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2,053,080

TRANSFER DOLLY AND JACK

Original Filed Aug. 22, 1927

2 Sheets-Sheet 1

Fig. 1.

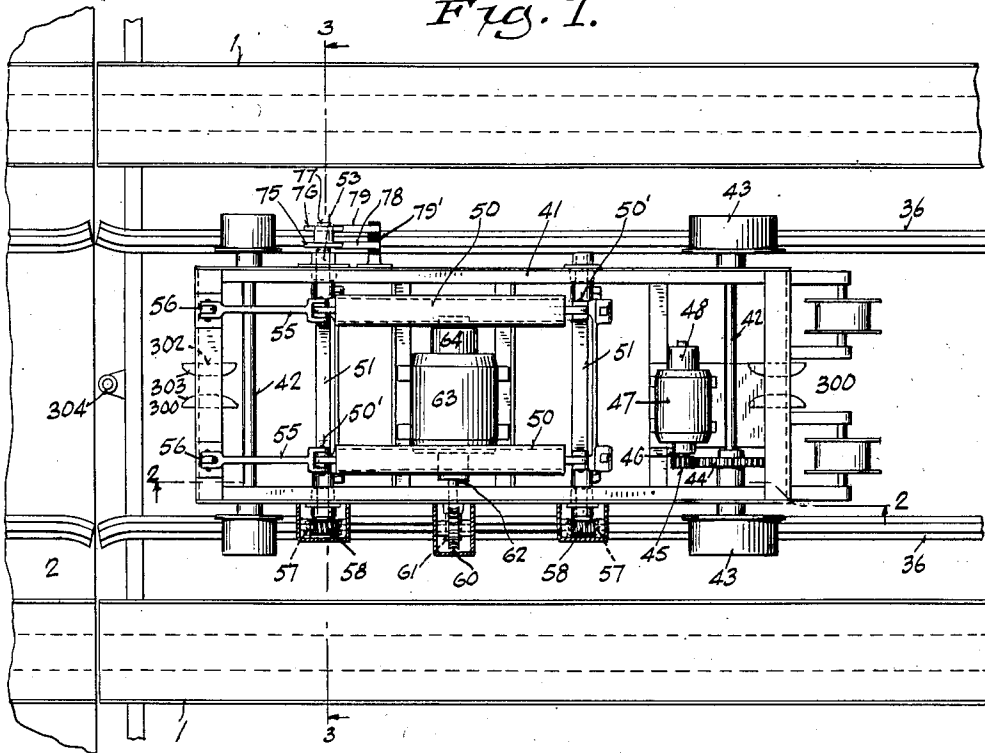


Fig. 2.

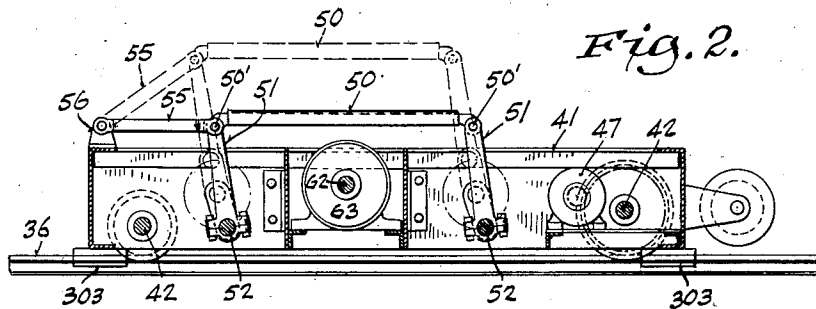
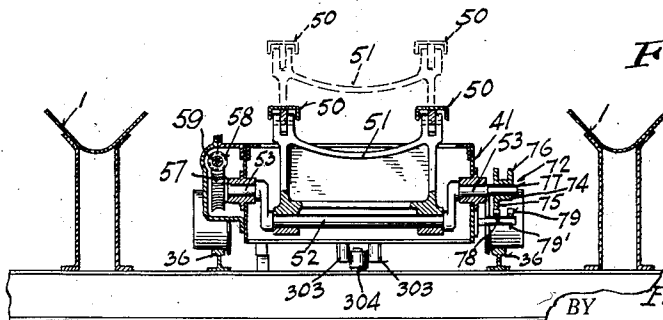


Fig. 3.



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2 Sheets-Sheet 2

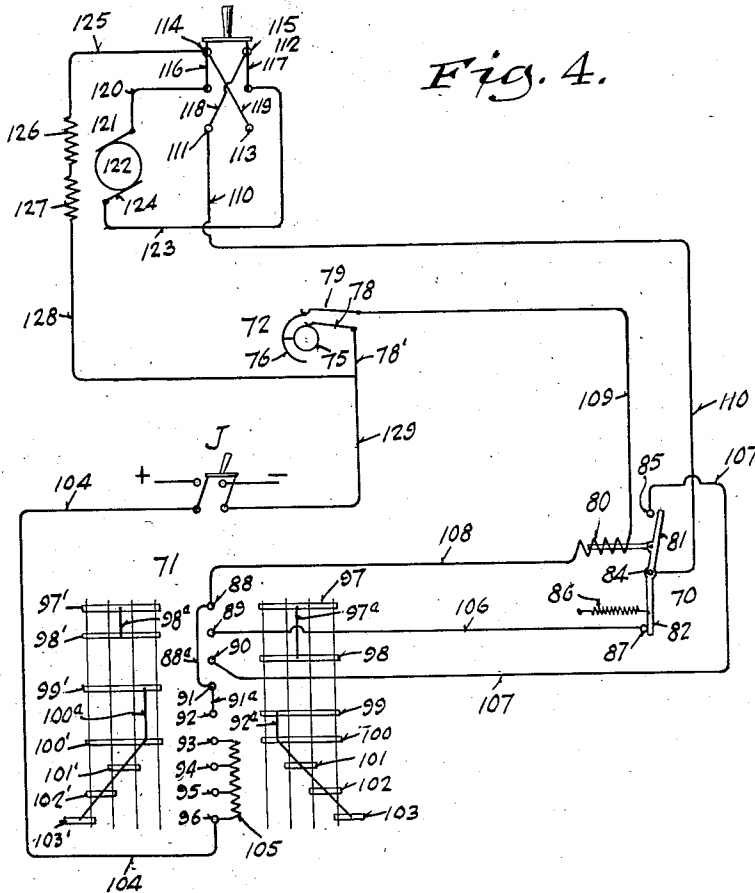
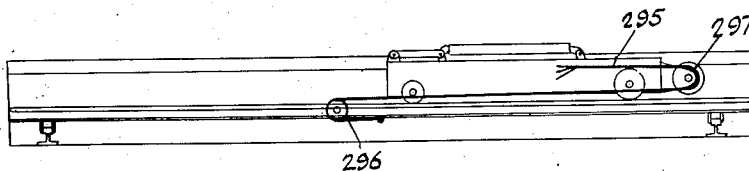


Fig. 5.



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UNITED STATES PATENT OFFICE

2,053,080

TRANSFER DOLLY AND JACK

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Original application August 22, 1927, Serial No. 214,617. Divided and this application August 20, 1928, Serial No. 300,930

5 Claims. (Cl. 254—2)

This invention relates to a transfer carriage or dolly and jack adapted for advantageous use in the handling and transporting of various articles and materials. Thus, while the present embodiment of the invention is especially designed for use in apparatus adapted for handling and storing or parking automobiles it is also adapted for the handling of lumber as well as for other diverse purposes. The present application is a division of the copending application of Arthur G. Henricks for Apparatus for handling and storing, filed August 22, 1927, Serial No. 214,617.

One of the principal objects of the present invention resides in the provision of a dolly and jack of this character in which the dolly or carriage is positively driven by means of a self-contained electric motor drive and in which the jack is positively raised and lowered in any position of the dolly or carriage.

Another object of the present invention resides in the provision of a novel form of jack or hoist alternately raised and lowered upon continued rotation of the electric motor driving the same without the aid of a complicated system of reversing switches, reversing limit switches, or the like. In other words, the electric motor for driving the hoist or jack normally runs in the same direction, although, of course, it may be reversed under abnormal or emergency conditions, but with the motor running in the same direction the jack is alternately raised and lowered. This prevents damage to the jack or hoist in the event the motor should continue to run after the completion of a raising or lowering movement inasmuch as sustained running of the motor will only result in alternate raising or lowering of the jack or hoist.

Another object of the present invention is to provide a novel controlling means for the jack whereby the jack is automatically stopped at the end of a raising or lowering movement.

Another important object is to provide a device of this character and having these advantages and capacities and which is of simple and durable construction, reliable and effective in operation and easy and comparatively inexpensive to manufacture.

In carrying out the present invention a motor driven frame or carriage is provided. On the frame a number of lifting elements are supported for up and down movement. Preferably, the lifting elements are in the form of a pair of bars pivotally connected to the upper ends of link members or frames, the lower ends of which are pivotally connected to crank shafts journaled

on the frame of the carriage. Means is provided for constraining the lift bars to up and down movement when the crank shafts are rotated and this means may consist of tie bars pivotally connected to the frame and to certain of the link members. The crank shafts are rotated from an electric motor through a suitable gearing.

The control system for the jack includes a controller having two "on" positions and a limit switch actuated by one of the crank shafts. When the controller is turned to the "on" position for actuating the jack motor to elevate the lift bars the motor continues to run until the jack bars are fully elevated, whereupon the limit switch breaks the motor circuit. To lower the lift bars the controller must be turned to its other "on" position which causes the motor to run in the same direction to effect lowering of the lift bars. A controller is also provided for the motor which drives the running gear of the carriage. The controllers may be located at some point off of the carriage, or if desired, they may be placed on the carriage.

Other objects and advantages reside in certain novel features of the construction, arrangement and combination of parts which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawings, forming a part of this specification, and in which:

Figure 1 is a fragmentary plan view showing a transfer carriage or dolly and jack embodying the present invention and associated with apparatus for handling and storing vehicles;

Figure 2 is a view in longitudinal section taken on line 2—2 of Figure 1;

Figure 3 is a view in transverse section taken on line 3—3 of Figure 1;

Figure 4 is a diagrammatic view of the electric controls for the motor circuit of the jack motor; and

Figure 5 is a diagrammatic view in side elevation showing one way in which the electric current may be conducted to the transfer carriage.

In the present embodiment of the invention the transfer carriage or dolly and jack is especially designed and adapted for use with apparatus for handling and storing automobiles. Such apparatus includes a transfer platform or traveling bridge adapted to be aligned with stalls or compartments. This apparatus for handling and storing automobiles forms no part of the present invention and is fully shown, described and claimed in the copending application of Arthur G. Henricks for Apparatus for handling and stor-

ing, filed August 22, 1927, Serial No. 214,617. And reference is made to this copending application for a full disclosure of this handling and storing apparatus.

- 5 As indicated, the present invention relates entirely to the transfer carriage or dolly and jack, one of which is provided on each transfer platform or traveling bridge.

10 Each transfer carriage or dolly consists of a suitable frame 41 having axles 42 on which flanged wheels 43 are mounted, the wheels 43 running on the rails 36. For driving the carriage back and forth one of the axles 42 has a gear wheel 44 fixed thereto, the gear wheel 44 meshing with the 15 pinion 45 fixed to one end of the armature shaft 46 of an electric motor 47 (see Figure 1) suitably supported on the frame 41 of the carriage. The other end of the armature shaft 46 has an electromagnetic brake 48 associated therewith and this electromagnetic brake 48 is of conventional 20 construction, it being designed to be automatically released by an electromagnet when the motor 47 is running and yet being automatically set by a spring when the electric motor 47 is stopped.

25 Each carriage has a jack or hoist arrangement associated therewith and made up of a pair of lift bars 50 which may be constructed of metal and covered with leather or other suitable cushioning material and which are pivotally mounted as at 50' on the upper ends of link frames 51, the 30 lower ends of the link frames 51 being pivotally mounted on crank shafts 52 having trunnions 53 journaled in bearings provided therefor in the side members of the frame 41 (see Figures 2 and 3). Tie bars or tie links 55 are pivotally connected to the bars 50 and to the adjacent link frame 51 at the pivotal connections 50' of these parts, the tie bars also being pivotally mounted as at 56 on the adjacent end of the frame 41. 40 These tie bars constrain the lift bars to up and down movement in a vertical plane.

For the purpose of rotating the crank shafts 52 to raise and lower the lift bars 50, one trunnion 53 of each crank shaft 52 has a worm wheel 57 45 fixed thereto, the worm wheels 57 meshing with worms 58 fixed on a worm shaft 59. The worm shaft 59 also has a worm wheel 60 fixed thereon and meshing with a worm 61 fixed on one end of an armature shaft 62 of an electric motor 63 supported on frame 41 as shown in Figure 2. The 50 opposite end of the armature shaft 62 of the motor 63 is equipped with an electromagnetic brake 64 similar to the electromagnetic brake 48. With this arrangement the motor 63 may be of 55 simple type of electric motor (such as a series wound direct current motor) which, under normal conditions, constantly turns in the same direction and yet effects alternate raising and lowering of the lift bars.

60 An important advantage of the jack construction resides in the fact that the motor, during the lifting operation, may and does acquire considerable torque before it is subjected to the load, since during the first phases of the movement of 65 the crank shafts the vertical component of their motion is slight and consequently their lift is slight. Moreover, the lift bars do not engage the automobile or other load until moved upwardly slightly. These lift bars 50 are designed to engage 70 under the front axle of an automobile when they are elevated and by virtue of such engagement to lift the front end of the automobile to an extent sufficient to interconnect it with the carriage and provide for its control by the carriage. 75 In other words, the weight of the automobile is

taken partly by the bars 50 and partly by the rear wheels of the automobile, the front wheels being lifted up above the runways.

The jack itself possesses inherent features of safety in that even though the motor or other 5 actuating means therefor run uncontrolled or over a longer period than intended, the jack cannot and will not become stuck or jammed or otherwise injured but would merely raise and lower slowly and smoothly. And the jack is not 10 capable of injuring its associated parts or the articles with which it coacts even though the jack be improperly operated.

The armature of the electric motor 63, under normal conditions, turns in the same direction to 15 effect alternate raising and lowering of the lift bars 50. This motion of the armature shaft 62 is initiated under the manual control of the operator, but the armature shaft is stopped automatically at the end of a raising or lowering 20 movement. In order to provide for this operation of the jack the motor circuit of the electric motor 63 has a contactor designated generally at 70, a controller designated generally at 71, and a limit switch designated generally at 72 organized there- 25 with, as shown in Figure 4.

As shown in Figures 1, 3, and 4, the limit switch 72 preferably comprises a mutilated slip ring assembly made up of a hub 74, a full ring 75 and 30 a mutilated or half ring 76, the hub 74 being mounted on and secured to an extension of one of the trunnions 53 of one of the crank shafts 52 but being electrically insulated from its trunnion 53 by means of an insulating sleeve 77. The hub 74 and rings 75 and 76 are of conductive mate- 35 rial. Spring fingers 78 and 79 are carried by a bracket 79' mounted on the frame of the carriage and bearing against the rings 75 and 76, respectively (see Figures 1 and 3).

The contactor 70 includes a contactor coil 80 40 and arms 81 and 82 rigidly connected to each other and pivoted as at 84. The coil 80 when energized draws the arm 81 to it and causes the arm 81 to engage a contact 85. When the coil 80 is de-energized a spring 86 pulls the arm 82 into 45 engagement with a contact 87 and simultaneously disengages the arm 81 from the contact 85.

The controller 71 has two "on" positions in either of which the motor 63 is, under normal conditions, rotated in the same direction. As 50 shown, the controller has contacts 88, 89, 90, 91, 92, 93, 94, 95, and 96, and two sets of segments designated at 97, 98, 99, 100, 101, 102, 103, and 97', 98', 99', 100', 101', 102', and 103', respectively, one set of segments being engaged with 55 the contacts in one "on" position of the controller and the other set of segments being engaged with the contacts in the other "on" position of the controller.

A wire 104 which connects with the positive 60 pole of a knife switch J leads to the contact 96 of the controller, this contact 96 being electrically connected with one end of the controller resistance 105. Wires 106 and 107 are electrically connected with the contacts 89 and 90, respectively, the wire 106 leading to the contact 87 of the contactor 70, while the wire 107 leads 65 to the contact 85 thereof. One terminal of the contactor coil 80 is connected by a wire 108 with the contact 88 of the controller and the other 70 terminal of this coil 80 connects by a wire 109 with the spring finger 79 of the limit switch 72. The arms 81 and 82 of the contactor 70 are connected by a wire 110 to one contact 111 of a reversing switch designated generally at 112. This 75

reversing switch 112 has a companion contact 113 for the contact 111 and also has a set of contacts 114 and 115 and switch arms 116 and 117 designed to engage the contacts 114 and 115 or the contacts 111 and 113. A cross wire 113 connects the contacts 111 and 115 and a similar wire 119 connects the contacts 113 and 114. The arm 116 is connected by a wire 120 with a brush 121 of the armature 122 of the electric motor 63 and the arm 117 is similarly connected by a wire 123 with a brush 124. The contact 114 connects by a wire 125 with the field 126. A coil 127 of the electromagnetic brake 64 is connected in series with the field 126 and connects by a wire 128 with a common return wire 129 which leads back to the negative pole of the knife switch J which connects with the source of current. The contact finger 73 of the limit switch 72 also connects through a wire 78' with the common return wire 129.

With the limit switch 72 positioned as shown in Figure 4, and the controller 71 turned to the "on" position in which the segments 97, 98, 99, and 100 engage their respective contacts 88, 89, 92, and 93, current flows from the source through the wire 104 to the contact 95 and thence through the resistance 105 to the contact 93 of the controller. From the contact 93, the current passes over to the segment 100 and then flows through wire 92^a, connecting segments 100 with segment 99, through segment 99, contact 92, wire 91^a connecting contacts 92 and 91, contact 91, wire 93^a connecting contacts 91 and 88, wire 103 to the coil 80 of the contactor 70, through the coil to the wire 109, and thence to the contact finger 79 of the limit switch 72. The current flows through the half ring 76, hub 74, and full ring 75 of the limit switch to the spring finger 78 and passes from the spring finger 78 to the common return wire 129, through which it flows back to the negative source of current. In this way the coil 80 is energized and the arm 81 is pulled into engagement with the contact 85. Engagement of contacts 81 and 85 completes the motor circuit of the electric motor 63 with the control in the "on" position wherein the segments 97 to 103 are engaged with their respective contacts, the current at this time flowing through the following path. The current flows through the wire 104 to the contact 95, resistance 105 and contact 93 of the controller and passes from the contact 93 to the segment 100, thence through the wire 92^a, segment 99, and contact 92, to the wire 91^a, through the wire 91^a, contact 91, and wire 98^a, to the contact 88. Here the current divides, part passing on through the coil 80, as previously described, and part passing over to the segment 97, and down through the wire 97^a to the segment 93 which engages the contact 90 to permit the current to flow to this contact and on through the wire 107 to the contact 85 of the contactor. The current then flows through the arm 81 and wire 110 to the contact 111 of the reversing switch. Leaving contact 111 the current passes through the wire 118, contact 115, arm 117, wire 123, to the brush 124, thence through the armature of the motor and out through the brush 121, wire 120, arm 116, contact 114, wire 125, to the field 126. The current traverses the field 126 and then passes through the brake coil 127, and the wire 128 to the common return wire 129. This starts up the motor and the motor continues to move until the half ring 76 moves out of engagement with the spring finger 79. Disengagement of the half ring 76 and

spring finger 79 breaks the circuit through the coil 80 thereby de-energizing the coil and permitting the spring 86 to disengage the arm 81 from the contact 85 of the contactor thereby breaking the motor circuit for the electric motor 63. This has, however, engaged the arm 82 with the contact 87 so that the motor circuit may be completed to continue the rotation of the armature in the same direction by turning the controller to its other "on" position wherein the segments 97' to 103' are engaged with their respective contacts 88 to 96. With the controller so positioned and the arm 82 engaged with the contact 87 the current flows through the wire 104 to the contact 96, resistance 105 and contact 93 of the controller, and thence passes over to the segment 100', through a wire 103^a, to the segment 99' and to the contact 91 engaged therewith. From the contact 91 the current passes through wire 88^a to the contact 88 and thence over to the segment 97' engaged therewith. A wire 98^a connects the segment 97' with the segment 98' and the current flows through this wire 98^a to the segment 98' and to the contact 89 engaged therewith. Leaving the contact 89 the current passes through a wire 106 to the contact 87 of the contactor and thence through arm 82 and the wire 110 to the contact 111 of the reversing switch, from whence it flows through the armature 122, field 126, brake coil 127, wire 128 30 and common return wire 129 as before. During this operation the contactor coil 80 is not energized as the circuit through the coil is broken through the limit switch 72 since the spring finger 79 does not engage the half ring 76. This operation continues until the half ring 76 again comes into engagement with the spring finger 79 whereupon the coil 80 is energized to disengage the arm 82 from the contact 87 of the contactor. This breaks the motor circuit for the electric motor 63 but it engages the arm 81 with the contact 85 so that upon shifting the controller 71 to its other "on" position the motor circuit may be again made in the manner first described.

The limit switch 72 is designed to permit half revolutions of the crank shafts 52 each time the controller is thrown to the proper "on" position. This permits alternate raising and lowering movement of the lift bars and while these raising and lowering movements are started under the manual control of the operator they are automatically terminated by the limit switch 72. From the foregoing and from a consideration of Figure 4, it will be understood that the controller must be turned to its proper "on" position to energize the jack motor 63. For instance, if the controller is turned to the "on" position wherein the contacts 88, 89, 91, and 93 engage the segments 97', 98', 99', and 100' while the spring finger 79 engages the half ring 76 the motor 63 will not be energized because to energize the motor in this position of the controller the motor circuit must be completed in part through the contact 87 and the arm 82. This cannot occur because the instant that the controller is turned to the position just described the contactor coil 80 is energized and the arm 82 is swung out of engagement with the contact 87. As long as the spring finger 79 engages the contact 76 the jack motor may be energized only by turning the controller to engage the contacts 88, 90, 92, and 93 with the segments 97, 98, 99, and 100. On the other hand, when the limit switch 72 is so positioned that the spring finger 79 is disengaged 75

from the half ring 76 then the contactor coil 80 cannot be energized and consequently the circuit for the motor 63 can be completed only by engaging the contacts 88, 89, 91, and 93 with the segments 97', 98', 99', and 100'. The advantage of this is that even if the operator inadvertently turns the controller to the wrong position no damage will be incurred and no inappropriate operation will be initiated. In the operation of the jack the reversing switch is left in the position shown in Figure 4 and it is not employed except in an emergency, that is, when it is desirable for one reason or another to interrupt the normal operation and cause the lift bars which have been partially raised to descend or lower before completing the upward movement.

In handling automobiles these lift bars are designed to engage under the front axle and if, under unusual circumstances, the carriage is incorrectly positioned with respect to the automobile and the operator starts the elevation of the lift bars before he detects their improper positioning, he can throw the controller to "off" position, throw the reversing switch 112, and then lower the lift bars. It is not often that the reversing switch will be employed, and in fact, under many circumstances it can be omitted entirely.

It is to be understood that the method of wiring illustrated is shown for the purpose of illustration only and various changes, additions, and omissions are contemplated within the spirit of the invention and the scope of the subjoined claims.

The jack on the carriage is so constructed, organized, driven and controlled that successive reverse manipulations of the controller 71 causes operation of the electric motor 63 over such period as to result in alternate raising and lowering of the lift members of the jack.

Sections of the wires through which the current for the motors 47 and 63 is transmitted are embodied in cables 295 trained around rollers or spools 296 and wound on reels 297 and mounted on the carriage and wound up by springs (not shown) to tension the cables and yet permit them to reel out when the carriage moves off of the traveling platform. However, it is to be understood that any appropriate means may be provided for conducting current to the motors of the carriage and for this purpose appropriate contact shoes, mounted on the carriage and incorporated in the motor circuits, may be provided, the contact shoes coacting with electric current supply rails paralleling the track or tracks on which the carriage runs. In fact, any suitable expedient may be resorted to and the usual trolley and trolley wires are contemplated.

Although the traveling platform is always substantially aligned with the selected stall or elevator it is difficult to obtain exact alinement in all instances and for the purpose of obtaining a final and substantially exact alinement between the carriage and the selected stall or elevator the carriage is provided with a set of guides 300. Each set of guides includes a pair of guide members, each of which has a substantially straight central portion 302, and outwardly inclined end portions 303, the end portions 303 providing outwardly diverging wings. These guides are designed to coact with vertical guide rollers 304 provided on the traveling platform. It is to be noted that the wheels which support the carriage are relatively broad and are flanged at their inner margins only. When the carriage begins to move

off the platform one or the other of the wings coact with the guide rollers 304 of the platform to center the carriage on the platform. Then as the carriage moves off of the platform its wheels are positioned to engage the bent or curved ends of the rails of the compartment or elevator. In this way such final matching or final alinement as is essential is insured. The flanged wheels 43 are designed to permit the action as will be understood from Figure 1.

When the invention is embodied in an apparatus for storing and handling vehicles, vehicles are run into the receiving station which the ground floor of the building provides and are loaded on the elevators and carried to the floor on which they are to be stored. On each floor there is a traveling platform equipped with a carriage and jack for transporting the automobiles to and from the elevators and stalls. The traveling platform is lined up with the elevator which brings the car to the floor and when so lined up the carriage is run off of the platform onto the elevator and when properly positioned under the automobile the jack of the carriage is elevated into engagement with the front axle of the automobile. The carriage is then run back onto the traveling platform and in this way the automobile is taken from the elevator onto the traveling platform. With the automobile properly positioned on the traveling platform the platform is run down the aisle until it is aligned with the selected stall whereupon the carriage is run off into the stall to carry the automobile thereinto. With the automobile properly located in the stall the jack is lowered and the carriage with the lowered jack is returned onto the platform. These operations being partly automatic may be carried out with a great deal of expedition so as to speed up the handling of the automobiles. The automatic features while speeding up the operation in this way also operate as safety features as hereinabove pointed out.

The invention claimed is:

1. A jack comprising a lifting element, means for alternately raising and lowering said lifting element, an electric motor operable in the same rotational direction for driving said means, a controller for said motor having two "on" positions, a contactor operatively associated with the motor and controller and operable to permit flow of current to the motor in one or the other of the "on" positions of the controller, and a limit switch operated in synchronism with the lifting element and coacting with the contactor to shut off the current to the motor automatically at the end of a lifting movement and also at the end of a lowering movement.

2. A jack comprising a lifting element, means for alternately raising and lowering said lifting element, an electric motor operable in the same rotational direction for driving said means, a circuit for said motor, a contactor including contacts incorporated in the motor circuit and arms cooperable with the contacts, means for biasing one of the arms to engage its contact and the other arm to disengage its contact, a contactor coil operable when energized to reverse the position of said arms, a circuit for the contactor coil, a limit switch embodied in the contactor coil circuit, and a controller having two "on" positions and incorporated in the motor circuit and in the contactor coil circuit.

3. In a motor driven transfer carriage of the character described, comprising spaced crank

shafts rotatably mounted on said carriage, a pair of spaced lifting bars positioned above the crank shafts, link members pivotally connected to the crank shafts and pivotally connected to the lifting bars, means constraining the lifting bars to raising and lowering movement, a motor mounted on the transfer carriage and gearing between the motor and the crank shafts for rotating the same in one direction and thereby causing the lifting bars to alternately raise and lower.

4. In a motor driven transfer carriage of the character described, comprising a pair of longitudinally extending and transversely spaced lifting bars disposed substantially horizontally and adjacent the top of the transfer carriage when in the lowermost position, crank shafts rotatably mounted on the transfer carriage below and adjacent the end portions of the lifting bars, links extending upwardly from the crank shafts and pivotally connected thereto and to the lifting bars, tie links between the frame and the lifting bars for constraining the lifting bars to raising and lowering movement, and means carried by the carriage and connected to the crank shafts to rotate the same in one direction thereby causing the lifting bars to raise and lower.

5. In a motor driven transfer carriage of the character described, comprising a pair of longitudinally extending and transversely spaced lifting bars disposed substantially horizontally and adjacent the top of the transfer carriage when in the lowermost position, crank shafts rotatably mounted on the transfer carriage below and adjacent the end portions of the lifting bars, links extending upwardly from the crank shafts and pivotally connected thereto and to the lifting bars, tie links between the frame and the lifting bars for constraining the lifting bars to raising and lowering movement, a motor mounted on the carriage in between the crank shafts, a worm shaft driven from the motor and extending longitudinally of the carriage, worms on said worm shaft and worm wheels meshed with the worms and fixed to the crank shafts.

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Deceased.

By W. I. BARTH,
Secretary.