Dec. 15, 1936. B. F. FITCH 2,063,916

LOAD HANDLING MECHANISM

Filed Dec. 10, 1934 3 Sheets-Sheet 1

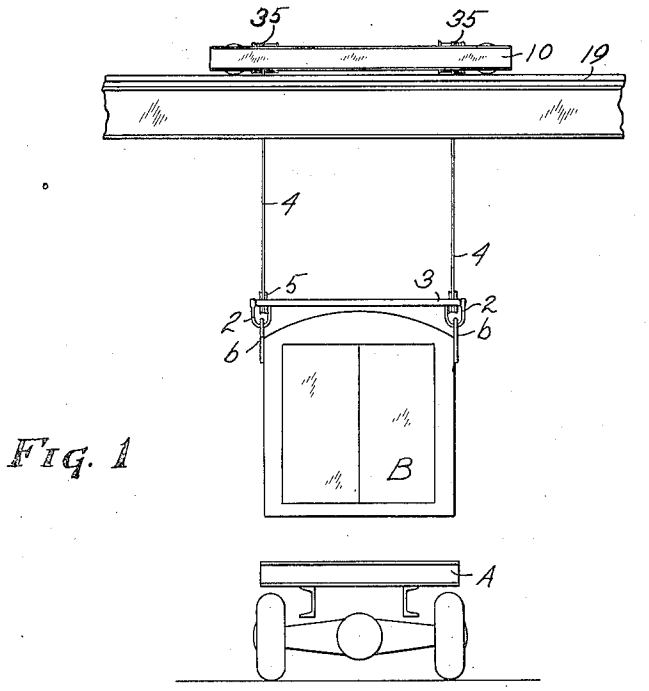



FIG. 1

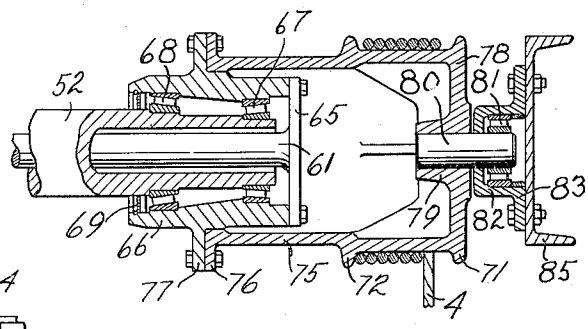



FIG. 5

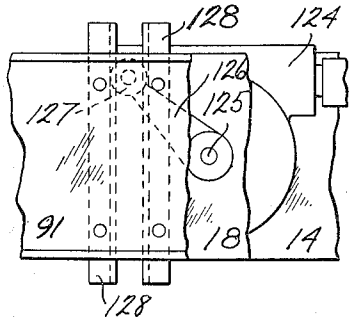



FIG. 6

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Dec. 15, 1936. B. F. FITCH 2,063,916

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Filed Dec. 10, 1934 3 Sheets-Sheet 2

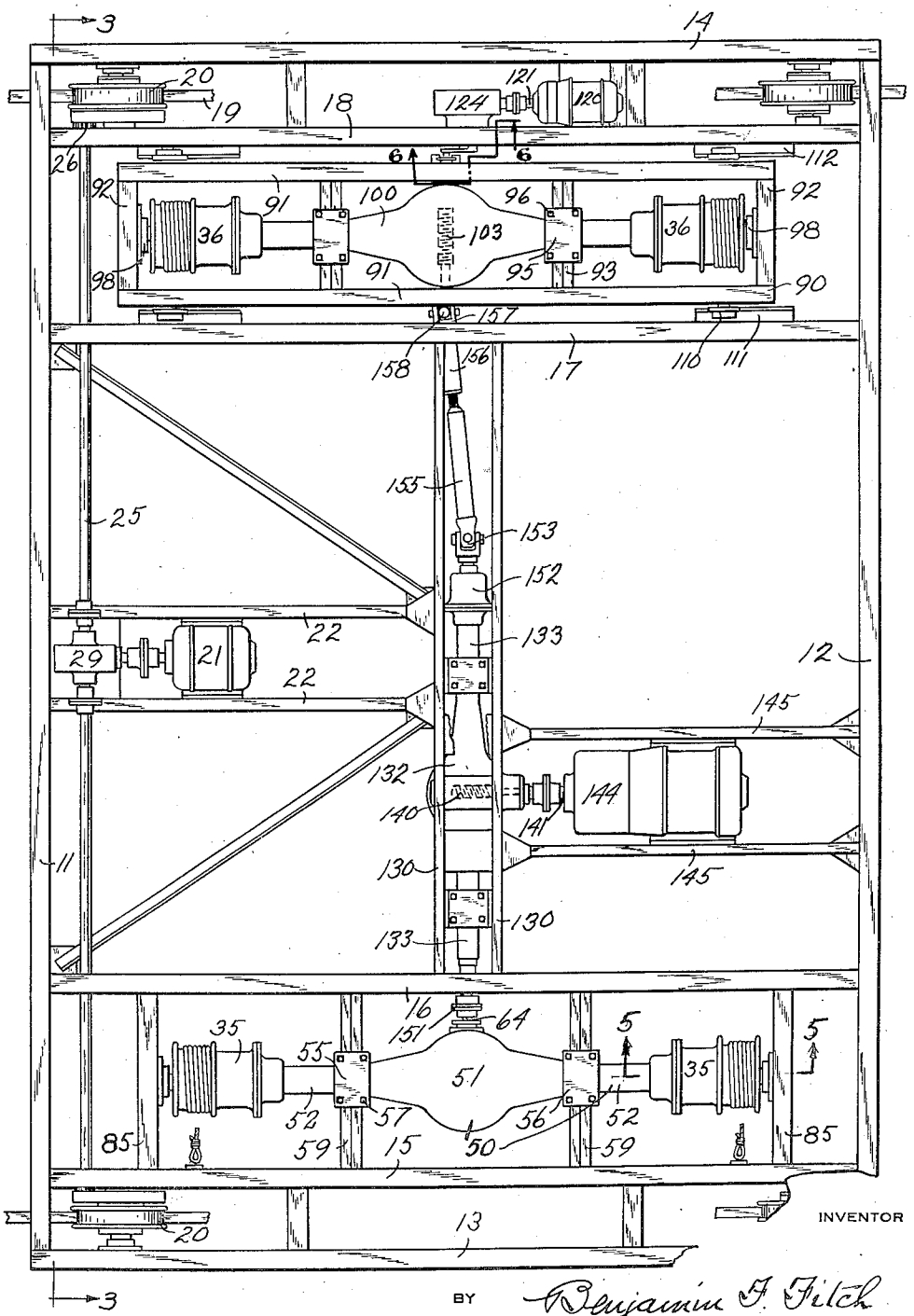



FIG. 2

Dec. 15, 1936. B. F. FITCH 2,063,916

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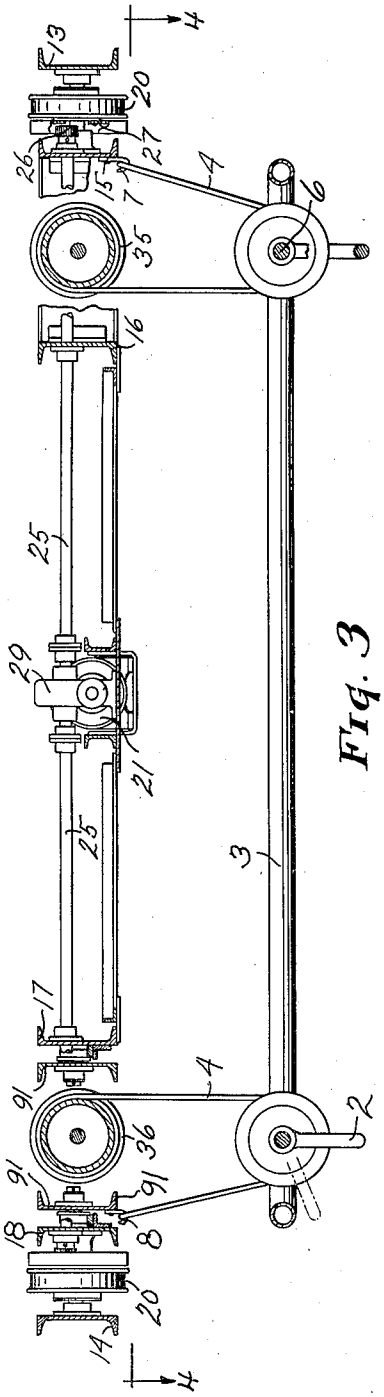


Fig. 3

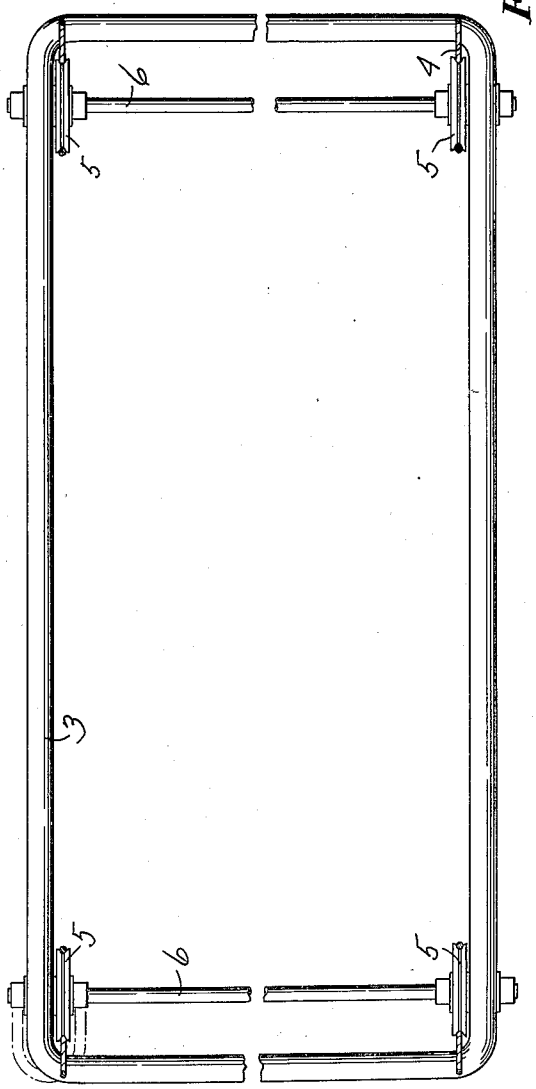


Fig. 4

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Patented Dec. 15, 1936

2,063,916

# UNITED STATES PATENT OFFICE

2,063,916

## LOAD HANDLING MECHANISM

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Application December 10, 1934, Serial No. 756,860

7 Claims. (Cl. 212—126)

This invention relates to a traveling crane adapted to lift and transport demountable automobile bodies or containers with their loads, to effect the transference between different vehicles or between a vehicle and a station platform or support. The traveling frame of the crane may be mounted to move transversely on a bridge carried by elevated supports or may be on top of a gantry, as desired. In either case I have provided four cables mounted on winding drums and adapted to depend in bights about sheaves on a cradle which may be attached to the container, the free ends of the cables being suitably supported by the crane.

The present application is a division in part and a continuation in part of my parent application Ser. No. 723,112, filed April 30th, 1934. Among the objects stated in that parent case is the provision of transmission mechanism between the raising motor and the cable drums in the form of standard driving axle construction of automobile trucks. Such mechanism is underslung from the crane frame so that it may be lowered intact for repairs whenever necessary. Such features being also shown in this case, reference is made to the parent application for claims thereon.

The crane has means for shifting two of the load supporting cables laterally as a unit with reference to the other two, so that the cradle may be skewed slightly in one direction or the other to enable it to register with a truck which does not stand in exact parallelism with the crane. The crane mechanism for accomplishing the skewing operation is shown and claimed in a companion application Serial No. 756,858 of even date herewith which is also a continuation in part of said case Serial No. 723,112, and reference is made to it for claims on such feature.

The present invention is concerned with the load engaging cradle and the support thereof by the lifting cables. This support is effected in a manner which increases the lifting power. It also enables the ready skewing of the cradle by the crane mechanism, and does away with any troublesome longitudinal swinging of the cradle.

The details of my invention will become apparent from the description about to be given of a preferred embodiment thereof, illustrated in the drawings hereof.

In the drawings, Fig. 1 is an end elevation of my cradle supported by depending cables from an overhead crane and shown in the act of suspending a demountable body above a truck frame; Fig. 2 is a plan of the crane proper; Fig. 3 is a vertical longitudinal section through the crane and cradle in a plane indicated by the line 3—3 on Fig. 2; Fig. 4 is a plan of the cradle; Fig. 5 is a detail in vertical section of one of the four cable winding drums as illustrated, for instance, by the line 5—5 on Fig. 2; Fig. 6 is a fragmentary elevation of a portion of the weaving mechanism of the crane, the location being indicated by the line 6—6 on Fig. 2.

In Fig. 1, A indicates a suitable vehicle which may be a highway truck or railway car; B indicates a demountable body adapted to be positioned on the vehicle. This body has at its eaves upstanding hooks *b*, which are adapted to be engaged by shackles **2**, depending from a shackle frame **3**, supported by four cables indicated by **4**, depending from raising mechanism of the crane frame **10**. This frame **10** has supporting wheels **20** riding on suitable supporting rails **19**, which may be on top of a gantry or on a crane bridge or otherwise mounted. I will first describe the crane itself as shown particularly in Figs. 2, 5 and 6, and then take up the cradle and its support with which the present invention is more immediately concerned.

As shown in Fig. 2, the rectangular frame work of the crane comprises two side members **11**, **12**, and two end members **13**, **14**, and four intermediate members **15**, **16**, **17** and **18**, parallel with the end members. Between each end member and the adjacent cross member are the wheels **20**, one substantially in each corner of the rectangle forming the frame work.

Two of the wheels **20**, one on each track **19**, furnish the driving means for the frame across the bridge. A motor **21**, supported by frame bars **22**, drives a worm **23** meshing with a worm wheel in a casing **29** on a long shaft **25**, extending across the bridge. At each end of the shaft **25**, which is journalled in the frame **10**, are pinions **26**. These pinions engage internal gears **27** in the corresponding wheels **20** to drive the wheels as the motor **21** is electrically excited. The longitudinal transmission shaft **25** is preferably made of separate aligned connected sections which extend through the various frame members and are suitably supported and coupled.

Two of the raising cables **4** are mounted on winding drums **35**, which are rotated, but do not shift axially, while the other two cables **4** are mounted on similar drums **36**, which to effect the weaving of this invention, as hereinafter described, may be shifted axially.

The cable drums **35** and the housings **50** which carry them and contain their driving axles, are

mounted between the frame beams 15 and 16, and thus stand close to the supporting wheels 20. The peculiar construction of the transmission mechanism to the cable drum, which, as heretofore explained, is of standard automobile construction and suspension by the frame members, and which is claimed in my parent application, is here indicated in Fig. 2. In that figure 50 indicates a hollow housing which has an enlarged central portion of approximately spherical form 51, and lateral extending tubular portions 52. These tubular portions are mounted between a pair of clamping plates 55 and 56 and held by vertical bolts 57 passing through these clamping plates and through another plate not shown, which rests on top of short frame beams 59, extending between the frame beams 15 and 16 and rigidly connected to them.

Within the center portion of the housing 51 is a suitable worm wheel (not shown) rigidly connected with the two aligned driving axles 61 (Fig. 5), which are connected at their ends, as hereinafter described, to the cable drums 35. The driving mechanism, hereinafter described, operates a worm driving shaft 64 extending within the housing below a worm wheel, with which it meshes. The worm and worm wheel are not shown. On the outer end of each axle 61 is a head 65, which is bolted to a sleeve 66, surrounding the housing 52 and journalled thereon by means of interposed roller bearings 67 and 68, the bearing space being closed by a grease washer 69 after the manner of the standard mounting and connection of the hub of an automobile driving wheel.

The cable drum 35 is a hollow member having on its exterior an annular region bounded by circular ribs 71 and 72 for the reception of various turns of the cable. Beyond this cable region the drum extends as a sleeve 75 terminating in an outward flange 76. This flange is bolted to an annular flange 77, formed on the exterior of the hub sleeve 66. At its other end the cable drum has an end wall 78, with a central hub 79, in which is rigidly mounted a stub shaft 80. This shaft extends into a roller bearing 81, mounted in a cage 82 which, by means of a flange 83, is bolted to the web of a short channel beam 85, which has its ends rigidly secured to the cross beams 15 and 16 of the crane frame.

The arrangement for supporting and driving the cable drums at the weaving end of the crane which is shown near the top of Fig. 2 and near the left-hand of Fig. 3, is identical with that described, except that the housing and drums, instead of being mounted on the rigid frame, are mounted on a shiftable carriage 90, composed of a pair of main beams 91, end beams 92, and intermediate beams 93. The intermediate beams 93 correspond to the beams 59, which support the housing 50 at the other end, and carry corresponding plates 95 and bolts 96, by which the housing 100 is suspended. The winding drums 36 at this end are journalled on the housing and connected to the drive shafts, and the end supporting studs are journalled in roller bearings in the cage 93, secured to the end beams 92 in the manner heretofore described.

The carriage 90, in which the drums 36 and their driving mechanism within the housing 100 are mounted, is provided with four laterally projecting studs on which are supporting wheels 110, which track on rails 111 and 112, rigidly supported on the frame beams 17 and 18. To shift the cradle one way or the other, as desired, I provide a motor 120, the armature shaft 121 of which is connected by a suitable coupling with a worm, meshing with a worm wheel (not shown) journalled in a housing 124 secured to the frame beam 18. The worm wheel is on a shaft 125, which carries a crank 126 (Fig. 6) having a roller 127 on its crank pin, which lies between a pair of vertical gibs 128 secured to the side member 91 of the carriage.

It results from the construction described that when the motor 120 is energized the moving crank pin travels in the space between the gibs 128 after the manner of a Scotch yoke and thus shifts the carriage 90 in one direction or the other. I prefer to make the motor 120 of the reversing type and actuate it in one direction or the other according to the direction of shift desired for the carriage.

The worm 103, which drives the worm wheel at the weaving end is in the same horizontal plane as the worm at the fixed end. Both these worms are driven simultaneously by a common motor. However, the connection to the carriage worm employs an extensible universal shaft to enable the drive to be effected for any position of the carriage. Beneath the region between the beams 130 of the crane frame is suitably suspended a housing 132, having a central chamber and extending sleeves 133 similar to that heretofore described but preferably of smaller construction. Within the housing 132 is a driving worm 140 connected by a suitable coupling with the armature shaft 141 of a motor 144, supported by frame beams 145 leading from the adjacent beam 130 to the side beam 12.

Within the housing 132 is a worm wheel (not shown) meshing with the worm 140 and rigid with two aligned axles, one of which extends out of the housing and is suitably coupled as at 151 to the worm shaft 64. The axle at the other end extends within a suitably supported bearing member 152 and terminates in one member of a gimbal joint 153 connecting it to a universal shaft 155. This shaft is tubular and slidably receives a splined extension 156 of a shaft 157, which is connected by a gimbal joint 158 with the worm 103. Accordingly, when the motor 144 is energized the rotation is simultaneously transmitted to all four of the cable drums, operating them to the same extent to wind the cables in or out, and thus raise or lower the body while maintaining it level. This action is entirely independent of the weaving, which may take place during the raising or lowering of the load.

The four cables 4 support my floating cradle 3 indicated in Fig. 1 and shown more fully in Figs. 3 and 4. This cradle, as already stated, has depending loops or shackles 2, which may engage the lift hooks b on the demountable body. The cradle frame is an open rectangular structure and may, if desired, be made of pipes welded together at the corners of the frame.

As shown more particularly in Figs. 3 and 4, the cradle 3 has sheaves 5 which may be journalled on the same bolts 6 which carry the shackles. I have shown the bolts as through-rods extending from one side of the cradle frame to the other. On each rod immediately adjacent the inner side of the frame part is the sheave 5. The shackle is a U-shaped member having its cross portion below the sheave and its arms extending upwardly, one on the inner side of the sheave and the other at a sufficient distance to pass onto the outer side of the frame bar. These

arms have eyes in their frames embracing the rod 6.

Each cable depends vertically from the drum about the innermost edge of the sheave 5 and lies beneath it for about half its circumference, and then, instead of extending vertically, extends somewhat diagonally away from the line connecting the drum and sheave axes, as shown in Fig. 3. At its upper end each of the diagonal reaches of the cables 4 at the end of the crane carrying the fixed drums is attached to a hook 7, secured to the cross frame beam 15, while the corresponding reaches of the cables 4 from the drums on the carriage are attached to hooks 8 secured to the carriage beam 91. It will be seen that by reason of this diagonal course of the anchored reaches of the cables, both of them outwardly from the cradle, the cradle is automatically centered and the longitudinal swaying thereof materially reduced.

It will be understood from the description given that I have provided a body engaging cradle which is of comparatively light structure and still able to properly position the shackles with reference to the hooks on the body, and correspondingly hold the supporting sheaves about which the cables pass. When the crane is in operation its comparatively light motor, by reason of the reduction gearing and the increase of the power due to the sheaves, may readily raise a very heavy load. The cradle may be easily skewed one way or the other by the weaving motor to present the cradle shackles accurately to a body on a truck out of parallelism with the cran. When such body is raised the tendency to swing longitudinally is greatly reduced by reason of the special cable support, and thus ceases to be troublesome.

I claim:

1. In a crane having a frame, a rigid carriage mounted thereon within the limits of its rigid portions, two cable drums, one on the frame and one on the carriage, and cables wound on said drums and depending in bites, the combination therewith of a cradle having sheaves occupying said bites, the free end of one of the cables being attached one to the crane frame and the free end of the other being attached to the carriage.

2. In a hoist having a frame with mutually rigid parallel ends adapted to ride on spaced tracks, two cable drums thereon in fixed location, a carriage shiftably supported on the hoist frame between said ends, two cable drums on the carriage, and means for driving all of said drums, the combination of a rectangular cradle having means for engaging the load and having four sheaves, cables wound on the respective drums and depending in bites occupied by the sheaves, the free ends of the cables from the fixed drums being anchored to the frame and those from the shiftable drums being anchored to the carriage.

3. In hoisting mechanism an overhead hoist having four cables depending from the same in parallel loops at four regions in rectangular arrangement, a substantially open cradle frame having means to detachably engage and support a demountable truck body, four sheaves on the cradle frame occupying the loops of the cables, the ends of respective pairs of cables leading diagonally upwardly from the sheaves to the hoist in relatively opposite directions and being anchored to the hoist whereby to prevent swinging of a load attached to the cradle in a plane parallel to the planes of the cable loops.

4. In hoisting mechanism of the class described, cradle comprising a generally rectangular open rigid frame comprising mutually rigid tubular members, four load engaging devices pivotally depending from the frame substantially adjacent its corners, and having respective pairs of arms, cross-bars secured to opposite tubular frame members and extending through said arms to support said devices, and means on the cradle for operative attachment thereto of cables depending from an overhead hoist.

5. In hoisting mechanism, a cradle comprising an open rectangular frame having mutually rigid parallel frame members, cross-bars parallel to two of said members, and supported at their end portions on the other two members, sheaves adapted to receive loops of cables to suspend the cradle, said sheaves being rotatably carried on the bars adjacent respective frame members which carry the ends of the bars, and pivoted load-securing members carried by the bars adjacent respective sheaves.

6. In hoisting mechanism, a cradle comprising an open, rectangular frame, composed of tubular side and end members, cross-bars parallel to two of said members and supported at their ends on the other two, said ends of the cross-bars projecting beyond said other two frame members, load-attaching shackles each having arms in embracing relation to respective frame members and pivotally supported on the bars, and means to operatively attach cables to the frame.

7. A lifting cradle comprising a rigid, open, rectangular frame composed of substantially circular tubes, two pivoted, load engaging members carried by opposite tubular members of the frame, and two cable sheaves carried by the same opposite tubular members, the pivot axes of the load engaging members and the axes of rotation of the sheaves lying in a horizontal plane coincident with the axes of said opposite tubular frame members.

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