Feb. 18, 1936. B. F. FITCH 2,030,863

LOAD LIFTING CRADLE

Filed Sept. 22, 1934 2 Sheets-Sheet 1

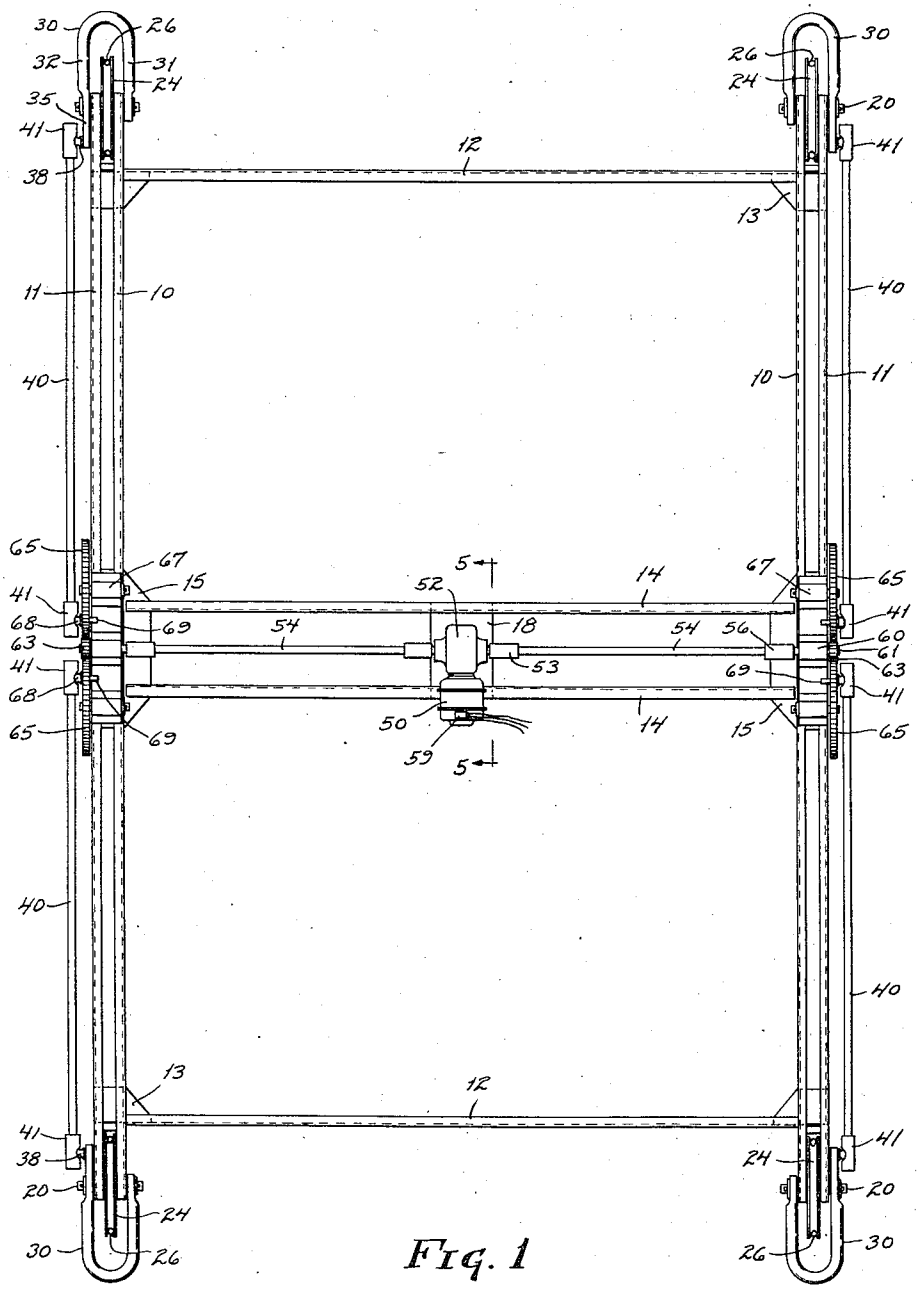


FIG. 1

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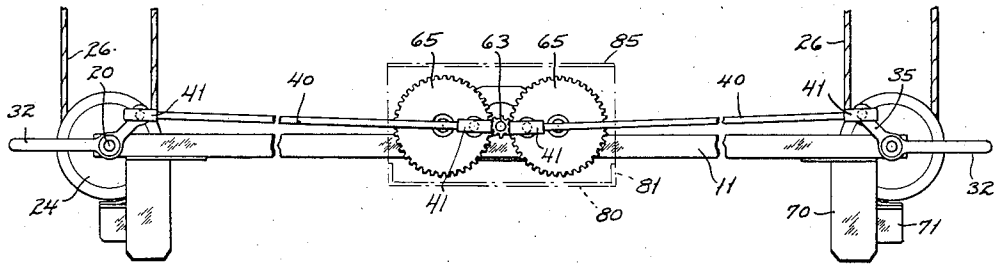


FIG. 2

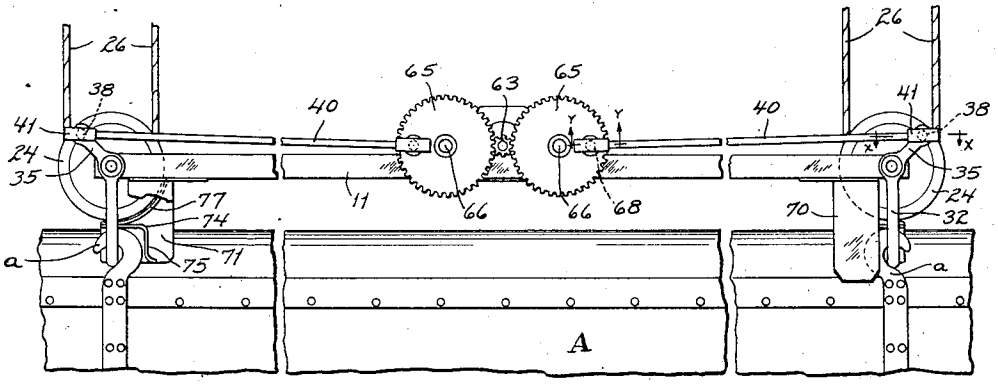


FIG. 3

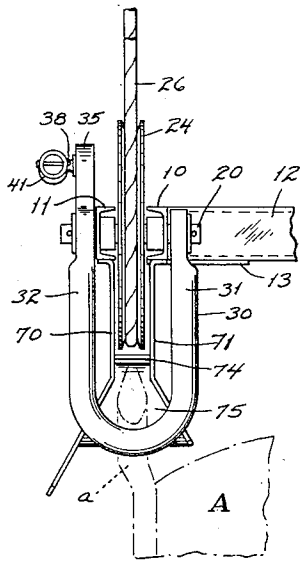


FIG. 4

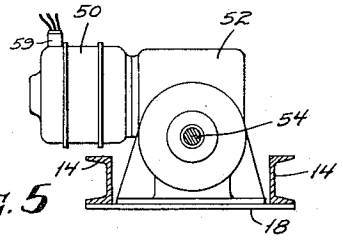


FIG. 5

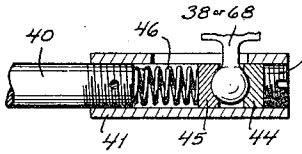


FIG. 6

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UNITED STATES PATENT OFFICE

2,030,863

LOAD LIFTING CRADLE

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Application September 22, 1934, Serial No. 745,027

9 Claims. (Cl. 294—67)

This invention relates to apparatus for connecting a lifting mechanism to a demountable automobile body, which may be loaded with bulk or package freight. This apparatus is adapted to be suspended in a horizontal position by a suitable depending raising mechanism, and has load-engaging means arranged to be connected with the body at four points, two on each side, whereby the body may be well supported for lifting while maintained in its level position.

More particularly, the invention is designed to raise demountable bodies having supporting hooks projecting slightly above their eaves, and to that end employs a cradle comprising a floating rectangular frame having shackles or loops pivoted to the frame and depending therefrom, so that they may be swung into and out of engagement with the hooks.

An object of the present invention is to provide power-operated means which may be actuated from a distance and is effective to swing the four shackles as a unit either into active position or into idle position, or both, as desired. To this end, I have provided a motor mounted on the cradle and connected through suitable reduction gearing and linkage mechanism with the various shackles. Accordingly, the operation of the motor may cause the simultaneous movement of all of the shackles. Preferably the mechanism between the motor and shackles is of such character that it may swing the shackles positively both into closing and opening position.

The invention above outlined is illustrated in the drawings hereof and is hereinafter more fully explained and the essential novel features are summarized in the claims.

In the drawings, Fig. 1 is a plan of my power-actuated cradle; Fig. 2 is a side elevation thereof, showing the shackles in disengaged position; Fig. 3 is a side elevation showing the shackles in engaged position; Fig. 4 is an end view of the cradle adjacent one corner and illustrative of the construction at each corner; Fig. 5 is a detail of the motor mounting, being a vertical cross-section as indicated by the line 5—5 on Fig. 1; Fig. 6 is a detail of the yielding connection at either end of the power transmitting links, being a substantially horizontal section on the line x—x on Fig. 3, looking down, or on the line y—y looking up.

In Fig. 3 I have shown the upper portion of a demountable body A provided with hooks a adjacent its eaves by which it may be engaged to the cradle. Accordingly, the hoist mechanism supporting the cradle may thus be coupled to the body and raise it from a truck or railway car and transfer it to another vehicle or support, as may be desired.

The cradle comprises an open rectangular frame adapted to be suspended horizontally from a suitable crane or hoist mechanism and provided adjacent its corners with U-shaped shackles adapted to engage the body hooks. As shown, the cradle frame is made up of two parallel side bars 10 and 11 on each side, end bars 12 connected by gussets 13 to both side bars at each side, and intermediate brace bars 14 connected by gussets 15 to both side bars at each side.

The two members of each side are preferably inwardly facing channel beams. Mounted in the webs of these beams adjacent their ends are horizontal pins 20. On these pins are journalled sheaves 24, which extend between the two bars 10 and 11. These sheaves are adapted to receive the loops of depending cables 26, which extend downwardly from suitable crane mechanism (not shown) and support the cradle.

Pivotally mounted on the cradle pins 20 are U-shaped shackles 30, the pin preferably passing through the two arms, 31, 32, of the shackle and being retained in place, for instance, by cotter pins passing through openings in the pins 20.

The outer arm 32 of each shackle 30 extends beyond the pivot, preferably at an angle of about forty-five degrees (45°) to the lower portion, as shown at 35 in Figs. 2 and 3. These arms are provided with suitable crank pins 38, which may be ball-shaped at their outer ends. Each crank pin is pivotally connected to a link 40, preferably by a fitting 41 on the link having a partial spherical recess to receive the ball end of the pin. Means about to be described operate the four links simultaneously to swing the four shackles into engaging or disengaging position.

Adjacent the center of the cradle is a platform 18, carried by the cross braces 14. On this platform is mounted a reversible motor 50 and worm reduction gearing in a casing 52. The driven member of this gearing carries a pair of aligned transversely extending couplings 53. Mounted in these couplings are transverse shafts 54, the outer portions of which are provided with couplings 56. Journalled in a suitable bracket 60 on the longitudinal side bars 10 and 11 is a shaft 61, connected at its inner end to the coupling 56 and carrying at its outer end a pinion 63. The pinion 63 meshes on opposite sides with a pair of gears 65 on shafts 66 which are journalled in bearings 67 carried by the frame bars 10 and 11. Each of the gears 65 has an outwardly extending crank pin

68 preferably having a ball end and occupying a socket member on the corresponding link 40.

It results from the construction described that when the motor 50 is operated the two gears are rotated in the same direction. These gears are installed in mesh with the pinion while the crank pins 68 stand in the same position with reference to the pinion. Accordingly, as the motor is operated, the rotating pinion acting simultaneously on the two gears causes the crank pins 68 to separate or approach each other at the same speed, whereby the four shackles are swung simultaneously and equally.

Fig. 2 shows the position of the shackle operating mechanism when the crank pins 68 are closest to the pinion 63, and this is the position which holds the shackles substantially horizontal, as indicated in this figure. When the cradle with the shackles so held is lowered, the shackles are entirely free from the hooks of the body and the cradle may descend until it rests on the hooks, after which the operation of the motor 50 will swing the shackles into the engaging position shown in Fig. 3.

To center the cradle with reference to the body, as well as to stop the lowering movement of the cradle, I provide depending abutments carried by the side bars which coact with the hooks. As shown, these abutments comprise a pair of plates 70, 71 which extend vertically and then bend, one outwardly and the other inwardly, as indicated in Fig. 4. Between these bent plates, above the flare thereof, is a cross plate 74 (Fig. 3) which has a horizontal portion adapted to engage the top of the hook and a downwardly extending portion 75 adapted to engage the back of the hook. This downwardly extending portion, at its lower end, is curved or diverted away from the hook, as shown.

When the cradle is lowered, the flaring side plates 70 and 71, by engaging the inner or outer face of the hook, serve to guide the cradle laterally, while the downward leg 75 of the interior plate engaging the top and the back of the hook guides the cradle longitudinally, so that it comes to rest with the shackle-shaft 20 directly over the hook. Now, if the motor is operated, the two gears 65 are rotated so that their crank pins travel away from the location of the pinion 63, and thus the links 40 shove outwardly on the upper arms of the shackles and swing the shackles downwardly into substantially vertical position, which causes them to pass into the mouths of the hooks, as shown in Fig. 3. This corresponds to the outermost position of the two crank pins and results in the cradle being coupled to the body, so that the cables may raise it.

It will be seen that the links 40 would actuate the shackles in substantially the same manner whether the gear crank pins 68 travelled through the upper half of a circle or the lower half. It is desirable, however, that means be provided whereby the motor will rotate the crank pins only half a revolution at a time, and a very simple way to effect this is to extend the crank pins 68 through the gears 65 (as at 69, Fig. 1), so that they may abut the upper surface of the side beam 11 or a flat portion of the bearing bracket 67 at the extreme throw of the crank.

When either limit of movement above described is reached, one or the other of two limit switches may open the motor circuit; or, if desired, a self-closing overload circuit breaker may be employed which will open the circuit to the motor whenever extra load is thrown upon it, as by the stop pin 69 engaging the frame, the circuit breaker being of the type which leaves the circuit ready as soon as it is closed in a reverse direction by the reversing switch. Such limit switches are illustrated, for instance, in my copending application 615,906, filed June 7th, 1932, while such a self-closing circuit breaker (indicated herein at 59 in Fig. 1) may be made in accordance with my Patent 1,766,620, issued June 24, 1930. In either case suitable operation of the controlling switch causes the simultaneous swinging of the shackles from either position of rest for approximately ninety degrees to effect the engagement or disengagement, as desired.

The bent-up arms 35 of the shackles, extending at about forty-five degrees (45°) as shown, enables each link 40 to operate through a very effective angle without at any time coming onto a dead center. To prevent jamming of the mechanism in case any shackle reaches the end of its possible movement before other shackles have reached a corresponding position, I provide yielding connections between the operating gears 65 and the shackles. This is very readily effected by making the sockets in the links which engage the corresponding pins at one or both ends in the form of blocks held by compression springs within sleeves on the link rods. This is illustrated in Fig. 6, where the shackle-crank-pin 38 and the gear-crank-pin 68 each stand between a movable bearing block 45 resting against a compression spring 46 and a fixed bearing block 44 seated against a threaded plug 48 in the end of the sleeve 41. This also enables accurate initial positioning of the shackles or readjustment for uneven engagement with the body hooks.

To maintain the gears oiled, I may provide a pan 80 beneath these gears, which is carried by the outer side bar 11, extends horizontally outwardly and has an upstanding flange 81, as indicated in broken lines in Fig. 2. This provides an oil sump into which the two gears 65 extend, so that the teeth are constantly oiled. A suitable sheet-metal cover 85 may extend over the gears and be carried by the pan and the side bar 11, such cover having open ends for the free passage of the links 40.

Within the space between the side plates 70 and 71, of the abutment guides, I may mount, above the guide plate 74, a curved shield 77 (Fig. 3) which coacts with the sheave 24 to assure the retention of the cable within that portion of the groove of the sheave.

It will be seen that my cradle provides for the positive simultaneous operation of the shackles in either direction by electric remote control. The support of the cradle passes directly from the cables through the sheaves to the pins, which carry the shackles, and accordingly the side bars of the cradle are relieved from carrying the load and the bending moment thereon is reduced. The same cross bars, which brace the rectangular cradle, support the motor and transverse shafts, and the rigid anchorage of these cross bars to the side bars provides a firm foundation for the gearing between the transverse shafts and the links. The ball and socket connection of the links with the crank pins at the opposite ends prevent any binding even if there should be some warping of the cradle in use.

An advantage of the present cradle is its ease of operation from any convenient point. It is merely necessary to have an electric cable depend to some push button control, such cable, for instance, running from an ordinary reel which

can be attached to the cradle or, if desired, to a bridge member of a gantry supporting the cradle. The crane operator can accordingly stand in the roadway in convenient position, for instance, between a truck and car or immediately adjacent the truck cab where he can cooperate with the truck driver to synchronize the truck and crane movements.

I claim:

1. The combination of a suspensible frame, four shackles pivotally carried thereby in positions corresponding to the four corners of a quadrilateral, four cranks carried by the frame, two on each side, four links connecting the respective cranks with the corresponding shackles, a gear associated with each crank, a pair of driving pinions each standing between and meshing with the two gears on that side of the frame, and motor mechanism for operating the two pinions.

2. The combination of a suspensible frame, four U-shaped shackles pivoted thereto, two gears mounted on parallel axes on one side of the frame, two corresponding gears on the other side of the frame, each gear having a crank pin, four links connecting the crank pins of the respective gears with crank pins on the corresponding shackles, a pinion between the two gears on each side of the frame, a motor, and transverse shaft mechanism connecting the motor with the two pinions.

3. The combination of a horizontal frame having side members and end members, four U-shaped shackles pivoted to the frame adjacent the corners, a pair of cross-bars bracing the frame intermediately, a motor carried by the cross bars, transverse shaft mechanism, geared with the motor and carrying pinions adjacent the two side members of the frame, a pair of gears at each side of the frame, said gears being separated from each other and both meshing with the pinion at that side, each gear having a crank pin, and links connecting the four crank pins thus provided with the four shackles.

4. A horizontal suspensible frame having side members and end members, each side member comprising two bars spaced apart, transverse pins through the two side bars, sheaves between the side bars mounted on the pins, U-shaped shackles also mounted on the pins, bearings carried by the side bars, a pair of gears at each side of the cradle rotatably carried by said bearings, each of said gears having a crank pin, four links connecting the respective crank pins with the respective shackles, and motor-driven gearing connected with the gears mentioned.

5. The combination of a horizontal floating frame comprising parallel side members and end members, each side member consisting of two structural beams spaced apart, gussets connecting the end members with the two side members and assisting in spacing the side members, horizontal pins through the side members, sheaves between the side members mounted on the pins, shackles also mounted on the pins, each shackle comprising a U-shaped member having one arm extending upwardly above the pivot, transverse braces between the inner beams of the two sides, a motor and reduction gearing mounted on the transverse braces, transverse shafts leading from the reduction gearing to the two sides, bearings for said shafts carried by the side members, pinions on the two shafts, a pair of gears suitably journalled in bearings on the side members on opposite sides of the pinion at that side and meshing with such pinion, crank pins on the gears, and links connecting the crank pins with the upper arms of the shackles.

6. The combination of a horizontal frame having side members and end members, each side member comprising a pair of inwardly facing channel beams spaced apart, four pins extending through the webs of the channel beams at the four corners of a quadrilateral, four U-shaped shackles mounted on said pins and having arms on the outer sides of the adjacent channel beams, sheaves on said pins between the channel beams, a pair of cross-bars bracing the frame intermediately, a motor and reduction gearing carried by the cross bars, transverse shaft mechanism operated by the reduction gearing and carrying pinions adjacent the two side members of the frame, a pair of gears at each side of the frame, said gears being separated from each other and both meshing with the pinion at that side, each gear having a crank pin, links connecting the four crank pins thus provided with the four shackles, and means for limiting the rotation of the gears to 180° or less.

7. The combination of a horizontal suspensible frame, four shackles pivoted to the frame in positions corresponding to the four corners of a rectangle, transverse shaft mechanism carried by the frame having pinions at the opposite ends, a pair of gears connected with each pinion, crank pins on the gears, links connecting the crank pins with the shackles, and means for limiting the rotation of the gears to 180° or less.

8. The combination of a suspensible frame, four shackles pivoted to the frame at points corresponding to the four corners of a quadrilateral, a pair of gears spaced apart and mounted on parallel axes on one side of the frame, a pair of gears spaced apart and mounted on parallel axes on the other side of the frame, driving pinions on the two sides of the frame between the gears and meshing with both of them, a crank pin on each gear, each shackle having an arm extending from the pivot of the shackle at an angle to the body thereof, and four links respectively connecting an arm of one of said shackles with a crank pin of one of said gears, the crank-throw of the gear being so proportioned to the shackle arm that substantially half a rotation of the gear causes the shackle to swing through substantially a right angle.

9. The combination of a horizontal rectangular suspensible frame, four shackles pivotally carried thereby, a rotary motor mounted intermediately in the frame, reduction gearing operated by the motor, transverse shaft mechanism operated by the gearing, a pair of cranks carried on each side of the frame and geared with said shaft mechanism, and links yieldingly connecting the respective cranks with the respective shackles.

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