Aug. 1, 1950 L. CIRILLO 2,517,085

INDUSTRIAL TRUCK

Filed Oct. 30, 1946 3 Sheets-Sheet 1

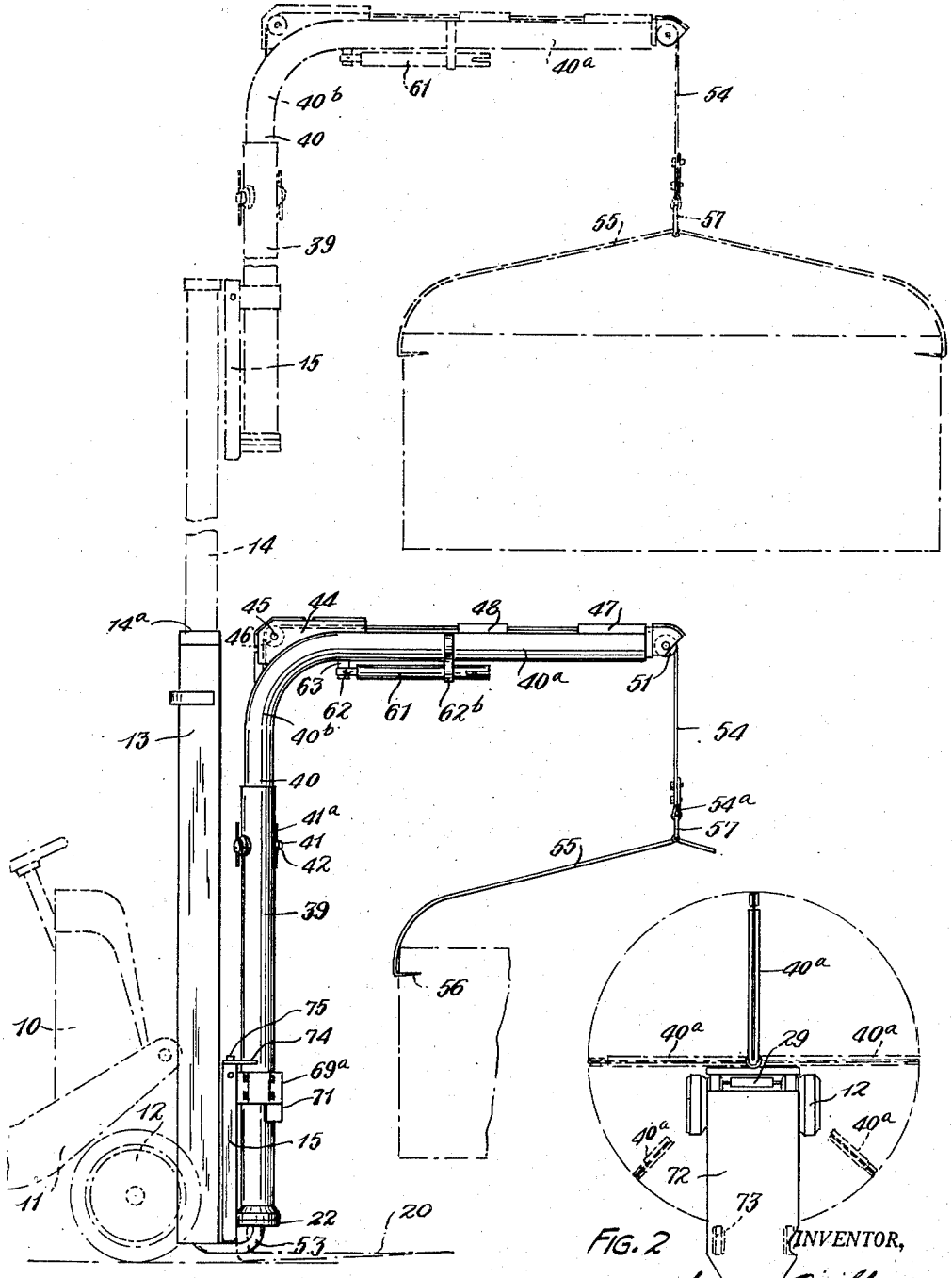


FIG. 1

FIG. 2

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INDUSTRIAL TRUCK

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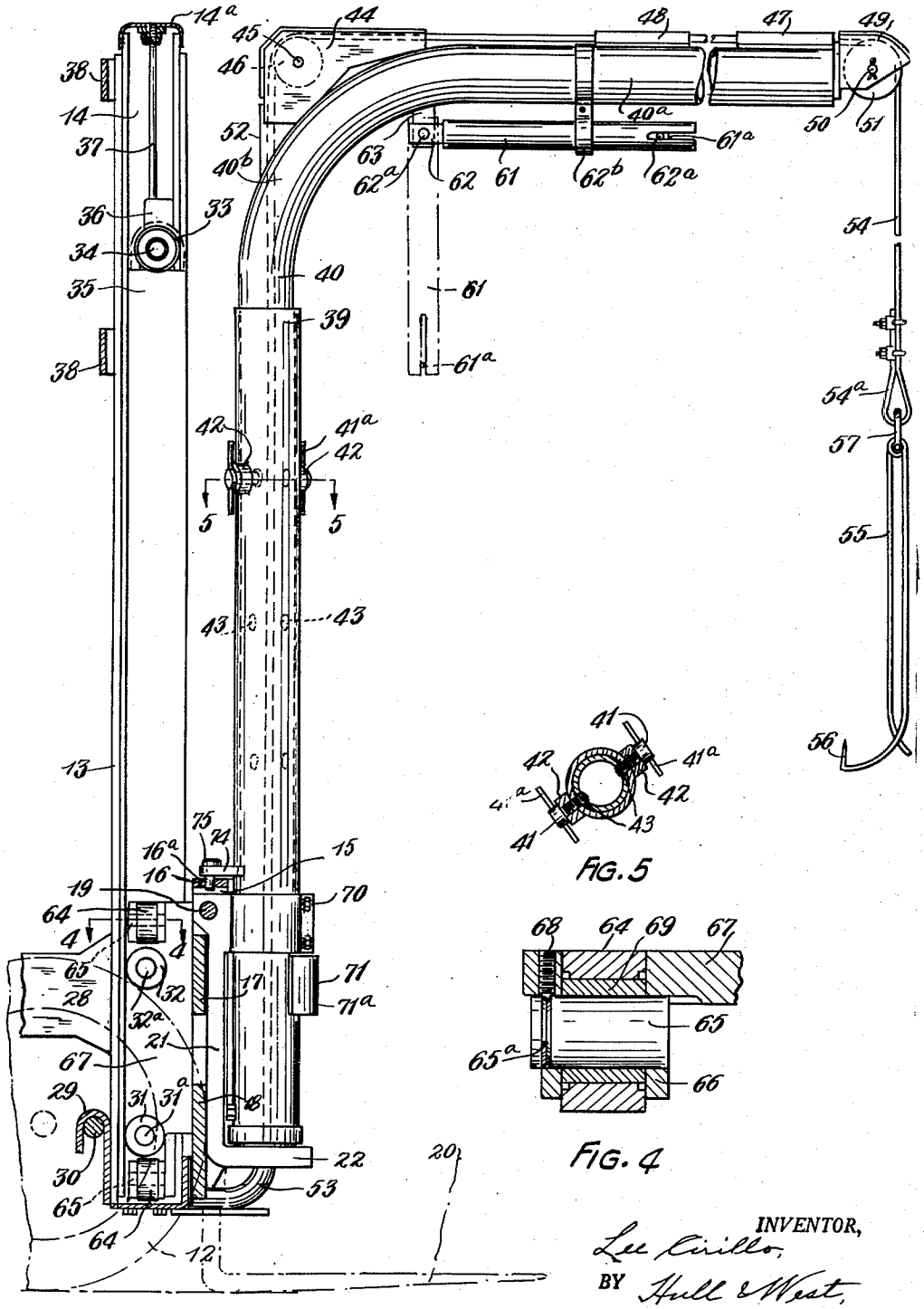


FIG. 3

FIG. 5

FIG. 4

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INDUSTRIAL TRUCK

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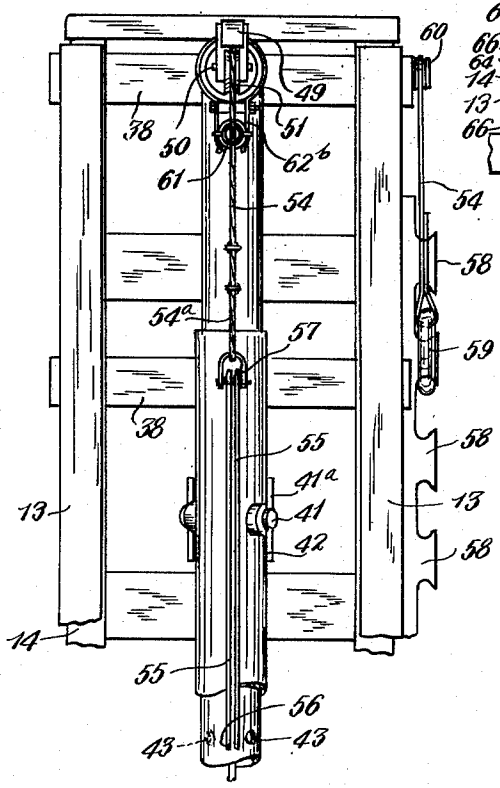


FIG. 6

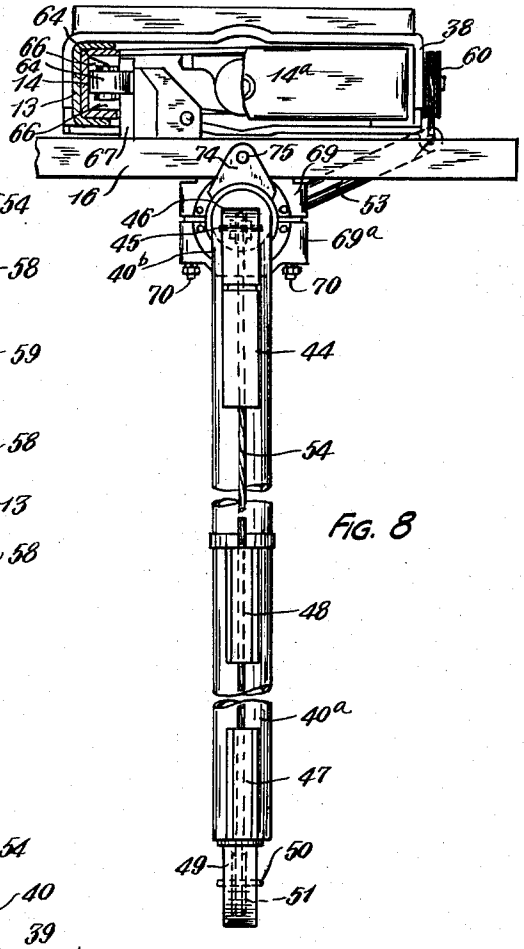


FIG. 8

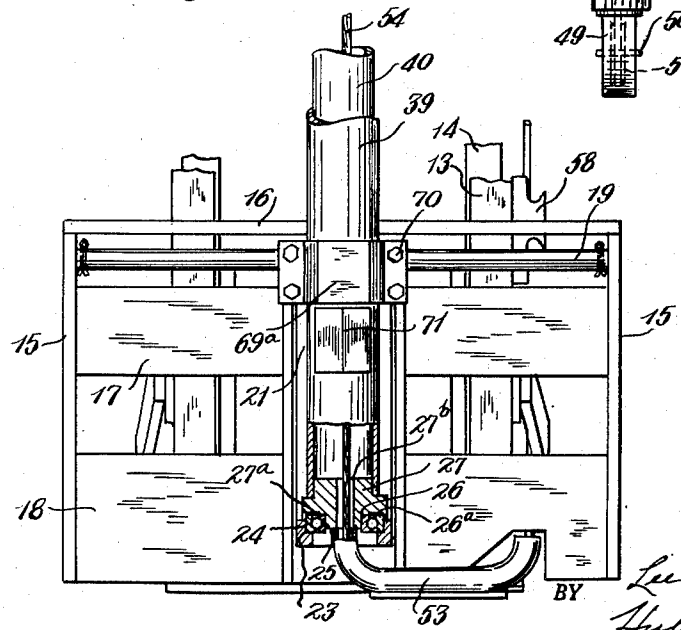


FIG. 7

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2,517,085

INDUSTRIAL TRUCK

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Application October 30, 1946, Serial No. 706,597

3 Claims. (Cl. 212—64)

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This invention relates to industrial trucks, and more particularly to industrial trucks of the type wherein a vertical mast is carried by the front of the truck frame and a load-supporting carriage is slidably mounted with respect to the said mast with means for raising and lowering the carriage along the said mast.

It is the general purpose and object of my invention to provide industrial trucks of this type with a boom assembly comprising a vertically extending portion supported by the carriage and a forwardly projecting arm portion and with cable means supported by the said boom assembly and provided with means for engaging and disengaging an object to be transported by the truck, independently of the operation of the carriage.

In the specific embodiment of my invention, the base of the vertical portion of the boom assembly is rotatably supported by the carriage; the vertical portion of the boom assembly is hollow for the passage of the cable longitudinally therethrough, and the horizontal or forwardly projecting portion or arm of the boom assembly is provided with a sheave or pulley at the rear and at the front end thereof for guiding the cable; and the operating end of the cable is shown as provided with hooks resembling those with which ice tongs are provided, whereby objects, such as bales of cotton, may be engaged and disengaged thereby. In addition, the boom assembly comprises a vertical housing section within which the vertical portion of the arm-carrying section is telescoped and which latter section is adjustably connected to the said housing section, and jack means are provided to facilitate extension of the telescoped members without effort on the part of the operator.

Further and still more limited features of construction of the present embodiment of my invention are shown in the drawings hereof, wherein Fig. 1 represents a side elevational view of the mast of an industrial truck having a load-supporting carriage mounted thereon and the boom assembly on said carriage and showing also in dot-and-dash lines the forward end of a truck by which the mast is supported and the positions assumed by the mast and by the carriage and the boom assembly when the carriage and the mast are in extended position, and also indicating the manner in which one form of load-engaging means carried by the cable cooperates with an article to be lifted and transported; Fig. 2 a diagrammatic plan view of an industrial truck equipped with my boom assembly and illustrating

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some of the positions to which the boom assembly may be swung about its vertical axis; Fig. 3 a vertical sectional view, taken between the side members of the mast, and showing the boom assembly in elevation; Figs. 4 and 5 are details in section taken on the lines 4—4 and 5—5 of Fig. 3, respectively; Fig. 6 a front elevational view of the upper portion of the apparatus shown in Fig. 3; Fig. 7 a similar view of the lower portion of the said apparatus, the lower portion of the boom assembly being shown in section; and Fig. 8 a plan view of the apparatus shown in Fig. 3.

Describing the parts by reference characters, 10 denotes the hood, 11 one of the side members, 12 one of the front wheels of an industrial truck of a well known type, 13 the side members of the lower mast section, and 14 the side members of the inner or extensible mast section.

15 denotes the side members and 16 the upper spacer bar of the carriage; and 17 and 18 denote the upper and lower cross plates which are connected to the said side members (see Fig. 7). 19 denotes a cross bar which is supported by the side members 15 beneath the spacer bar 16 and on which the usual forks 20 are shown as supported at their upper ends beneath the said spacer bar. 21 denotes a vertical plate the upper end of which is mounted upon the cross bar 19 and the sides and upper ends of which are the same general contour as the sides and upper ends of the forks 20 and the rear surface of which engages the cross plate 18. The forwardly projecting lower end 22 is shaped to provide an angular annular seat 23 for the outer race 24 of a thrust bearing the inner race 25 whereof is mounted upon a cylindrical seat 26 extending downwardly from the inner periphery of an annular horizontal surface 26a on a supporting base 27 for the bottom of the boom assembly, which will be described hereinafter. Anti-friction balls 27a are shown as interposed between the races 24 and 25.

28 denotes one of the tilt arms with which trucks of the general character referred to herein are provided, the said tilt arms being secured to the webs of the channeled side members 13, the said tilt arms being provided with the usual means for reciprocating the same whereby the mast assembly may be tilted forwardly and backwardly by means of the hook plate 29 secured to the lower portion thereof and mounted upon the cross bar 30, as shown in Weaver Patent No. 2,299,445, issued October 28, 1942.

The carriage is provided with the usual lower rollers 31 and upper rollers 32 which are adapted to engage respectively the inner surfaces of the

rear flanges and the inner surfaces of the front flanges of the side members 14.

The carriage may be raised and lowered by any of the means customarily employed for this purpose, as by cables (not shown) each connected at one end to the carriage and extending around rollers 33 carried by opposite ends of a cross head 34 on top of a plunger 35 mounted within a vertical cylinder (not shown). The cross head is provided with a saddle 36 which is adapted, when the plunger is elevated, to engage a cross member 14a connecting the tops of the inner mast members 14 thereby to raise the same. When desirable, a pull rod 37 may also be employed for the purpose of assisting in retracting the inner mast after the same shall have been elevated.

The webs of the channeled side members 13 are connected by one or more yokes 38 extending across the rear of the same. With the exception of the vertical plate 21 and the means supported thereby and cooperating therewith for the support of the boom assembly, the parts thus far described are substantially identical with those which have been employed by one of the leading manufacturers of industrial trucks and hence need no further illustration or description.

39 denotes the outer vertical tubular section of a boom assembly within which the lower vertical portion 40 of a second section is telescoped. These sections are connected by means of screw bolts 41 threaded through bosses 42 formed with or welded to diametrically opposite portions of the section 39 and adapted to enter vertically spaced apertures 43 provided therefor in the lower vertical portion 40 of the second section, and each of these screw bolts is shown as provided with an operating handle 41a. The location of these screw bolts and of the apertures with which they cooperate enable an operator on either side of the boom assembly to break the connection between the inner and outer telescoping portions of the sections for the purpose of enabling the second section to be raised and lowered with respect to the first section and to thereafter re-establish such connection.

The inner section of the boom assembly is provided with the forwardly projecting arm 40a, connected to the vertical portion of said section by a curved elbow 40b.

44 denotes a channeled bracket member which is secured to the elbow 40b and the side flanges of which support the shaft 45 of a sheave 46. 47 and 48 denote tubular guide members which are secured to and extend longitudinally of the top of the arm 40a and 49 denotes a channeled bracket member which is secured to the forward end of the arm 40a and the side flanges of which support the shaft 50 of a sheave 51. The sheaves 46 and 51 and the guides 47 and 48 are so arranged as to form a horizontal lead for the cable which carries the member or members adapted to engage articles to be raised and lowered by the boom and to be transported by the truck.

52 denotes a guide tube which is secured to the elbow 40b with its bore in alignment with the longitudinal axis of the vertical sections of the boom assembly, as is also the cable-receiving portion of the sheave 46. The supporting base 27 for the boom assembly is provided with a vertical central bore 27b therethrough, and into the bottom of said base and registering with said bore there projects the upper end of a pipe 53 which extends outwardly therefrom and has its outer end extending upwardly and beneath the outer surface of the web of one of the side members 13 of the lower mast section.

54 denotes a cable the front or operating end of which supports rod-engaging means, such as members 55 having hooks 56 at their lower ends and which are pivotally connected at their upper ends to the front end of the cable as by means of a clevis 57 supported by the looped end 54a of the cable.

The cable extends around the upper surface of the sheave 51, through the guides 47 and 48, around the sheave 46, through the tube 52 and downwardly through the portion of the elbow 40b beneath said tube, through the vertical portions of the boom assembly, through the bore 27b and the pipe 53. The lower end of the cable may be secured to any one of a vertical series of cleats 58 with which the web of the appropriate side member of the lower mast is provided, as by means of a looped member 59 carried by the lower end of the cable. Where it is necessary to raise the boom assembly a considerable distance, the lower end of the cable will be moved upwardly along the web of the mast and the loop 59 will be slipped over the top of the appropriate cleat. On the other hand, where it is necessary to raise the boom assembly only a comparatively short distance, there will be a considerable quantity of slack in the cable, and this slack can be taken up by means of a sheave 60 supported by one of the side flanges of the upper yoke 38 and around which the bight of the cable can be passed and the loop 59 thereafter passed beneath the lower portion of the appropriate cleat 58. It is noted that with this construction the carriage platform can be loaded and unloaded with the boom assembly with the platform in any desired position.

In order to facilitate extension of the telescoped boom members a novel jack means is provided that supports the crane arm on the mast while the carriage and associated telescoped member are lowered. In the preferred embodiment, 61 denotes the outer sleeve of a jack by means of which the forwardly projecting arm of the boom assembly may be supported on top of the inner extensible mast section. The sleeve is mounted upon a bar 62 which is pivotally supported at 62a upon a downwardly extending lug 63 connected to the underside of the arm 40a. The bar 62 extends nearly to the swinging end of the sleeve 61 when the parts are in the inoperative position shown in full lines in Fig. 3, wherein the outer sleeve and the bar are supported by means of a spring clamp 62b. For the purpose of retaining the sleeve in proper relation to the bar, the latter is provided at its front or outer end with a transverse pin 62a the ends of which are mounted in slots 61a provided on opposite sides of the sleeve and extending from the swinging end thereof. When the sleeve is released from the spring clamp, it will be swung into vertical alignment with the lug 63, as shown in dot-and-dash lines on Fig. 3, being retained on the bar 62 by the pin 62a, and will be in a position to enable the boom to be preliminary adjusted to a height which will determine the height to which the object engaged by the members 55 may be elevated before being disengaged. In making the height adjustment, the boom support 22 and the boom assembly will be lifted by the carriage a sufficient distance to enable the bottom of the sleeve 61 to clear the top 14a of the mast when the boom assembly has been swung about its vertical axis (as by pulling upon the outer portion of the cable 54) to bring the sleeve

in register with the top of the mast after which the carriage will be lowered to enable the bottom of the sleeve to engage the top of the mast. The sleeve then is forced upwardly along the bar that mounts it to surround the joint between the bar 62 and the lug 63 with which the jack will be held rigidly in a vertical position. The screws 41 can then be disengaged from the apertures in the inner boom member and the carriage lowered which will cause the inner boom section to be withdrawn to the desired extent from the outer section to set the arm 40a at the desired height above the carriage. When the height of the arm above the carriage has been thus adjusted in accordance with the particular work on which the boom is to operate, the carriage is manipulated until either of the two conveniently located screws 41 can be inserted into the proper hole 43 in the inner boom member. The apparatus will now be ready for operation as soon as the bottom of the jack is lifted from the top of the mast and re-secured in place beneath the arm.

The rollers 31 and 32, in cooperation with the rear and front flanges of the inner mast section, compensate for the thrust imparted to the top and bottom of the carriage by the load suspended from the arm 40a when the latter is in its forwardly extending position. However, when the mast assembly is rotated to a position where the arm 40a is approximately at right angles to that shown in Fig. 3 (see broken lines on Fig. 2) a severe lateral trust may be exerted upon the top and bottom of the carriage, and this thrust is compensated for by rollers 64 (see Figs. 3, 4 and 8) each mounted upon a horizontal pin 65 and engaging the webs of the side members 14 of the inner mast. Each pin 65 is supported by a bearing formed in brackets 66 secured to one of the plates 67 which in turn are secured to and project rearwardly from the carriage and form a support for the journals 31a and 32a of the rollers 31 and 32. The pin is secured against longitudinal movement by means of a headless screw 68 mounted in one of the brackets and extending into an annular groove 65a adjacent to one end of the pin. Each of the rollers 64 has a bushing 69 interposed between the same and its pin 65.

The lower portion of the outer boom section 39 is supported from the carriage by means of a split bearing the rear member 69 of which is secured to the vertical plate 21 and the front member 69a of which is detachably connected to the rear member by means of bolts 70.

The outer section 39 has secured thereto, as by welding, a stop member of wedge shape, the apex 71 of which is in a vertical plane extending at right angles to the general plane of the carriage and including the vertical axis of the said outer section. The sides of this member are adapted to engage opposite sides of the vertical plate 21. The construction and the relative positions of the stop member 71 and the cooperating sides of the plate 21 are preferably such as to enable the arm 40a to be swung approximately 135° from each side of its fore-and-aft position, as indicated in Fig. 2, wherein the body of the truck is diagrammatically shown at 72 and the rear wheels at 73.

The boom assembly may be retained in the position shown in Fig. 3—with the arm 40a extending directly forwardly from the carriage by means of a lug plate 74 welded or otherwise suitably secured to the rear surface of the boom section 39 and a pin 75 mounted in an aperture provided therefor in the said lug plate and adapted to enter an opening 16a provided therefor in the top spacer bar 16 of the carriage.

From the foregoing description, taken with the drawings, it is evident that I have provided an industrial truck of the type having a vertical mast and a load supporting carriage slidably mounted on said mast with a boom assembly, and wherein the carriage and the mast are adapted to cooperate effectively in supporting the boom assembly in various positions which it is desirable that the latter shall occupy, and wherein the load may be removed from the carriage fork or platform with the latter at rest in any vertical position.

Having thus described my invention, what I claim is:

1. In an industrial truck having a vertically extending mast and a load-supporting carriage slidably mounted on said mast and means for raising and lowering said carriage along said mast; a boom having a normally forwardly projecting arm, a boom support on said carriage including means for pivotally mounting said boom for swinging about a generally vertical axis, cable guide means supported by the outer portion of said arm, the inner portion thereof, and adjacent the area of pivotal support of said boom on the carriage, a cable engaging and guided by said guide means, load-lifting means secured to the forward end of said cable, and means for adjustably securing the other end of said cable to the truck, whereby said boom and boom support assembly elevates with the carriage but said cable and load-lifting means may be manipulated independently of the carriage for loading and unloading the carriage.

2. In an industrial truck having a vertically extending mast and a load-supporting carriage slidably mounted on said mast and means for raising and lowering said carriage along said mast; a two-part boom one part being vertically disposed and the other part having a vertical portion telescoped with said one part and a normally forwardly projecting arm portion, a boom support on said carriage including means for pivotally mounting said one boom part for swinging about a generally vertical axis, cable guide means supported by the outer portion of the said arm portion, the inner portion thereof, and adjacent the area of pivotal support of said one boom part on the carriage, a cable engaging and guided by said guide means, load-lifting means secured to the forward end of said cable, and means for adjustably securing the other end of said cable to the truck, whereby said boom and boom support assembly elevates with the carriage but said cable and load-lifting means may be manipulated independently of the carriage for loading and unloading the carraige; and jack means for supporting said other boom part on a part of said mast, said jack means being adjustably mounted on one of said last-named parts for movement into position against the other of said parts, and lock means to selectively secure said telescoped boom parts together against relative sliding, whereby said carriage may be elevated, said jack means positioned between said boom and mast parts, said lock released, said carriage and associated telescoped member lowered, and said telescoped boom parts re-secured in a different relative position.

3. In an industrial truck having a vertically extending mast and a load-supporting carriage

slidably mounted on said mast and means for raising and lowering said carriage along said mast; a two-part boom one part being vertically disposed and the other part having a vertical portion telescoped with said one part and a normally forwardly projecting arm portion, a boom support on said carriage including means for pivotally mounting said one boom part for swinging about a generally vertical axis, cable guide means supported by the outer portion of the said arm portion, the inner portion thereof, and adjacent the area of pivotal support of said one boom part on the carriage, a cable engaging and guided by said guide means, load-lifting means secured to the forward end of said cable, and means for adjustably securing the other end of said cable to the truck, whereby said boom and boom support assembly elevates with the carriage but said cable and load-lifting means may be manipulated independently of the carriage for loading and unloading the carriage; and a jack bar for supporting said other boom part on a part of said mast, said jack bar having one end pivotally mounted on one of said last-named parts for movement into a vertical position with its other end abutting the other of said parts,

and lock means to selectively secure said telescoped boom parts together against relative sliding, whereby said carriage may be elevated, said jack means positioned between said boom and mast parts, said lock released, said carriage and associated telescoped member lowered, and said telescoped boom parts re-secured in a different relative position.

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