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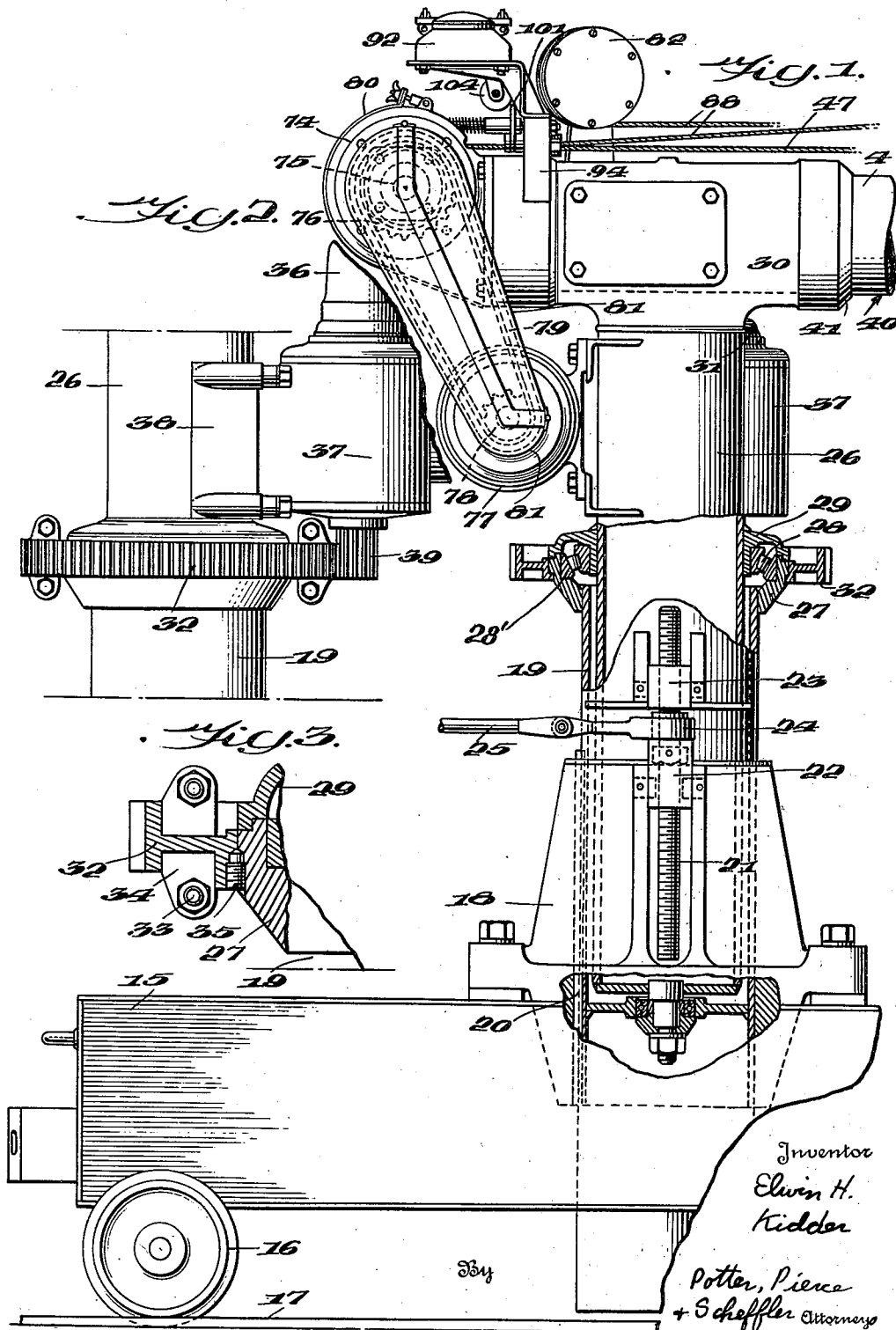
E. H. KIDDER

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CAR LOADING AND UNLOADING APPARATUS

Filed July 27, 1940

6 Sheets-Sheet 1



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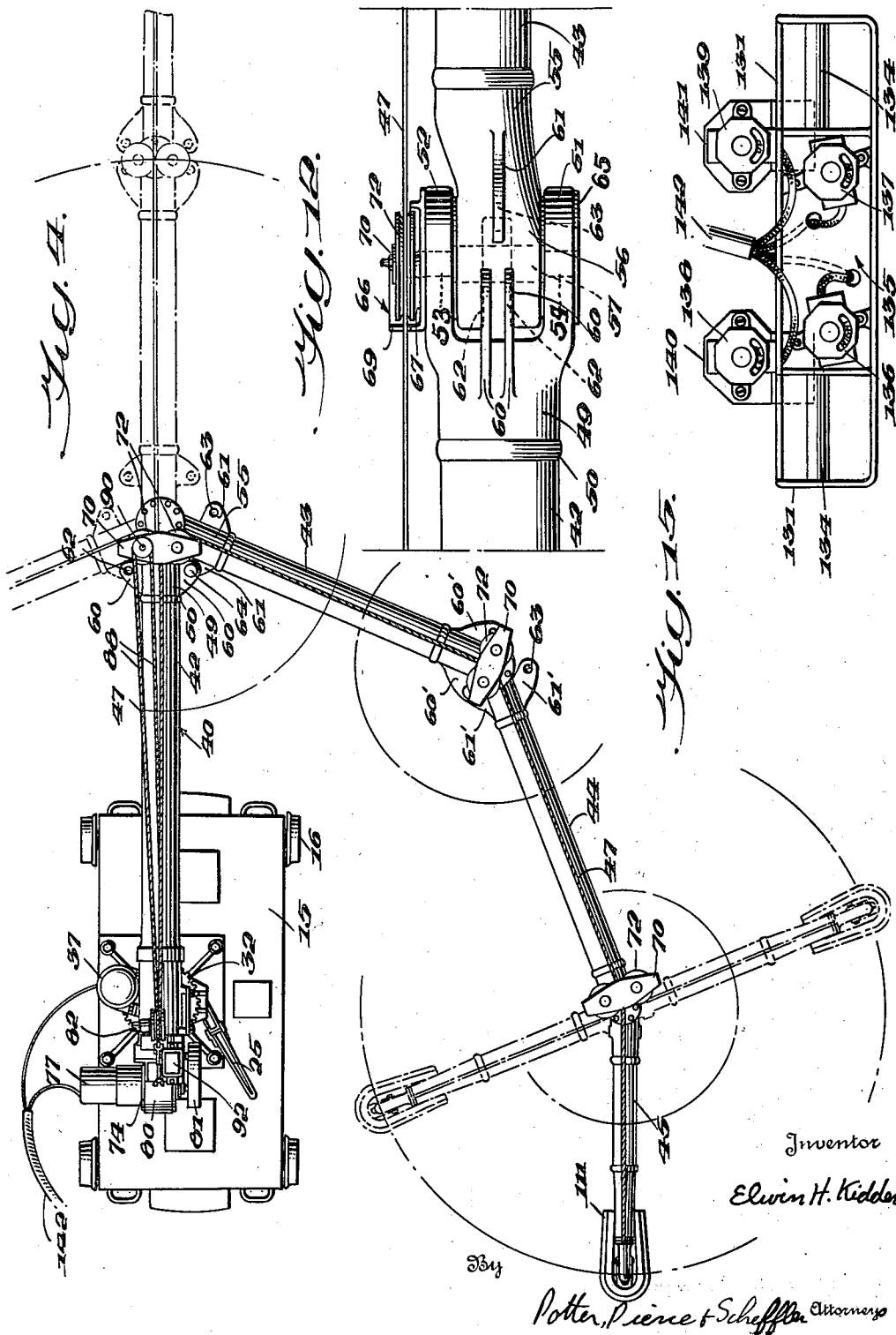
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CAR LOADING AND UNLOADING APPARATUS

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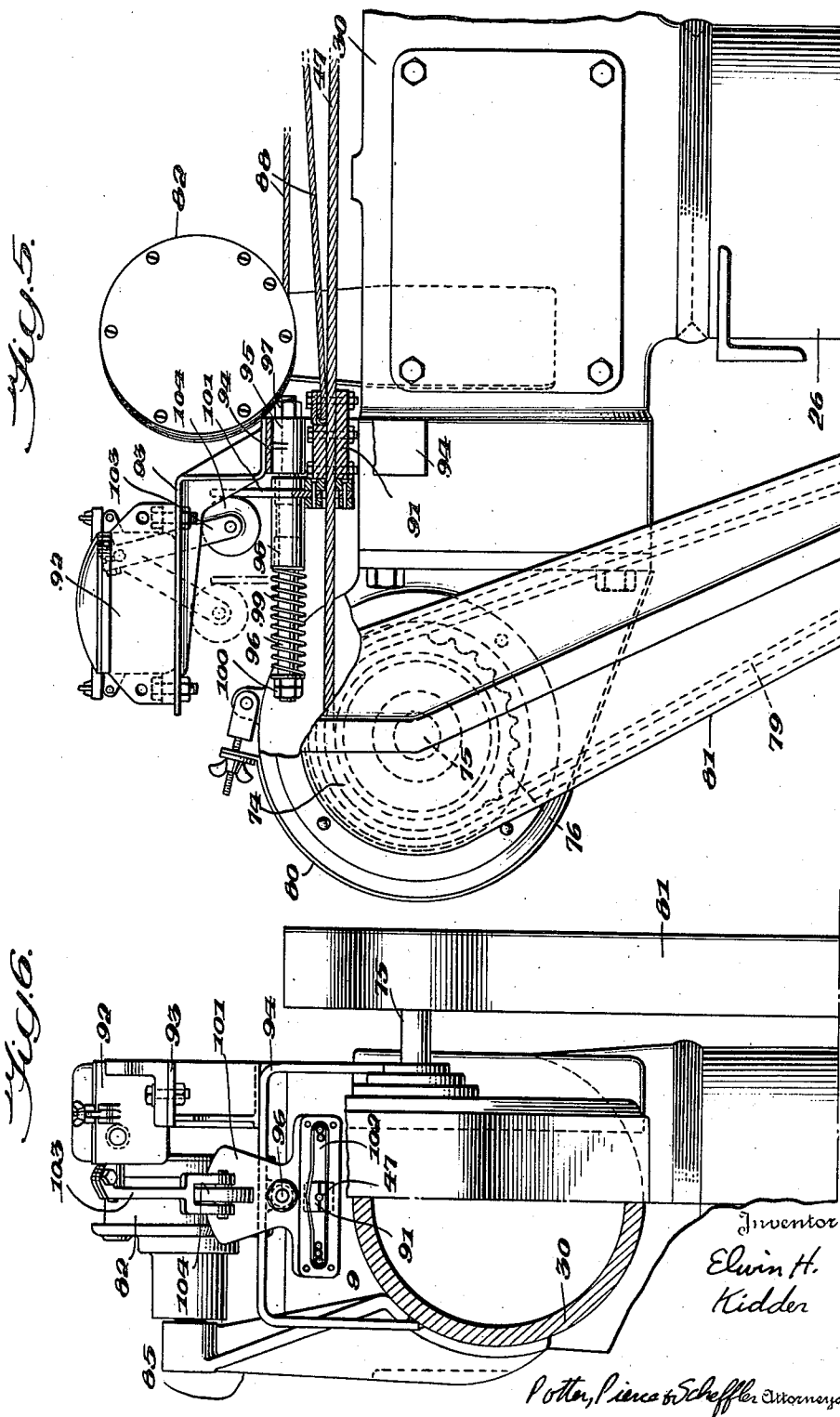
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CAR LOADING AND UNLOADING APPARATUS

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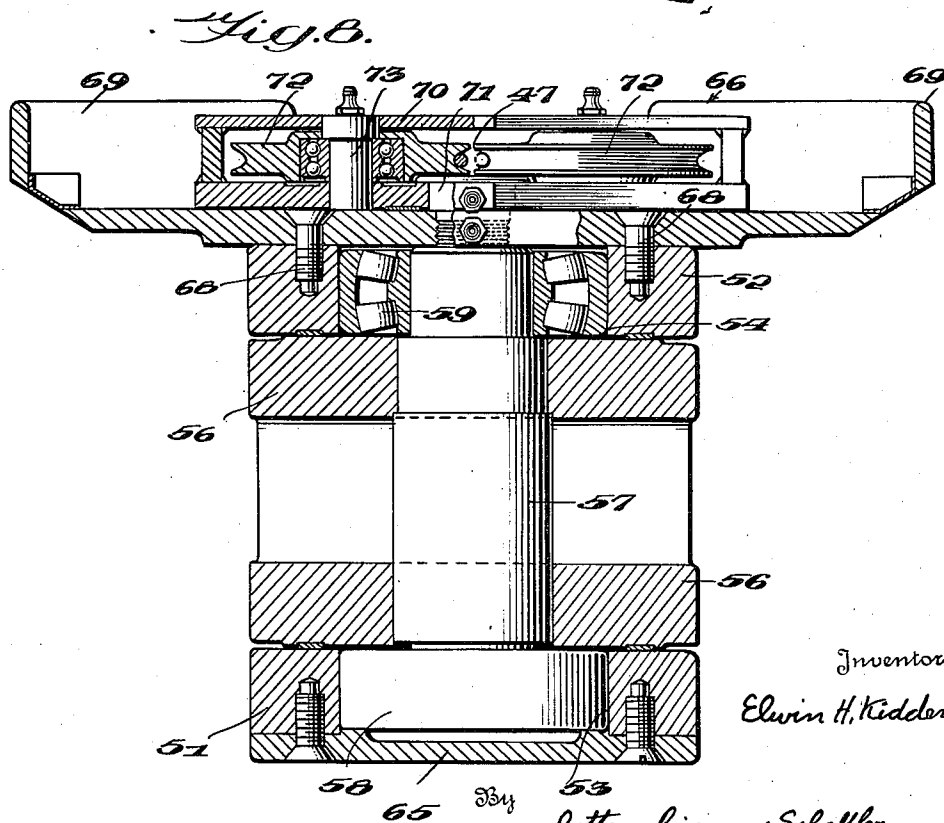
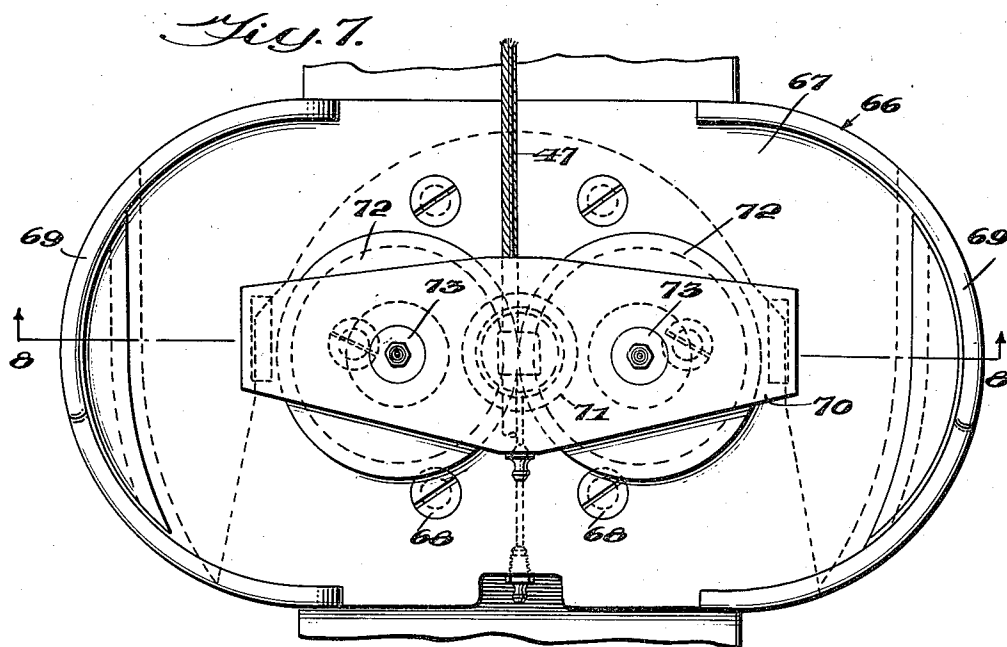
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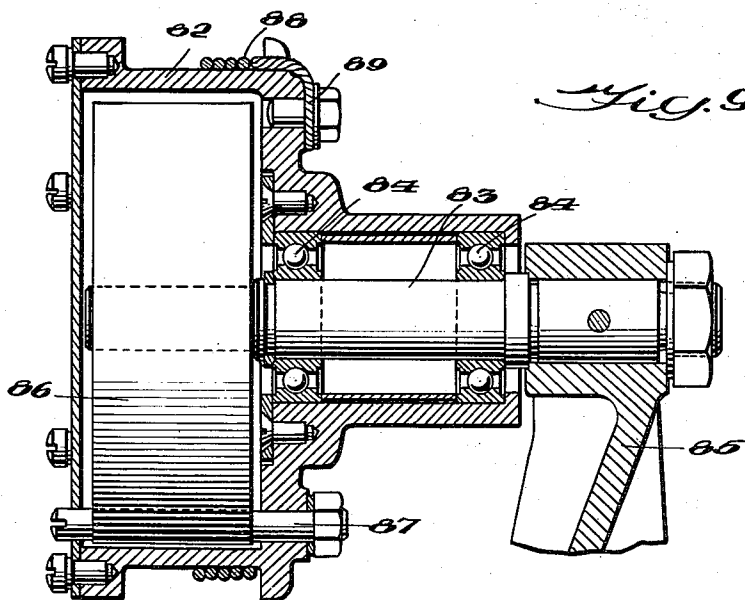


Fig. 9.

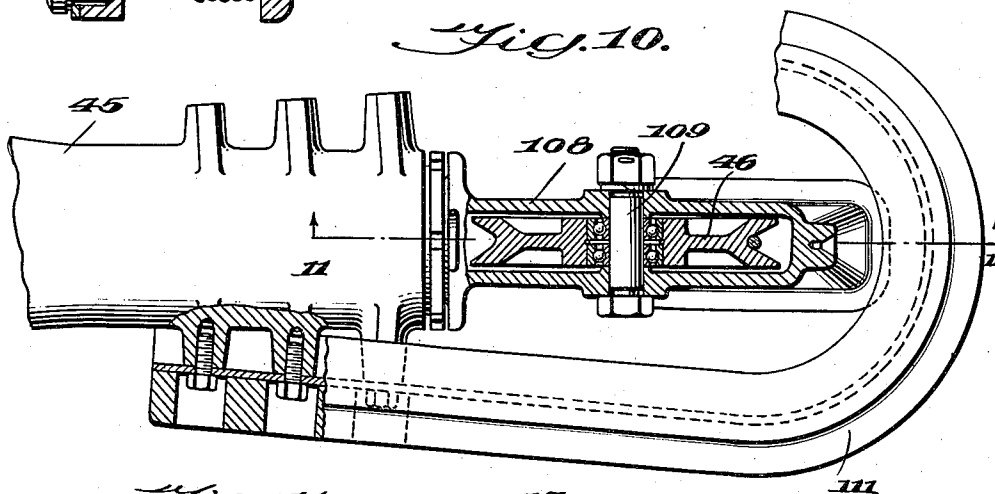


Fig. 10.

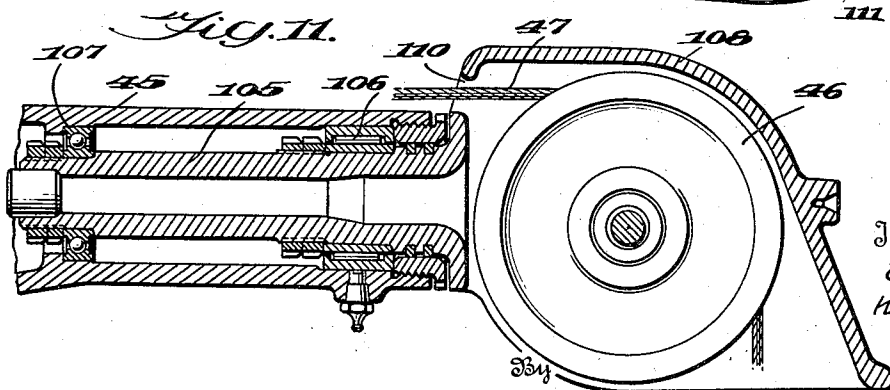


Fig. 11.

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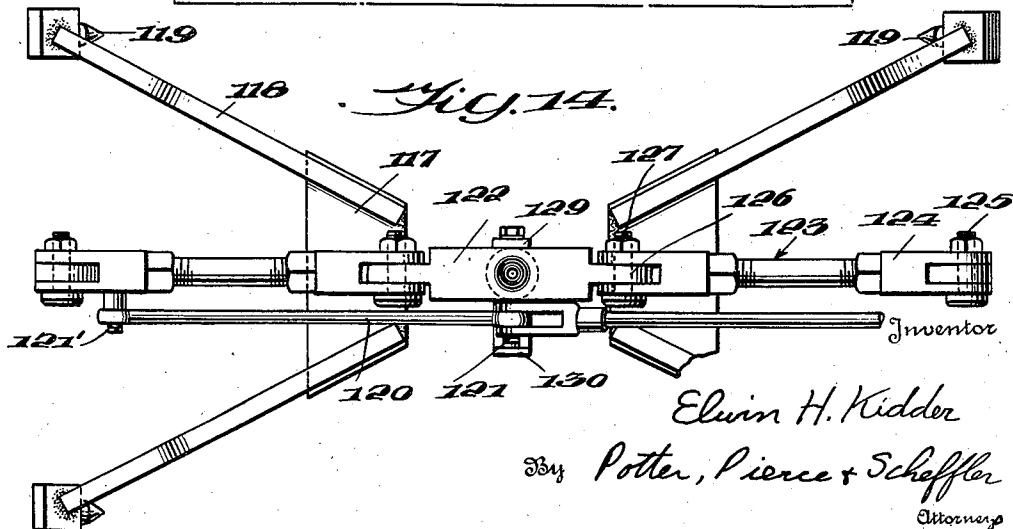
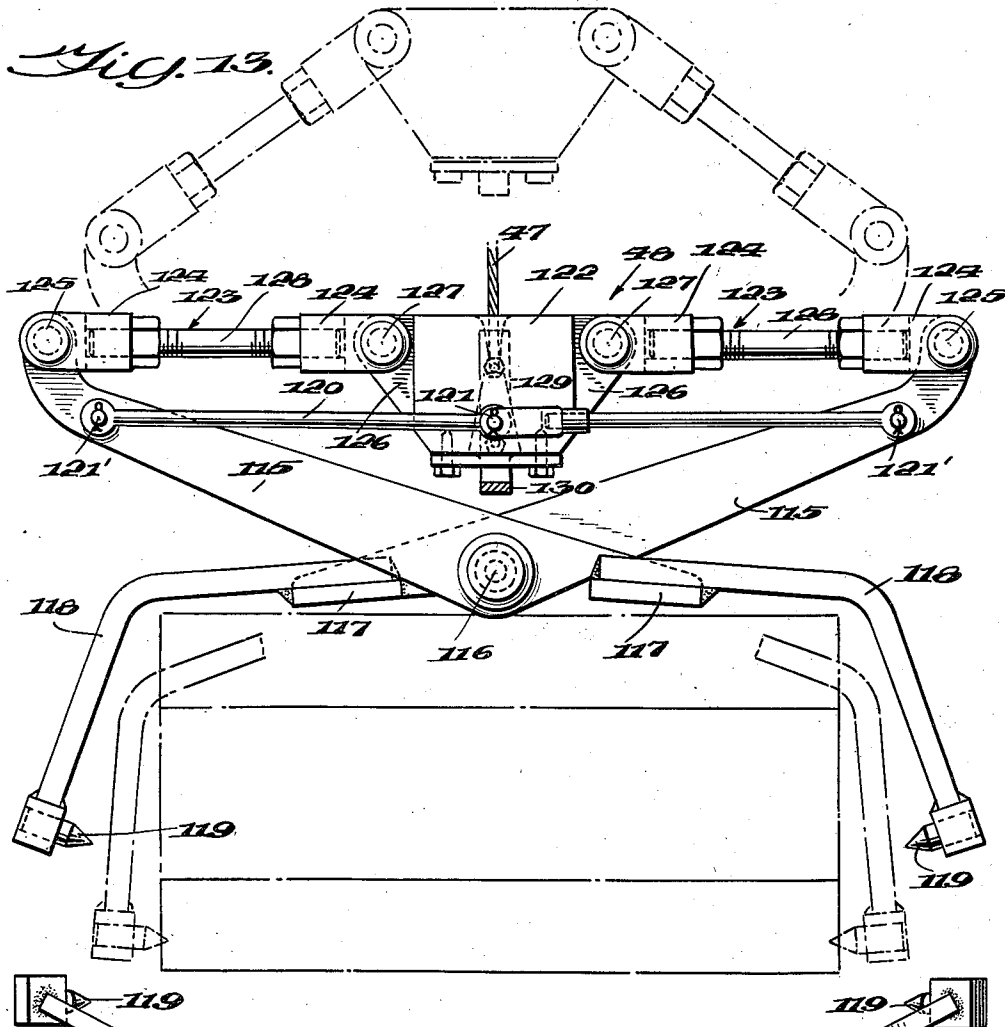
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UNITED STATES PATENT OFFICE

2,272,949

CAR LOADING AND UNLOADING APPARATUS

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Application July 27, 1940, Serial No. 347,953

9 Claims. (Cl. 212—42.5)

This invention relates to mechanism for loading and unloading railway cars.

An object of the invention is to provide mechanism particularly adapted to transfer railway switch ties, lumber or other material from a loading tram into a box car and stack the same at any point in either end of the car or adapted to remove ties or other articles from a car and place the same on supporting and transporting means such as a loading tram or the like adjacent the car.

Another object of the invention is to provide a compact and efficient mechanism of the character described which may be mounted on a track alongside a railroad siding and be readily moved from one car to another on the siding.

A further object is to provide a portable jib crane mechanism including a horizontally disposed sectional boom member arranged to have the sections thereof locked in angular relation to each other so as to swing in one continuous motion through the side door of a freight car in one direction into one end of the car and also capable of having the sections quickly reversed so as to swing in the opposite direction through the door into the other end of the car.

A further object is to provide an improved control mechanism for the loading and unloading mechanism including motor driven means for swinging the boom into and out of the car in either direction.

A further object is to provide a jib crane mechanism for loading and unloading railway cars having a novel and improved jointed boom structure quickly adjustable to either of two operating positions and a novel and improved tie hook combined therewith.

A further object of the invention is to provide car loading and unloading apparatus including a jib crane having a horizontally disposed swinging boom of novel construction shaped to swing into and out of the car in a continuous curved path, together with a tie hook connected to a hoist cable leading from the end of said boom, power operated hoist means for said hoist cable on the crane structure, power operated means on the crane structure for swinging said boom in either direction and a control station for controlling the operation of said power operated hoist means and said power operated boom swinging means whereby a single operator may control all operations in the loading and unloading of cars with a minimum of effort and with maximum speed and efficiency.

Other objects and advantages of the invention,

not specifically enumerated, will become apparent during the course of the following detailed description with reference to the accompanying drawings which illustrate a preferred embodiment of the invention.

In the drawings:

Fig. 1 is a side elevation, partly in section, of the carriage and mast portion of a crane structure embodying the invention.

Fig. 2 is a partial side elevation from the opposite side of Fig. 1,

Fig. 3 is a sectional detail showing the mounting of the ring spur in Fig. 1,

Fig. 4 is a plan view of the complete crane structure, illustrating one of the fixed angular adjusted positions of the boom sections in full lines,

Fig. 5 is an enlarged elevation, partly in section, of the mast head and operating mechanism,

Fig. 6 is an end view from the left of Fig. 5, with parts in section,

Fig. 7 is a plan view of a hoist cable guide sheave mount,

Fig. 8 is a vertical section through one of the pivot joints of the boom arm, approximately on the line 8—8 of Fig. 7, with the boom sections disposed in a position of alignment intermediate the two angularly fixed operative positions,

Fig. 9 is an enlarged sectional view of the take-up reel of the hoist cable tensioning means,

Fig. 10 is a plan view, with parts in section, of the end of the swivel arm at the extremity of the boom,

Fig. 11 is a sectional view taken on the line 11—11 of Fig. 10,

Fig. 12 is a side elevation of one of the pivot mounts connecting the boom sections,

Fig. 13 is a side elevation of the tie hook,

Fig. 14 is a plan view thereof, and

Fig. 15 is a detail view of the face of the push button control station.

Referring more particularly to the details of construction of the apparatus, the jib crane is preferably mounted on a counterweighted truck 15 provided with flanged wheels 16 for running on a narrow gauge yard track 17 laid alongside a railway track or siding on which the freight cars to be loaded or unloaded are disposed.

An upright tubular base casting 18 which extends above and below the level of the platform of the truck is securely bolted in position thereon. A vertically adjustable tubular outer column member 19 is telescoped into the bore of the base 18, and slidably keyed thereto against

rotation by a key 20. The outer column 19 is raised or lowered with respect to the base 18 by means of a jack screw 21 and threaded trunnions 22 and 23 carried by the base 18 and column 19, respectively. The jack screw is operated by a reversible ratchet mechanism 24 provided with an operating hand lever 25 to raise and lower the column 19 and thus adjust the height of the boom, to be later described.

A rotary inner column or mast 26, telescoped into the upper end of the outer column 19 is rotatably mounted therein. The upper end of the column 19 has a cast ring 27 secured thereon which is provided with a seat for one race of a roller bearing 28 and the column 26 has ring casting 29 rigidly mounted intermediate the ends thereof which is provided with a seat for the other race of the bearing 28. The inner end of the column 26 is journalled axially of the outer column at 28'.

The rotary mast or column 26 is provided with a tubular T-head 30 disposed on a substantially horizontal axis. The tubular head is rigidly secured to the column 26 as by welding at 31, forming a rigid part thereof.

A spur gear 32 is rigidly mounted on the casting 27 at the upper end of the outer column 19. This gear, which is formed of two half-circular sections fastened together in position embracing the casting 27 by bolts 33 passing through ears 34 carried by adjacent portions of each half section, is additionally locked against rotation on the casting 27 by a set screw 35 set in a threaded hole tapped in part in the gear and in part in the casting 27, as seen in Fig. 3.

A reversible electric motor 36 equipped with a solenoid brake and a speed reduction unit 37 therefor are mounted on a bracket 38 rigidly secured on the mast 26. A pinion 39 on the output shaft of the reduction unit 37 meshes with the spur gear 32 for the purpose of rotating the mast in either direction.

The inner end of a novel boom structure 40 is rigidly mounted in the horizontally disposed tubular portion of the head 30, being securely fastened therein by a welded joint 41. The boom 40 which extends horizontally from the head 30 is made up of three main sections 42, 43 and 44 pivotally connected end to end and adapted to be locked together in fixed angular relation with respect to each other to form a rigid boom with the sections 43 and 44 disposed substantially in the position of chords of a circle of which the pivotal axis of the mast 26 is the center and of which the section 42 is the radius. Thus, when the boom is swung about the pivotal center of the mast, the extremity of the sections 42 and 44 and the joints between sections 42-43 and 43-44 describe an arc of a circle with the mast 26 as a center.

An auxiliary arm 45 pivoted on the end of the boom section 44 is disposed in the same horizontal plane with the boom and is freely swingable in said plane. This arm at its free end mounts a swiveled sheave 46 over which a hoist cable 47 passes to its point of connection to the tie hook 48 to be later described in detail.

The details of the pivotal connections between the respective boom sections and between the end boom section 44 and auxiliary arm 45 are shown more clearly in Fig. 8. A description of the connection as between sections 42 and 43 only will be given since all are substantially identical, except as to size. A casting 49 secured, as by a

welded joint 50, on the end of the arm 42 is formed with a forked end providing vertically spaced trunnions 51 and 52 provided with vertically aligned bearing apertures 53 and 54, respectively. The adjacent end of the section 43 is provided with a casting 55, also welded to its main section. The casting 55 is formed at its end with a vertically apertured boss 56 in which is mounted a vertical pivot pin 57, which extends beyond the ends of the boss and is journalled in anti-friction bearings 58 and 59 seated in the bearing recesses of trunnions 51 and 52.

Means are provided for locking the boom sections in either of the two angularly related positions of operation, depending upon which end of the car is being served. For this purpose the casting 49 is formed on each side with a pair of vertically spaced wings or ears 60 which extend in horizontal parallel planes and the casting 55 comprising the end of section 43 is formed with wings or ears 61 on each side thereof which also extend in horizontal planes and are disposed to enter between the wings 60 on the casting 49. The wings 60 are provided with apertures 62 and the wings 61 are provided with apertures 63. When the apertures 62 and 63 are in registry a locking pin 64 is passed therethrough to lock the boom sections into a rigid arm with the sections disposed as seen in Fig. 4. By simply removing the pin 64, the sections 43 and 44 may be swung on their pivots to occupy the same relative angular positions in the opposite sense, as partially shown in dotted lines in Fig. 4.

It will be noted that the shape and dimensions of the locking wings 60' and 61' for locking the sections 43 and 44 in fixed relation are different from those of wings 60 and 61, this being necessary to effect correct angular relationship of the sections in the locked position, since the section 42 constitutes the radius of the circle of which sections 43 and 44 are chords.

A cover plate 65 for the pivot bearing is mounted on the lower trunnion 52. Except for the locking feature described above, the pivot mount between the extremity of section 44 and auxiliary arm 45 is similar in construction to the mounts between the main boom sections.

A sheave housing 66 mounted on the upper trunnion 52 of each of the castings 49 includes a base plate 67 secured on the trunnion by set screws 68 and upstanding guard flanges 69 at each side of the base plate. A sheave yoke 70 pivoted on vertical pivot bearing 71, set in the plate 68 substantially centrally thereof, mounts a pair of guide sheaves 72 journalled side by side on pins 73 carried by the yoke, which sheaves serve to guide the hoist cable 47 around the angles of the boom arm in its path from the swivel sheave 46 to a hoist drum 74 mounted on the mast head 30, on which the cable winds.

The hoist drum 74 is keyed on a shaft 75 on the end of which a sprocket gear 75 is also keyed. Power for operating the hoist drum is furnished by a reversible electric motor-reduction drive unit 77 which through sprocket gear 78 and roller chain 79 drives the sprocket gear 76 to rotate the hoist drum in either direction. A guard plate 80 is mounted around the drum and a guard 81 also encloses the chain drive mechanism.

In order to provide a positive tension at all times on the portion of the hoist cable wound on the hoist drum 74 to prevent loosening of the hoist cable on the drum when the end attached to the hook is slack, as when picking up or de-

positing a load, a spring tensioned take-up is connected to the hoist cable 47. This take-up means operates automatically and comprises a spring operated take-up drum 82 journaled on a stationary spindle 83 by ball bearings 84. The spindle 83 is mounted in an upstanding bracket 85 secured to the mast head 30. The drum 82 houses a heavy spiral spring 86, similar to a clock spring, one end of which is anchored to the drum by pin 87 and the other end of which is anchored to the end of stationary shaft 83. A cable 88 having one end anchored on the drum 82, as at 89, makes several turns around the drum and then passes forwardly around a guide sheave 90 mounted on the sheave yoke 70 at the extremity of the boom section 42. From the guide sheave 90 the cable passes back to the mast head and has the end thereof connected to a cable clamping block 91, which is fastened on the hoist cable 47, as seen in Fig. 5.

The cable clamping block 91 is fastened on the hoist cable in such a position as to be pulled to the position shown in Fig. 5 when the hoist cable is wound on the hoist drum to the point of lifting the tie grab on the outer end thereof to an elevated position just short of contact with the end of auxiliary swivel arm 45. When this position is reached, continued operation of the hoist motor to wind up more of the hoist cable and elevate the tie grab into its uppermost position in contact with the end of arm 45 causes the sheave block 91 to move to the left of the position shown in Fig. 5 and actuate a limit switch 92 to break the hoist motor circuit.

The limit switch 92 is mounted on a bracket 93 which in turn is mounted on an inverted U-shaped bracket 94, the legs of which are welded to the mast head 30. A sleeve 95 is rigidly secured on the bracket 94, spaced above and extending parallel with the axis of the mast head. A rod 96 fastened at one end in the sleeve 95 by a nut 97 threaded thereon projects therefrom in the direction of the hoist drum 74. A sleeve 98, slidable on the rod 96 is yieldingly urged toward the sleeve 95 by a coil spring 99 surrounding the rod and confined between the sleeve 98 and lock nuts 100 threaded on the outer end of the rod. The sleeve 98 carries an upstanding plate 101 which is widened at its lower end and provided with a cross slot 102 for passage of the hoist cable. The lower portion of the plate 101 is in the path of the block 91 mounted on the cable 47 and when the cable is taken up to the limit permissible, as described above, the block 91 engages the plate 101 and shifts the same along the rod 96 against the tension of the spring 99. When this occurs, the upper part of the plate swings the operating arm 103 of the limit switch 92 from the full line position to the dotted line position of Fig. 5 to break the circuit to the hoist motor and stop the same. A roller 104 is mounted on the end of the arm 103 for engagement by the plate 101.

The swivel mount for the cable sheave 46 at the end of the auxiliary arm 45 includes a stub shaft 105 journaled in the end of the arm on bearings 106 and 107 and a yoke 108 mounting a cross pin 109 on which the sheave is journaled. The yoke 108 which is in the form of a guard extending over the top of the sheave is provided with an opening 110 for passage of the hoist cable 47. A buffer yoke 111 also mounted on the end of the arm extends around the sheave mount to protect the same.

The tie hook 48 mounted on the end of hoist

cable 47 is in the form of tongs including a compound lever connection between the gripping members and the hoist cable. The tie hook comprises a pair of main crossed levers 115 pivoted together intermediate their ends at 116. Below the pivot 116 each lever is welded to a cross plate 117 to the ends of which are welded bent depending tie engaging legs 118 provided at their lower ends with gripping points 119. The legs 118 are splayed outwardly with respect to each other so as to separate the respective gripping points and provide good four point contact on the sides of the ties or other elements handled.

A two-part adjustable yoke or toggle 120, jointed in the middle by a pivot pin 121, has its ends pivoted at 121' to the ends of the upper arms of the levers 115 and serves to retain the tong levers in open position until the pivot 121 is raised to break the link.

The upper ends of the main lever arms are connected to a cable block 122 by toggle links 123. The links 123, adjustable in length, comprise threaded sleeve members 124 constituting end pieces, pivoted to the upper ends of arms 115 at 125 and to ears 126 on the cable block at 127, and a reach rod 128 threaded at its ends into the sleeves 124.

A U-shaped bracket 129, mounted on the cable block 122 with one leg 130 thereof extending beneath and up in front of the pivot 121 of the toggle yoke 120, serves to limit downward movement of the pivot 121 to a point just below the dead center position thereof. When the hoist cable is slackened to spread the tong levers to open position to release ties held therein, the toggle yoke 121 spreads to the horizontal full line position of Fig. 13 from the dotted position above. Thereafter when the hoist cable is taken up to raise block 122 and through links 123 attempts to close the tongs, pivot 121 falls below dead center where it is stopped by bracket 129. This locks the tongs in open position so that they may be raised free of the load. When the tongs are lowered over the next load of ties to be lifted, the pivot point of the toggle yoke is raised manually above dead center position so as to break upwardly to permit closing of the tongs upon lifting the cable block 122.

Fig. 15 shows in detail a portable push button control station suitable for controlling the hoist and boom turning motors and adapted to be carried by the operator. This station comprises a combined push button mount and handle in the form of an open faced box or casing 131. The casing 131 has hand grips 134 in each end thereof and in the central portion 135 between the hand grips are mounted push buttons 136 and 137. Mounted above the push buttons 136 and 137 and offset therefrom in the direction of the respective handles 134 are push buttons 138 and 139. The push buttons 138 and 139 are supported on brackets 140 and 141 fastened on the back of the casing 131.

The push buttons 136 and 137, which control the circuits of the boom arm turning motor 37, are mounted so as to be readily operable by the thumb of the left hand of an operator grasping the left-hand grip 134. The push buttons 137 and 139, which control the circuits of the hoist motor 77 are similarly positioned with respect to the right-hand grip. The control wires from the push buttons are preferably formed into a cable 142 leading to the respective motor under control of the push buttons.

In the operation of the apparatus, for instance,

in unloading ties from a box car and depositing the same on trams located adjacent the car, the truck 15 is positioned on the narrow gauge track 17, paralleling the track on which the box car is standing, a short distance from the center door of the car in the direction of the end to be first unloaded. The position of the truck is such that the arc of a circle described by the end of boom section 42, when the mast is rotated, will pass through the door well clear of the sides thereof. The boom sections are locked in the angular operative position in which the end of the boom will swing into the car through the side door when the mast is rotated in that direction. With the tie hook in open position, the operator grasps the hand grips 134 and depresses the push button 139 to operate the hoist motor to elevate the hook to its uppermost position, if not already in this position. He then depresses button 136 or 138 to operate the boom turning motor, depending upon which way the boom must swing to enter the car, and as the boom is driven around, follows the tie hook into the car, guiding the same through the door. By pulling or pushing on the tie hook, as required, the auxiliary arm is swung about its pivot to position the tie hook properly over the ties to be picked up thereby. The boom turning motor is stopped by releasing pressure on the push button controlling the same as soon as the boom has swung into the car the required distance to permit the tie hook to reach the pick-up position. The operator then depresses the push button 137 to operate the hoist motor to lower the tie hook over the ties to be unloaded, releasing the same when the hook rests on the ties. He then lifts the pivot 121 of locking toggle 120 and depresses push button 139 to operate the hoist motor to wind the hoist cable on the drum. As the cable block is elevated, drawing the upper ends of levers 115 upwardly, the operator releases toggle yoke 120, permitting the points on legs 118 to engage the outer side faces of the ties to be picked up. As the load is being lifted, or after it has been elevated sufficiently, the operator depresses the proper push button to cause the boom turning motor to swing the boom of the car to position over the tram, following which the push button 137 is depressed to lower the ties on the tram. When the ties rest on the tram the hoist motor is operated further enough to slack the hoist cable sufficiently to permit the arms 115 to fall to full open position wherein the toggle yoke will be positioned to lock the same open, when the cycle is repeated.

After all of the ties have been unloaded from one end of the car, the boom is swung clear of the same and the locking pins are removed from the ears on one side, the boom sections are swung around on their pivots to the opposite position, and the locking pins are inserted in the registering holes therefor to lock the boom sections in that position. The truck is then moved to occupy the same relative position on the opposite side of the door and the apparatus is ready to proceed with unloading the remainder of the car.

It will be noted that the operator merely has to guide the tie hook or adjust the end positions thereof by swinging the auxiliary arm, all of the work of elevating, lowering and turning of the boom being done by the respective motor under control of the operator by means of the portable control station carried by him.

While a preferred embodiment of the inven-

tion has been shown by way of illustration, it will be understood that various modifications in the details of construction and mode of operation may be resorted to without departing from the spirit of the invention, within the scope of the claims.

I claim:

1. In car loading and unloading apparatus, a vertical mast, a horizontally extending sectional boom mounted at one end on said mast for swinging movement in a horizontal plane about the axis of said mast, said boom comprising a plurality of sections pivotally connected end to end for adjustment to either of two oppositely disposed angularly related positions of operation in which the ends thereof lie substantially on the circumference of a circle of which the end mounted on said mast is the center, and means for locking said sections in fixed angular relation in either of the said two oppositely disposed angularly related positions of operation, whereby said boom may be selectively adjusted to provide a rigid horizontal arm capable of swinging into either end of a car through the center door thereof.
2. In car loading and unloading apparatus, a vertical mast, a horizontally extending sectional boom mounted on said mast for swinging movement about the axis of said mast, said boom comprising a terminal section mounted at one end on the mast and at least one outer section pivotally connected end to end with the other end of said terminal section for relative adjustment in a horizontal plane to either of two oppositely disposed angularly related positions of operation in which the pivotal connections therebetween lie substantially on the circumference of a circle with the axis of said mast as a center, and means for selectively locking said boom sections in either of said angularly related positions of operation, whereby said boom may be selectively adjusted to provide a rigid horizontal arm capable of swinging into either end of a car through the center door thereof.
3. In car loading and unloading apparatus, a crane including a vertical mast, a horizontally extending sectional boom mounted on said mast for swinging movement about the axis thereof, said boom comprising a plurality of pivotally connected rigid sections disposed end to end in the same horizontal plane and adjustable with respect to each other to either of two oppositely disposed angularly related positions of operation in which positions the pivotal connection between the respective sections lie substantially on the circumference of a circle of which the axis of the mast is the center, means for locking said sections in fixed angular relation when disposed in either of said positions of operation, a hoist mechanism mounted on said mast including a hoist cable, and guide means for said cable carried on said boom at the points of pivotal connection between the respective sections thereof, whereby said cable follows the line of said boom in all positions of adjustment thereof.
4. In car loading and unloading apparatus, a crane including a vertical mast, a horizontally extending sectional boom mounted on said mast for swinging movement about the axis thereof, said boom comprising a plurality of pivotally connected rigid sections disposed end to end in the same horizontal plane and adjustable with respect to each other to either of two oppositely disposed angularly related positions of operation in which positions the pivotal connections be-

tween the respective sections lie substantially on the circumference of a circle of which the axis of the mast is a center, means for locking said sections in fixed angular relation in either of said positions of operation, a hoist drum mounted on said mast, driving means for said hoist drum, a hoist cable wound at one end on said drum and extending along the length of said boom to and depending at its other end therefrom, guide means comprising twin sheaves mounted on said boom at the points of pivotal connection between the respective sections thereof, whereby said cable is caused to follow the line of said boom in all positions of adjustment thereof, and motor operated driving means for swinging said boom horizontally about the axis of said mast in either direction.

5. Apparatus according to claim 2 in which said locking means comprises apertured laterally extending rigid ears carried by said sections adjacent the respective ends thereof, said ears being dimensioned so that when the sections are swung in the same direction about their pivots until the apertures in the ears of adjacent ends are in vertical alignment, said sections will be positioned in one of the angularly related positions of operation, and a locking pin inserted through the apertures when so aligned to lock the ears together.

6. In loading apparatus of the character described, a mast, a boom structure secured to said mast, a hoist drum mounted on said mast, a motor for driving said drum a hoist cable wound at one end on said drum and extending from said drum to the end of said boom and depending therefrom, a resilient take-up device mounted on said mast, a flexible connection from said take-up device to said hoist cable for tensioning said cable in a direction to maintain tight winding of the latter on said drum at all times.

7. In loading apparatus of the character described, a mast, a boom structure secured to said mast, a hoist drum mounted on said mast, an electric motor for driving said hoist drum, a hoist cable wound at one end on said drum and extend-

ing therefrom along the length of said boom and having its other end depending therefrom for the connection of a load thereto, means for tensioning said cable on said drum comprising a spring operated take-up reel, a flexible cable wound thereon, a guide sheave on said boom remote from said drum, said flexible cable extending from said take-up reel around said guide sheave, a clamping block secured on said hoist cable in position to approach said drum when the hoist cable is wound thereon sufficiently to raise a load carried on the end thereof to an upper desired limit, the end of said flexible cable extending around said guide sheave being fastened to said block, a limit switch in the circuit of said electric motor, and means engaged by said block on said hoist cable for operating said limit switch to break the motor circuit when the hoist cable is wound on said drum sufficiently to raise a load on said cable to said upper desired limit.

8. In car loading and unloading apparatus, the combination with a crane including a vertical mast, a horizontally disposed boom mounted on said mast for swinging movement about the axis thereof, said boom being formed to swing into and out of a car door in a curved path with said mast as a center, a power operated hoist means mounted on said crane including a hoist cable extending from the end of said boom and a tie hook attached to the end of said hoist cable, of power operated means on the crane for swinging said boom in either direction about the axis of said mast, and a portable control station including control means for controlling the operation of said power operated means for swinging said boom and said power operated hoist means.

9. Car loading and unloading apparatus according to claim 8 in which the power for operating said hoist means and said boom swinging means is furnished by reversible electric motors and in which said portable control station comprises circuit control elements for said electric motors.

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