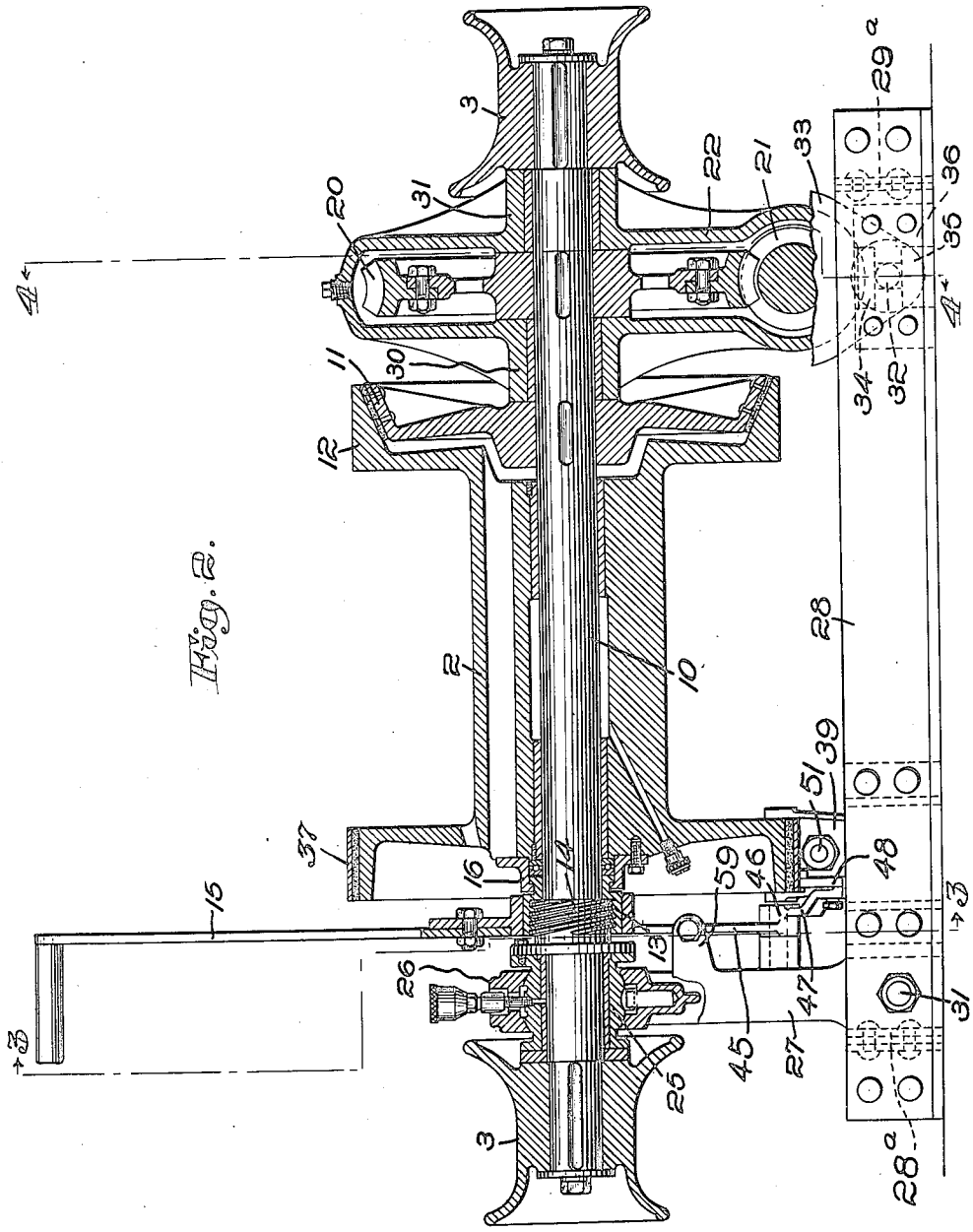


Fig. 2.

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3 Sheets-Sheet 3

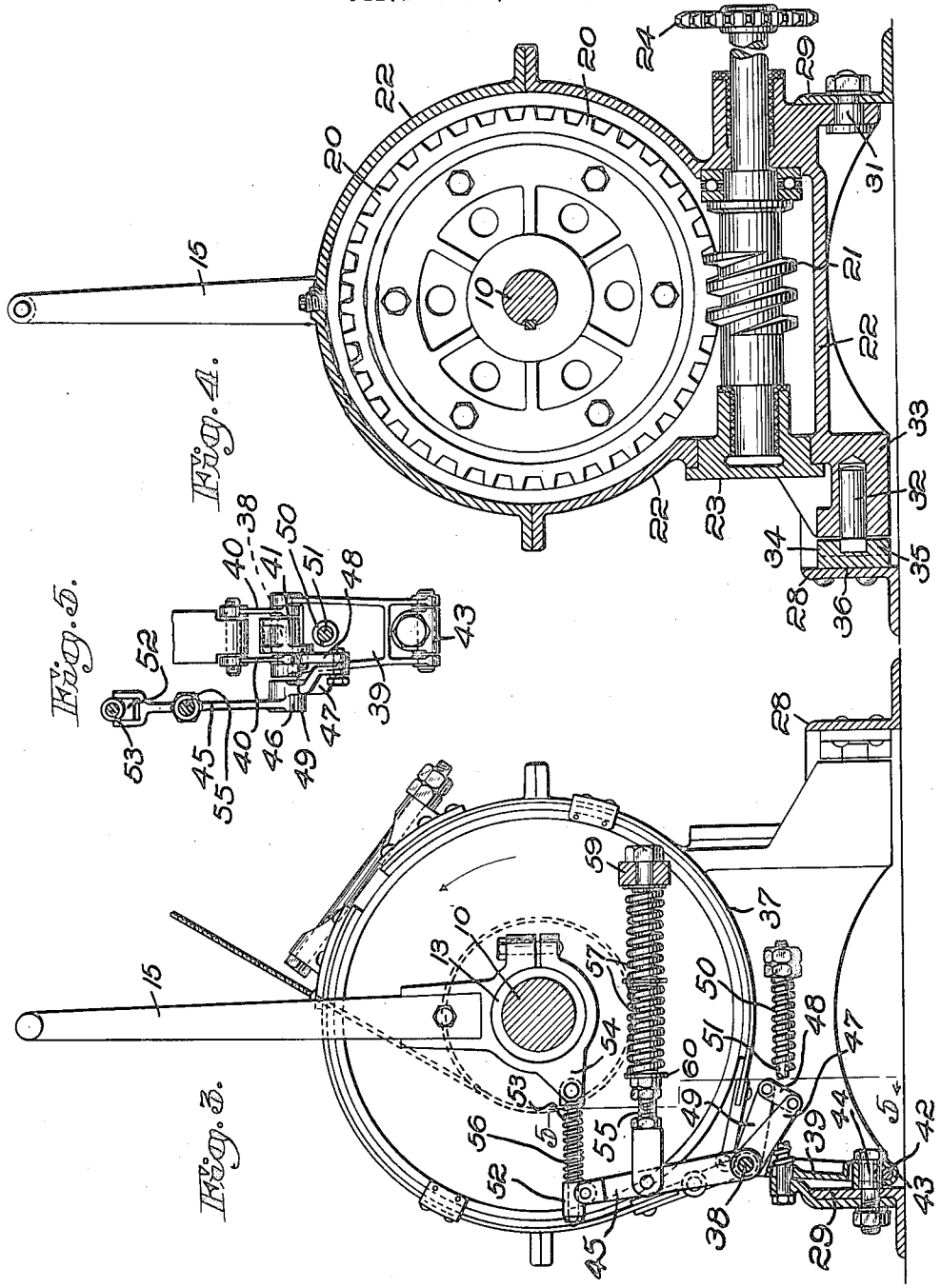


Fig. 4.

Fig. 5.

Fig. 3.

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Patented Nov. 6, 1923. 1,473,248

UNITED STATES PATENT OFFICE.

ALMON E. NORRIS, OF BROOKLINE, MASSACHUSETTS.

HOISTING DEVICE.

Application filed November 1, 1919. Serial No. 335,059.

To all whom it may concern:

Be it known that I, ALMON E. NORRIS, a citizen of the the United States, and a resident of Brookline, in the county of Norfolk and State of Massachusetts, have invented an Improvement in Hoisting Devices, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to hoisting devices, or the like, intended more particularly for use in connection with motor trucks or the like.

The invention will be best understood by reference to the following description, when taken in connection with the accompanying illustration of one specific embodiment thereof, while its scope will be more particularly pointed out in the appended claims.

In the drawings,

Fig. 1 is a plan view of a typical form of motor truck equipped with one embodiment of the invention;

Fig. 2 is a vertical elevation partly in section showing the principal working parts of the hoisting mechanism;

Fig. 3 is a sectional end elevation taken on the line 3—3 in Fig. 2 looking in the direction of the arrow and showing the controlling mechanism therefor;

Fig. 4 is an end elevation taken on the line 4—4 in Fig. 3, looking in the direction of the arrow shown thereat and illustrating the driving gearing and the attachment of the hoisting mechanism to the base frame; and

Fig. 5 is a detail in sectional elevation on line 5—5 of Fig. 3, showing the connections for the automatic brake.

Referring to the drawings and to the illustrative embodiment therein shown, in Fig. 1 there is illustrated a motor truck of a conventional type having the body flooring 1, on which there is mounted suitable hoisting mechanism, which may include the hoisting drum 2 and one or more connected winches 3. These devices may be arranged about any suitable part of the truck, but are herein located immediately back of the driver's seat 4, and have driving connection through a sprocket chain 5 with any suitable part of the driving mechanism of the truck (not herein shown). The drive of the sprocket chain is preferably so controlled by any suitable arrangement of controlling instrumentalities (not herein shown) that the power from the truck motor may be applied to or withdrawn from the sprocket chain 5 to operate the hoisting devices and preferably irrespective of whether the motor is or is not at the same time connected to the driving mechanism of the vehicle.

The hoisting drum (Fig. 2) is mounted to turn freely about the main driving shaft 10, to which the winches 3 are keyed or otherwise fixedly secured, but the drum has a limited endwise movement on the shaft and may be connected thereto to be turned thereby through a cone-shaped friction clutch 11, of any suitable construction, keyed to the shaft 10 and adapted to be placed in engagement with the cooperatively formed friction drum 12 at one end of the hoisting drum 2 when the latter is moved endwise on the shaft 10. The drum may be clutched to the drive shaft by any usual controlling devices, there being herein provided for that purpose the clutch operating nut 13, engaging the threaded sleeve 14 which is bolted or otherwise secured to the adjacent bearing 25, the nut being adapted to be turned by the controlling lever 15 to force the hoisting drum into or out of engagement with the friction cone through the intermediate collar 16, the latter secured to the end of the drum and having an inturned end flange engaging a circumferential groove in the end of the nut.

In the illustrated form of the invention, the hoisting mechanism is so constructed as to prevent binding at the bearings or in the driving gearing in case the supporting frame is sprung out of alignment, due to an uneven flooring on the truck or other non-rigid support upon which it may be mounted, or due to a change in the relation of the flooring or the truck frame to the supporting frame from any cause which is apt to arise from time to time in the use of a truck.

Referring to the drawings and more particularly to Figs. 2 and 4, the driving shaft 10 is driven by a worm gear 20 which engages the driving worm 21, the worm gearing being contained within a housing 22, the upper and lower halves of which are shown in section in Figs. 2 and 4.

The worm receives journal support in the lower half of the housing, one end of the worm shaft being journaled in the removable cap piece 23 and the opposite end passing through the housing and having secured at

its exterior the sprocket wheel 24, adapted to be driven by the sprocket chain 5. The worm gear 20 is keyed or otherwise secured to the shaft 10.

At its opposite end, the shaft 10 is journaled in a member 25 having a spherical seat in the journal box 26, the latter carried by the supporting member 27 herein in the form of an upright pedestal having a supporting leg at each side connected one to each of the two base members 28 and 29.

At its opposite end the shaft 10 receives journal support in the worm gear housing 22, the latter being provided with hubs 30 and 31 which afford a prolonged cylindrical bearing for the shaft, the shaft, worm gear and worm being thereby maintained in properly aligned relation under all conditions of use irrespective of any movement which may take place in the supporting frame.

In order to permit the deformation of the base to take place without affecting the proper alignment of the bearings for the shaft 10, the supporting pedestal 27 which carries the spherical bearing 25 for one end of the shaft, and the housing 22 which carries the cylindrical bearing for the opposite end thereof, are both flexibly connected to the supporting base in such manner that they automatically adapt themselves to such deformation without affecting the proper alignment of the parts. Such flexible connection may be provided for in any suitable or desired way, and the supporting base may be constructed in any desired form, but herein the latter consists of the two parallel angle irons 28 and 29, preferably connected by transverse plates 28^a and 29^a (Fig. 2), which are bolted to the flooring of the truck or other support at the required distance apart. The pedestal 27 is flexibly connected to the base and herein preferably at each leg thereof by the provision of axially aligned studs 31 (similar to the stud 31 shown in Fig. 4), the latter being bolted to the side frame but providing a pivotal support thereat for each pedestal leg, about which support the pedestal may swing or rock to a limited extent on an axis transverse the hoisting drum.

The worm gear housing 22 is also flexibly connected to the supporting frame at one side by a similar stud 31 (Fig. 4) and at the opposite side by a pin 32, carried in a seat or recess formed in the lug 33 depending from the housing. The projecting end of the pin 32 engages a groove formed between upper and lower projections 34 and 35 respectively carried by the plate 36, the latter fixedly secured to the side of the channel iron 28.

The axis of the pin 32 and the stud 31 coincide with each other and these parts provide a pivotal connection for the housing on the supporting base, so that the housing can also swing or tip about the pins 31 and 32 as may be required by the deformation of the supporting base. The pin 32 is also capable of a limited longitudinal movement in the groove between the projections 34 and 35 (see Fig. 2) and the connection at the pin 31 for the housing provides some degree of play or looseness so that the gear housing is also capable of a limited movement lengthwise the axis of the drum or a limited angular movement about an upright axis, without causing binding in the bearings, thereby adapting itself to such deformation as requires a swing or a tip of the driving shaft 10 in a horizontal plane.

Any springing or warping of the floor may, therefore, take place and the supporting frame if it deforms to follow such warping cannot transmit any binding action to the driving parts, inasmuch as the supports will automatically adapt themselves to the deformation of the base by the movement of the parts flexibly connected thereto. The worm and worm gear being held in fixed aligning relation to the driving shaft, any movement of the shaft bearings in adaptation to the deformation of the base will not affect the relation of the driving parts.

Referring now to the device for controlling the movements of the hoist drum, I have provided means for so coordinating the action of the clutch 12 with the movement of a suitable braking device that a very simple control may be effected. To hold the drum there is provided a suitable brake, herein in the form of an encircling band 37 (Figs. 2, 3 and 5) opposite ends of which are connected at 38 to a swinging link 39. One end of the band is connected to the link 39 by the short links 40 (Fig. 5) and the opposite end to one end of a brake-controlling member 41. The latter is in the form of a short brake-control lever or rocker member fulcrumed on the swinging link between the short links 40, the lever or rocker member having two short arms jointed at their ends to the brake band. As the rocker 41 is turned on its fulcrum, the band may be tightened or loosened.

The swinging link 39 has what in effect is a universal joint connection to the frame member of the machine, being pivoted at 42 to the knuckle piece 43, which in turn is pivoted on the stud 44 fixed on the base member 29. This provides a flexible connection whereby the link may not only swing transversely the frame in performing its automatic controlling function with respect to the brake, but may also swing longitudinally the frame so as to accommodate itself to any deformation of the frame.

To turn the rocker 41, a brake-releasing lever 45 is employed pivoted on the frame at 46 independently of the swinging link

39 but preferably, though not necessarily, at a point coincident with the axis 38 when the link 39 is in a normal position.

The connection provided between the brake-releasing lever 45 and the rocker 41 is such that movement of the link 39 to a brake-releasing position has no effect in tightening the band, such movement on the contrary preferably, though not necessarily effecting a movement of the rocker 41 which further assists in releasing the band. Such connections are provided by the bell-crank lever arm 47 fixedly secured to the lever 45 and having the link 48 which connects it to the lever arm 49, the latter extending from the brake-control member 41. When the lever 45 is turned clockwise (Fig. 3), the arm 47 acts through the link 48 to turn the arm 49 and move the brake-control lever 41 to release the brake.

The parts are shown in their normal working position wherein the turning movement (clockwise in Fig. 3) of the drum, such as is adapted to unwind the rope or cable thereon, is prevented by the action of the band. The parts are so arranged, however, that the brake operates on substantially the same principle as shown in my prior Patent No. 1,123,786, wherein the unwinding movement of the brake is prevented in the normal position of the operating parts but the winding-on movement is at the same time automatically permitted and the brake may at any time be released also to permit the unwinding movement of the rope or cable.

This follows from the fact that when the drum is turned counterclockwise for hoisting, a clockwise tipping movement of the link 39 about its axis 42 results, which tends to open and release or partly release the band, whereas a clockwise movement of the drum tends to tighten the band. On the other hand, the lever 45 may be turned clockwise about its fulcrum 46 to permit the drum to turn clockwise for unwinding, since this movement of the lever turns the rocker 41 and tends to open the band. The link 39 is held in its normal operative position by a spring 50 which encircles a rod 51 secured to the base member 29, the spring acting to press the link normally toward an upright position.

When the hoisting drum is driven, however, in such a direction as to wind on the rope or cable (in the counterclockwise direction as shown by the arrow in Fig. 3), the pull on the band is such as to swing the link 39 righthandedly (Fig. 3), compressing the spring 50 and opening or slackening the band sufficiently to release the drum and automatically allow the winding-on movement. As soon as such winding-on movement of the drum ceases, or as soon as such movement tends to reverse, the link again returns towards an upright position and the band tightens about the drum preventing reverse movement thereof.

It will be observed, however, that the movement of the link 39 toward a band-releasing position does not effect any movement of the brake-controlling member 41 which tends to tighten the band but on the contrary such movement, so far as it occurs through the change in position of the fulcrum 38 with relation to the fulcrum 46, acts through the arm 47, link 48 and arm 49 to move the brake-controlling lever to effect a further loosening of the band.

The band may also be loosened to permit unwinding movement by movement of the controlling lever 45 about its pivotal point 46. For this purpose the end of the lever is pivotally connected to a sleeve 52 suitably mounted on the end of a rod 53, the latter pivotally connected to the part 54 which is rigidly attached to the handle 15 and the clutch-adjusting nut 13. When the controlling lever 15 is moved counterclockwise (Fig. 3) it swings the brake lever 45 into a brake releasing position, the threaded end of the rod 53 having suitable means such as an adjustable nut thereon, so that the movement of the clutch lever in that direction effects a movement of the sleeve 52 and the brake lever. Interposed between the sleeve 52 and an enlarged head at the opposite end of the rod 53 is a spring 56. When the controlling lever 15 is moved righthandedly (Fig. 3), this spring contracts, permitting the movement of the rod 53 without affecting the sleeve 52 or the brake lever 45. The spring 56 is of such proportions that it tends to center the lever 15 at an upright position.

The brake lever 45 is also held normally in an upright or an applied position by one or more springs 57 which are mounted on the rod 55, the latter jointed to the brake lever, the spring being interposed between a fixed stop 59 carried by the framework of the supporting base and a washer 60, the latter adjustably secured upon the said rod 55. This spring contracts when the brake lever is thrown by the controlling lever toward a brake-releasing position, but prevents the brake lever from moving beyond the upright position when the controlling lever is moved back. In other words, the spring 57 yieldably resists the movement of the controlling lever to release the brake and restores the lever to its brake-applying position when the pressure is removed. The spring 50 is relatively weak, being of sufficient strength to hold the link 39 in its upright position except when the drum is turned in the direction for winding-on the rope, whereupon it yields to permit the rocking movement of the link.

The parts, including the main controlling

lever 15, are shown in their normal operative positions, in which position the clutch is released and the load, if any, is held by the brake, thus preventing the hoisting rope or cable from unwinding. If the controlling lever 15 is moved right-handedly (Fig. 3), the friction clutch is thereby applied so that, if power is then being applied to the drive shaft 10 through the worm-gear driving mechanism and the sprocket wheel, the drum is connected to wind on the hoisting rope and lift the load. The application of the friction clutch permits this turning movement to be controlled by a graduated amount according to the movement of the lever and the pressure applied to the clutch, that is to say, a relatively small movement of the lever may permit more or less slippage at the friction clutch while a relatively large movement may apply the clutch so that the drum rotates without slippage. The described movement of the controlling lever which serves to apply the clutch has no effect upon the brake parts, the spring 56 compressing more or less and the rod 53 sliding freely through the sleeve 52.

At any time the winding-on movement of the drum may be stopped by swinging the clutch lever back to its midposition, this serving to release the clutch, the brake automatically preventing the drum from turning reversely and thereby holding the load.

To release the drum for unwinding movement, the controlling lever is moved left-handedly (Fig. 3), this serving to open the brake band and release the drum as described, and having no effect upon the clutch except to further back away the friction cone from its cooperating clutch member.

Obviously, if desired, toothed quadrants with locking latches or any other suitable means for holding the lever 15 in a fixed position of adjustment may be employed and if desired separate and independent levers for controlling the friction clutch and the brake respectively may be utilized. Linkages or other connections (not shown) may also be employed connecting the lever or levers at the hoisting winch for controlling the brake and clutch to another lever or levers appropriately located at the driver's seat so that the control of the brake and clutch may be readily effected by the driver without leaving his seat.

It will be seen that in the illustrative embodiment of the invention, through the use of a single controlling lever the clutch and brake may be simultaneously and coordinately actuated, whereby the hoisting rope may be wound in and the load hoisted, or the load held suspended or allowed to drop. While the lever thus has three positions for hoisting, holding or lowering the load, respectively, it will be understood that intermediate positions may be utilized to allow more or less slippage, either at the brake or the clutch, whereby both the speed of lowering the load as well as the hoisting of the load may be controlled.

While I have referred to the action of the winding drum with its clutch and controlling brake, in connection with the raising of a load, it will be obvious that the device may be similarly and usefully employed whether the rope or cable is utilized for raising the load or for any other purpose.

While I have herein described for purposes of illustration one specific embodiment of the invention, it will be understood that the same is not limited to the mechanical details shown or the construction or relative arrangement of parts, but that extensive deviations may be made therefrom without departing from the spirit of the invention.

Claims:

1. A hoisting apparatus for motor trucks, or the like, comprising a driving shaft with hoisting mechanism thereon, a supporting base for said mechanism, a pedestal in which one end of said shaft has a spherical bearing permitting relative movement between the shaft and the pedestal, said pedestal having a pair of supporting legs each having a pivotal connection to one side of said base, driving mechanism for said shaft including a worm gear and driving worm, a gear casing therefor in which the opposite end of said shaft receives journal support, and a flexible connection between said gear casing and said base comprising a pivotal connection at the one side of the base and a pivotal connection at the opposite side thereof, the latter being capable also of a longitudinal movement, the casing being thereby adapted to a deformation of the base without causing any binding action upon the bearings.

2. A hoisting apparatus comprising a supporting base, a driving shaft with hoisting mechanism thereon, a support for one end of said shaft permitting relative movement thereof, said support having a flexible connection to said base, a support for the opposite end of said shaft comprising a casing containing transmission gearing, and a flexible connection between said casing and said supporting base.

3. A hoisting apparatus for motor trucks and the like comprising a driving shaft with hoisting mechanism thereon, a supporting base, an upright support for one end of said shaft, said support being pivotally connected to said base to permit a rocking movement thereof lengthwise said shaft.

4. A hoisting apparatus for motor trucks and the like comprising a driving shaft with hoisting mechanism thereon, a supporting base for said mechanism, an upright support for one end of said shaft having a bearing permitting relative movement between the

shaft and said upright support, the latter being flexibly connected to said base to permit a rocking movement thereof relatively to the base and lengthwise the shaft.

5. A hoisting rope-winding apparatus comprising a driving shaft with rope-winding mechanism thereon, a supporting base adapted to be secured to a flooring or other non-rigid support and upright bearing supports for said shaft flexibly connected to said base to permit movement thereof in conformity to any deformation of the base.

6. A rope-winding mechanism comprising a driving shaft with winding devices thereon, a supporting base for said mechanism adapted to be secured to a flooring or other non-rigid support, driving mechanism for said shaft, including a worm gear and driving worm, a gear casing therefor in which said shaft receives journal support and a flexible connection between said gear casing and said base, permitting relative swinging movement at a point outside of the axis of said shaft.

7. A rope-winding mechanism comprising a driving shaft with winding devices thereon, a supporting base for said mechanism adapted to be secured to a flooring or other non-rigid support, driving gearing for said shaft, a supporting member for said driving gearing and a flexible connection between said supporting member and said base, permitting relative swinging movement at a point outside of the axis of said shaft.

8. A hoisting apparatus adapted to be mounted upon a non-rigid support and comprising a driving shaft with hoisting mechanism thereon, a supporting base for said mechanism, means for supporting one end of said shaft to permit longitudinal and lateral movement thereof to conform to deformation of said base, a support for the opposite end of said shaft, also movable to adapt itself to deformation of the base, and transmission gearing in fixed relation to said support and said shaft.

9. A hoisting apparatus comprising a supporting base, a driving shaft with hoisting mechanism thereon, the latter being flexibly connected to the base to permit movement thereof in conformity to any deformation of the base, a brake member for said hoisting mechanism and a flexible connection between said brake and said base to permit movement of the brake also in conformity to deformation of the base.

10. A hoisting mechanism comprising, in combination, a driving shaft with hoisting mechanism thereon; a supporting base for said mechanism; a support flexibly connected with said base; a bearing for said shaft flexibly connected with said support; a second support flexibly connected with said base; and a second bearing for said shaft supported by said second support.

11. A hoisting mechanism comprising in combination, a driving shaft with hoisting mechanism thereon; a supporting base for said mechanism; a support flexibly connected with said base; a bearing for said shaft flexibly connected with said support; a second support flexibly connected with said base; and a second bearing for said shaft rigidly supported by said second support.

12. A hoisting mechanism comprising, in combination, a driving shaft with hoisting mechanism thereon; a supporting base for said mechanism; a support pivotally connected with said base to swing lengthwise of said shaft; a bearing for said shaft pivotally connected with said support to swing about an axis extending transversely of said shaft; a second support pivotally connected with said base to swing lengthwise of said shaft; and a second bearing for said shaft supported by said second support.

13. A hoisting mechanism comprising, in combination, a driving shaft with hoisting mechanism thereon; a supporting base or said mechanism; a support pivotally connected with said base to swing lengthwise of said shaft; a bearing for said shaft pivotally connected with said support to swing about an axis extending transversely of said shaft; a second support pivotally connected with said base to swing lengthwise of said shaft; and a second bearing for said shaft rigidly supported by said second support.

14. A hoisting mechanism comprising, in combination, a driving shaft with hoisting mechanism thereon; a supporting base for said mechanism; two bearings for said shaft; two supports for said bearings, respectively, one of said supports being flexibly connected with its bearing and both of said supports being flexibly connected with said base; and means providing for relative movement of one of said supports longitudinally of said shaft relatively to a part of said base.

15. A hoisting mechanism comprising, in combination, a driving shaft with hoisting mechanism thereon; two bearings for said shaft; a supporting base; and two supports for said bearings, respectively, one of said bearings being pivotally connected to its support to swing about an axis extending transversely of said shaft, and both of said supports being pivotally connected to said base to swing about axes extending transversely of said shaft.

16. A hoisting mechanism comprising, in combination, a driving shaft with hoisting mechanism thereon; two bearings for said shaft; a supporting base; and two supports for said bearings, respectively, one of said bearings being pivotally connected to its support to swing about an axis extending transversely of said shaft, both of said supports being pivotally connected to said base to swing about axes extending transversely

of said shaft, and one of said supports being connected to said base to move longitudinally of said shaft relatively to said base.

17. A hoisting mechanism comprising, in combination, a driving shaft with hoisting mechanism thereon; two bearings for said shaft; a supporting base; and two supports for said bearings, respectively, one of said bearings being pivotally connected to its support to swing about an axis extending transversely of said shaft, both of said supports being pivotally connected to said base to swing about axes extending transversely of said shaft, and one of said supports being connected to said base to slide longitudinally of said shaft relatively to said base.

18. A hoisting apparatus comprising, in combination, a driving shaft with hoisting mechanism thereon; a supporting base for said mechanism; a pedestal; a universal joint supporting said shaft on said pedestal and permitting relative movement between said shaft and said pedestal; means presenting a pivotal connection between said pedestal and said base permitting relative movement about an axis extending transversely of said shaft; driving mechanism for said shaft; a casing therefor in which said shaft receives journal support; and a flexible connection between said gear casing and said base, comprising a pivotal connection at one side of said base and a pivotal connection at the opposite side thereof, the latter being also capable of a longitudinal movement, said casing being thereby adapted to a deformation of said base without causing binding action upon the bearings.

19. A hoisting apparatus comprising, in combination, a driving shaft with hoisting mechanism thereon; a supporting base for said mechanism; and two supports flexibly connected with said base, one of said supports being flexibly connected with said shaft.

In testimony whereof I have signed my name to this specification.

ALMON E. NORRIS.