May 16, 1961 S. S. McINTYRE 2,984,367

CABLE HAULING SYSTEM WITH FIXED MACHINERY FOR USE ON CONTAINER SHIPS

Filed Jan. 24, 1958 3 Sheets-Sheet 1

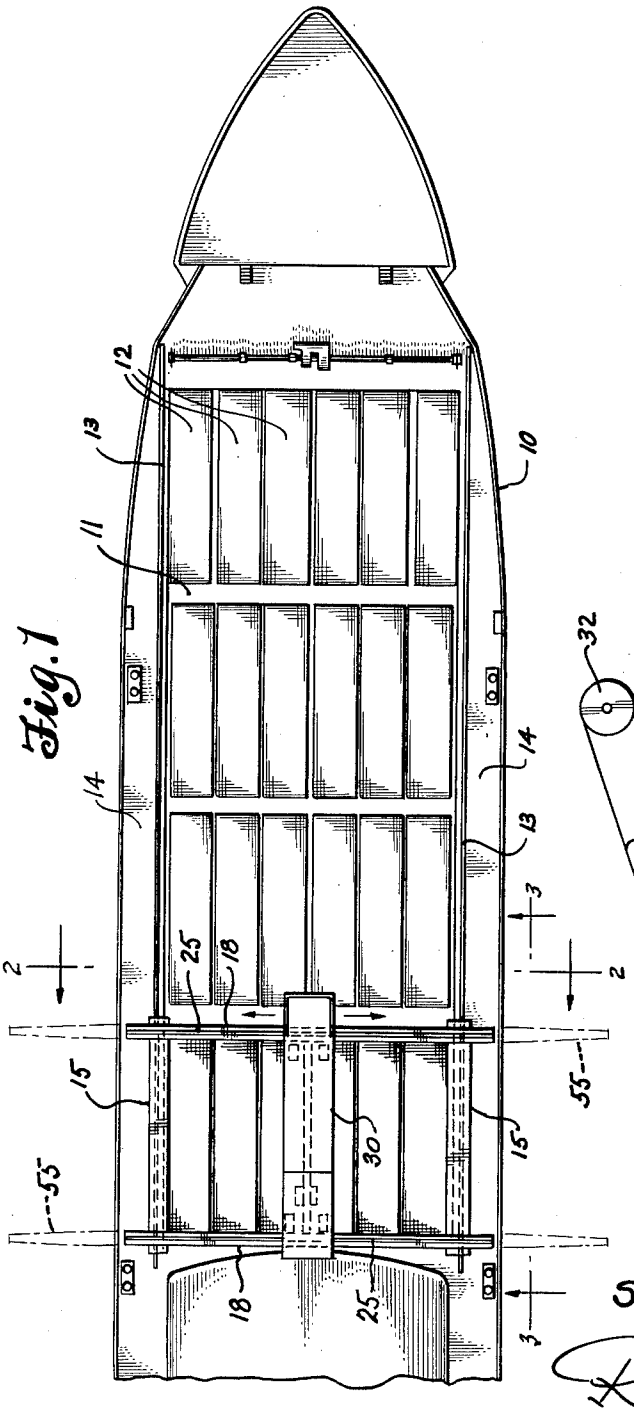

Fig. 1

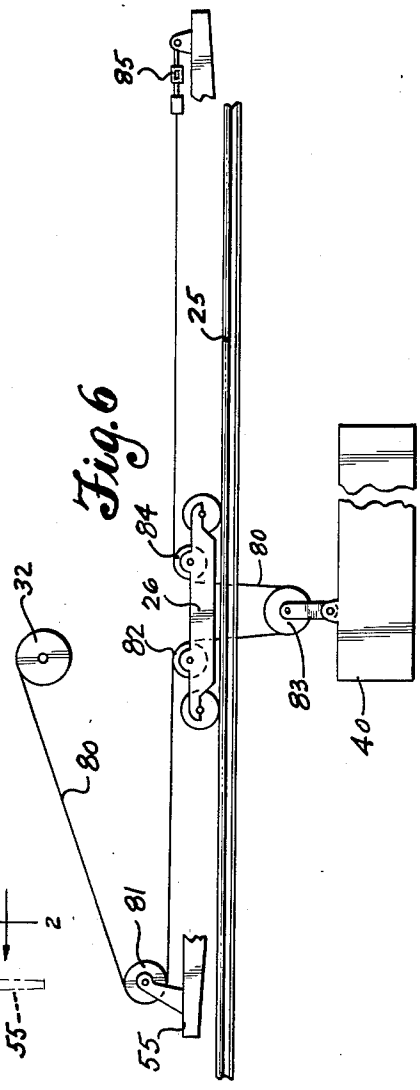

Fig. 6

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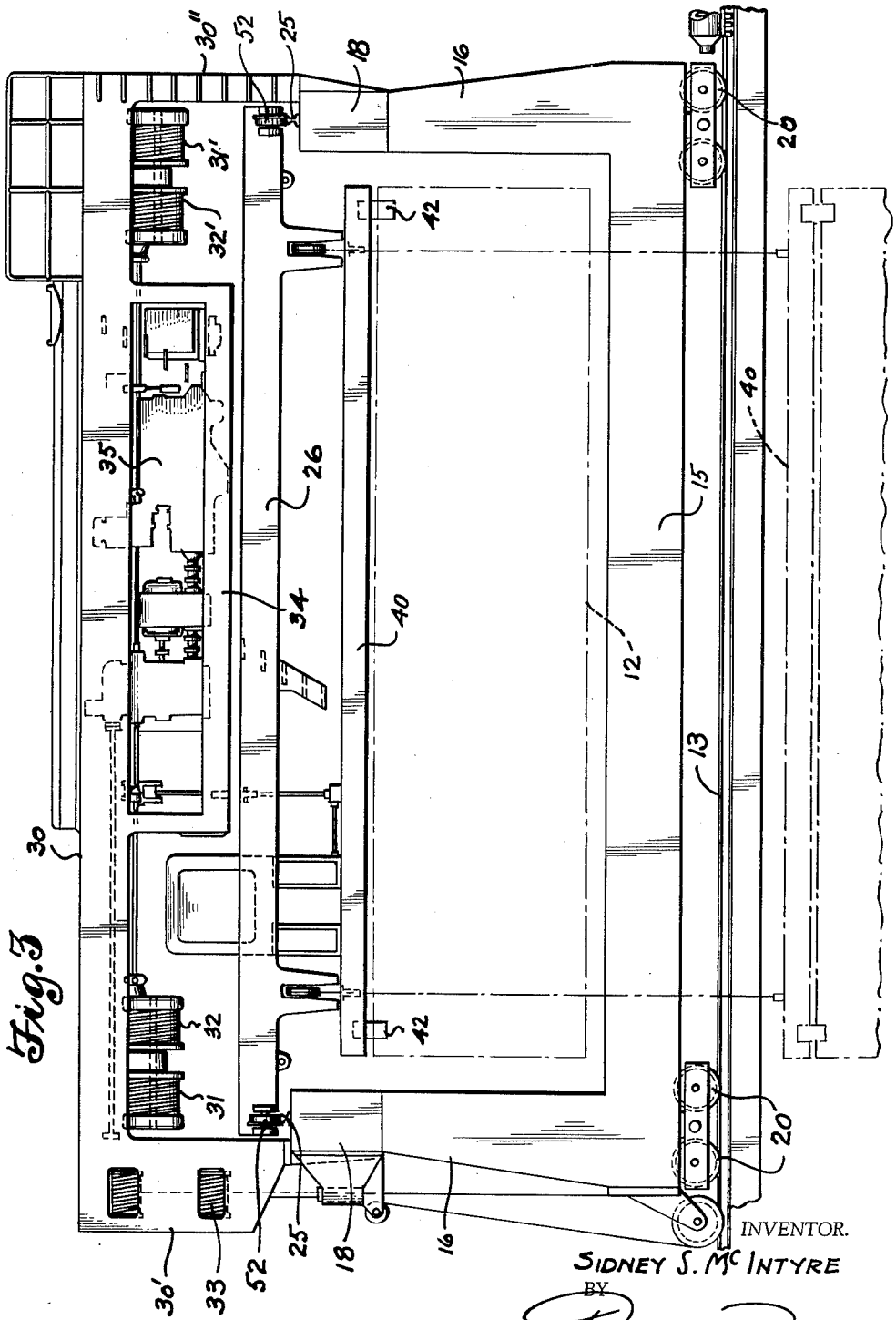

Fig. 3

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Filed Jan. 24, 1958 3 Sheets-Sheet 3

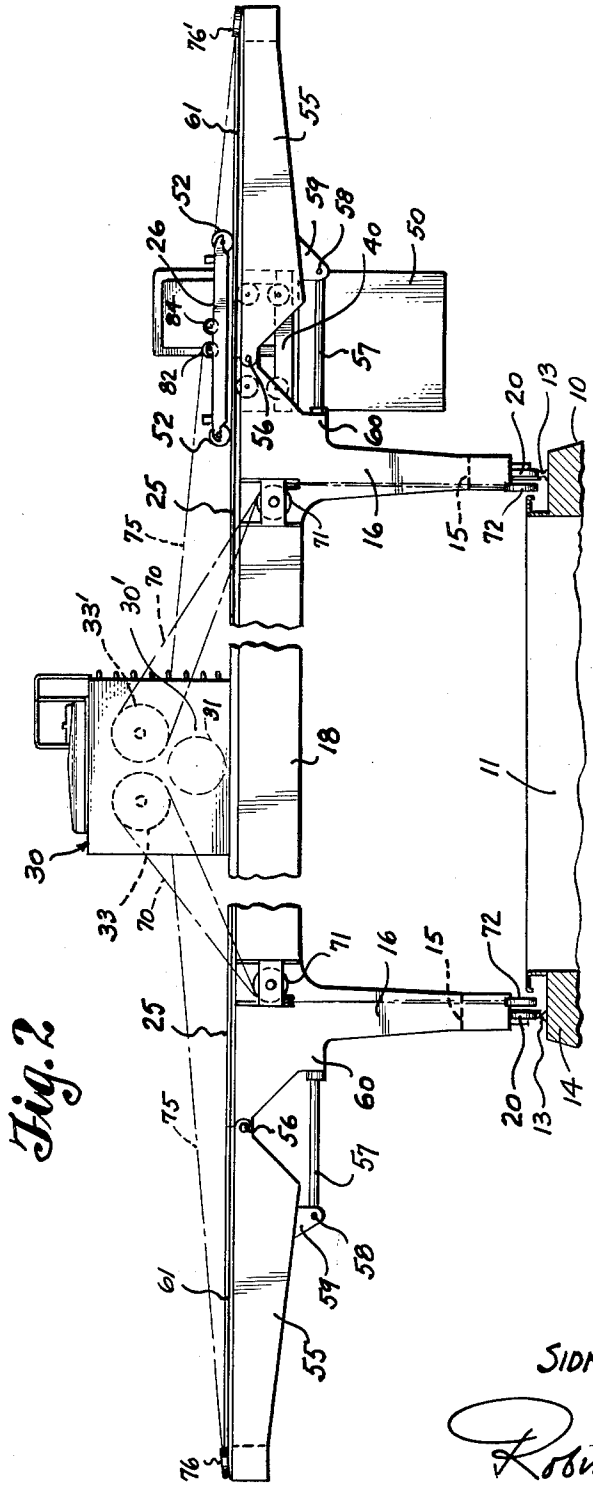

Fig. 2

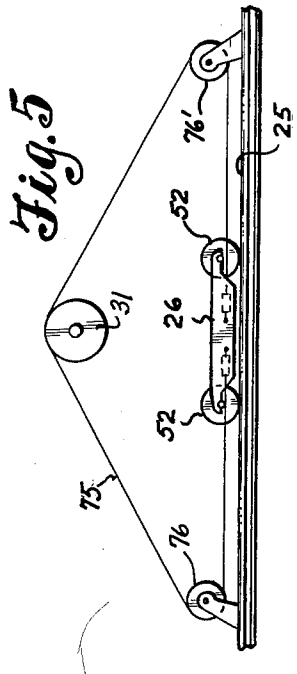

Fig. 5

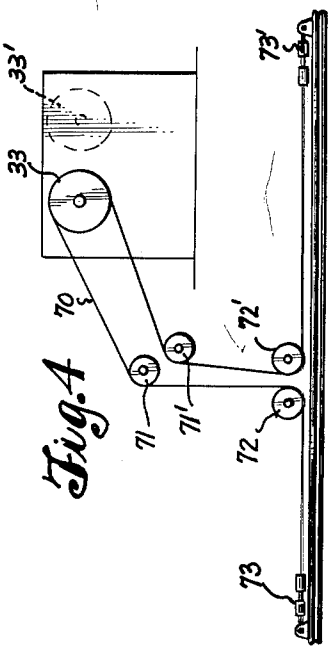

Fig. 4

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CABLE HAULING SYSTEM WITH FIXED MACHINERY FOR USE ON CONTAINER SHIPS

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4 Claims. (Cl. 214—15)

This invention relates to cranes and more particularly it has reference to gantry cranes designed for mounting, travel and use on the decks of sea going cargo carrying vessels. Specifically stated, it has to do with gantry cranes as applied to those ships which in industry are known as "container ships."

It will here be mentioned as explanatory to the present invention, that a "container ship" is one especially designed and equipped for the transportation therein of products that are stored in large, box-like containers of uniform dimensions and adapted to be loaded into and from the vessel by use of a crane. Also, insofar as the present invention is concerned, the crane is to be mounted on the vessel, for travel in a fore and aft direction, and it includes as a part thereof, a carrier frame for the loading and unloading of containers that are supported by and movable in the crane structure in a direction transversely of the ship.

Heretofore, in cranes used on ship board, the heavy machinery, including controls and motors, which lift and move cargo in loading and unloading, traveled in the crane structure transversely of the ship with the carried load. This has proven to be quite unsatisfactory and to be disadvantageous because, with the lateral shifting or transverse travel of the heavy machinery, the ship is caused to list or rock accordingly.

In view of the above mentioned and other disadvantages and unsatisfactory conditions that are incident to or result from the heavy power units and machinery associated therewith being constantly shifting in the crane structure transversely of the vessel during a loading or unloading operation, it has been the primary object of this invention to provide a crane in which this undesirable condition is avoided by use of "fixed machinery," that is, a crane wherein those heavy power units, controls and gear that normally are mounted for travel transversely of the crane with the carried load, are fixedly mounted in the crane structure at a location at which it will not, by reason of its weight, cause the ship on which the crane is mounted, to list or lean to either side.

It is also an object of the present invention to provide a crane structure that embodies the fixed machinery feature above mentioned whereby the handling, loading and unloading of containers of the character above mentioned can be more expeditiously, safely and economically accomplished.

Further objects and advantages of the invention reside in the novel features of control and construction, and in the combination of parts as hereinafter described.

In accomplishing the above mentioned and other objects of the invention, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a plan view of the fore end portion of a container ship equipped with a crane in which the heavy operating machinery is "fixed" in accordance with the objects of the present invention.

Fig. 2 is a cross-sectional view of the ship, as seen on

line 2—2 in Fig. 1, showing the present crane as mounted thereon and the position of the machinery on the crane platform.

Fig. 3 is a side elevation of the crane showing a container as supported therein for movement onto or from the ship.

Fig. 4 is a schematic view of the means for effecting travel of the crane along the deck of the ship.

Fig. 5 is a schematic view of the cable system for effecting travel of the bridge or carrier frame transversely of the crane.

Fig. 6 is a schematic showing of the load hoisting cable system associated with the crane.

Referring more in detail to the drawings:

In Fig. 2, I have shown, in cross-sectional view, a portion of a sea going vessel of that kind referred to as a container ship, especially designed for the carrying of containers of the kind hereinafter described. The hull 10 of the vessel is formed with an open hold 11 in which containers, each designated in its entirety by numeral 12, may be loaded and arranged for shipment as noted in Fig. 1. The crane, embodying the improvements of this invention is shown as being of gantry type and is mounted for travel in the fore and aft direction of the ship, on parallel rails 13—13 located at opposite sides of the hold on special top deck structures 14. The tracks 13—13 extend at least to the full length of the hold as provided in the fore or aft portion of the ship, so that containers 12 as conveyed by the crane from dock to ship may be lowered into or lifted from the hold at any location. Also, as will presently be described, the containers 12, as picked up by the crane, may be moved laterally in either direction within its framework and to either side of the ship by a bridge or "traveling frame" which is a part of the crane.

Referring now more particularly to Figs. 2 and 3, it is noted that the crane comprises a massive, and rigid main frame structure; this being of sufficient transverse width to span the vessel across the hold which it serves. This main frame structure comprises opposite side frames of a form best shown in Fig. 3, each extending in the fore and aft direction and including a horizontal base beam 15 with substantially vertical standards 16 at its opposite ends. The standards 16, at corresponding ends of the opposite side beams 15, are rigidly joined at their upper ends by transversely directed horizontal beams 18, shown in Figs. 1 and 2, thus to provide a rigid and substantial frame structure that, in plan view, is of the rectangular form. This frame structure is equipped, at the opposite ends of each of the horizontal beams 15—15, with supporting wheels 20, in tandem, mounted for travel upon the parallel rails 13—13.

It is also to be observed in Fig. 3, that rails 25—25 are fixed upon and extend in parallel relationship to the full length of the transverse beams 18—18. Mounted for travel on these rails is a horizontal frame structure 26 which will hereinafter be designated as the "bridge"; this being extended in the fore and aft direction of the ship and being adapted to travel on the rails 25—25 transversely of the vessel to the full width of the crane structure as shown in Fig. 2 as presently explained.

Supported at its opposite ends on the cross beams 18—18, in the central longitudinal line of the ship, is the crane platform 30. This comprises a horizontal beam structure equipped at its opposite ends with vertical leg portions 30', 30'' which are fixed at their lower ends upon the cross-beams 18—18 at points midway of their ends. These legs give clearance between them for the transverse movement of the traveling bridge 26, as will be understood by reference to Fig. 3. The platform 30 supports therein, near one of its opposite ends, the cable winding drums 31 and 32 and at its other end,

in a similar location, it supports the companion cable winding drums 31' and 32'. Also, within what is designated as the leg portion 30' of the bridge, a pair of cable winding drums 33—33' are mounted as shown in Fig. 4. The purpose of these several sets of cable winding drums will presently be explained.

Intermediate its ends, the platform 30 carries therein the power unit and other heavy machinery units as required for the driving of the drums and for the control of the crane elements; these units, as shown in Fig. 3, being carried on a suspended or underslung machinery deck designated by numeral 34. The power unit, in the present instance is a diesel engine and it is designated by numeral 35. Directly associated with this engine are units designated as the forward and reverse gearing unit 36 and reduction gearing unit 37, through which operative connections are made by conventional means not herein shown or described in detail, whereby the above mentioned cable winding drums are controlled.

Suspended from the previously mentioned bridge 26 and parallel therewith, is the container lifting frame or spreader frame 40. This is of rectangular form, with a length and width corresponding to the length and width of the containers that are to be handled. This frame 40 is horizontally disposed and is equipped at its four corners with suitable means, indicated at 42 in Fig. 3, for making a quick lifting connection with the upper corner portions of the containers.

In Figs. 2 and 3, a container 12 which has been especially designed for the present use, is shown to be of an elongated box-like form, in dimensions which permit it, when supported by frame 40 as held suspended from the bridge 26, as in Fig. 3, to be moved laterally between the upright legs 16—16 of the base frame structure and beyond the sides of the ship, as to the position in which it is shown at the right hand side of Fig. 2.

The bridge 26 is equipped at its opposite ends with supporting wheels 52—52, in tandem as shown in Fig. 2, adapted for travel on the rails 25—25. Provision for extending the lateral travel of the bridge 26 substantially beyond the sides of the ship is effected by equipping the crane, at the opposite ends of each of the two transverse beams 18—18 with extension arms 55 of the cantilever form shown in Fig. 2. Each arm 55 is pivoted at its inner end to the end of a beam 18 by a horizontal hinge shaft 56 and is adapted to be swung downwardly from the horizontal position shown to be in inactive, depending position. When in their extended positions, these arms serve as extensions of the corresponding beams 18. When in their extended positions, the arms 55 are supported by brace beams 57 that are connected at their outer ends by pivot pins 58 to brackets 59 on the underside of the arms, and at their inner ends are seated against and fixed in shoulders 60 formed on the frame legs 16. Each extension arm 55 mounts a rail 61 lengthwise thereon which, in effect, is a continuation of the rail 25 carried on the corresponding beam 18.

It is to be understood that, with the arms 55 extended to the opposite sides of the ship, as has been shown in Fig. 2, the bridge 26 as supported for travel by the wheels 52—52 can travel to the full width or span of the crane structure, thus providing for the pick up of container for conveyance from the hold of the ship to dock, or from dock to ship.

The travel of the crane along the ship on the rails 13—13 is effected and controlled through a cable system which has been schematically shown in Fig. 4. In this view, 70 and 70', designate cables that are wound on the drums 33 and 33' respectively, with their opposite end portions extended over sheaves 71—71' mounted on the crane structure at one side thereof, thence extend downwardly about sheaves 72—72, mounted on the lower side frame structure, and from the latter sheaves they extend toward forward and aft ends of the ship where they are anchored to turnbuckle devices, as at 73 and 73'. Thus, through the driving of the drums 33—33' in opposite directions, the crane can be moved along the ship in opposite directions. Holding of the drums against turning, holds the crane against travel.

For moving the bridge 26, transversely of the ship, the cable system of Fig. 5 is employed; this same arrangement of cables being applied at each end of the platform 30. In this system, a cable 75 is wound on drum 31, with opposite end portions extended therefrom to the opposite sides of the crane, passing about sheaves 76—76', thence toward each other and connected at their ends to the traveling frame 26. The driving of the drums 31—31' in opposite directions thus effects and controls the movement of the bridge transversely of the ship.

For the lowering and raising of the load carrying or spreader frame 40, the cable system of Fig. 6 is employed; this same system being used at opposite ends of the bridge 26. This system comprises a load lifting cable 80 extended from the drum 32 about a sheave 81, at the outer end of one of the arms 55, thence back to the traveling frame 26 where it passes over a sheave 82 on the latter, thence downwardly and about a pulley wheel 83 on the load carrying frame 40 thence upwardly about a sheave 84 on the traveling frame and thence to an anchoring turn buckle 85 at the outer end of the extension arm 55 that is opposite that first mentioned. The paying out or winding in of this cable 80 from drum 32 lifts or lowers the load as fixed to frame 40, accordingly. For traveling the load, it is lifted to the position shown in Fig. 3.

With the crane so mounted for travel along the deck of the ship, and having the bridge 26 mounted therein for travel laterally to the full extent of the lateral arms 55, and the load lifting frame 40 supported for vertical lifting and lowering of loads, the transfer of containers from dock to ship and from ship to dock can be expeditiously accomplished, and without the shifting in the crane structure, of any of the heavy equipment as supported by the crane platform 30.

By use of the "fixed machinery" in lieu of the usual traveling machinery, the heretofore objectionable oscillating or listing of the vessel during loading operations is overcome.

What I claim is:

1. In combination with a sea going vessel having a weather deck, an open hatch in the deck and a cargo loading and unloading crane mounted for travel on the vessel in a direction lengthwise thereof; said crane comprising an upstanding rigid frame straddling the cargo hatch and including a pair of fore-and-aft spaced standards rising from the deck on each side of the hatch, a longitudinal side beam rigidly connecting the lower end portions of each pair of standards, spaced transverse beams each rigidly coupling the top of a standard of one pair with the top of an opposite standard of the other pair and said beams being continued laterally beyond the outer sides of the adjacent standards, a platform structure supported on said transverse beams and arching across the space therebetween at a substantial elevation above the beams and comprising a horizontal beam having vertical supporting leg portions fixed at their lower ends upon said transverse beams at locations midway between the ends of the latter, track rails upon and extending longitudinally of said transverse beams upon the inner sides of the platform leg portions, an elongate traveling bridge extending across between said transverse beams and lying in a horizontal plane passing between said transverse beams and the platform beam, supporting wheels upon the ends of said bridge and resting upon said track rails, a lifting frame, cable means suspending the lifting frame from said bridge, an underslung machinery deck carried by said platform beam, power mechanism carried on said machinery deck, an operative connection between said cable means and the power mechanism for effecting raising and lowering of the lifting frame, power

transmitting means between the power mechanism and the bridge for moving the latter on said tracks, and means driven by the power mechanism for moving said frame lengthwise of the vessel.

2. In combination with a sea going vessel having a weather deck, an open hatch in the deck and a cargo loading and unloading crane mounted for travel on the vessel in a direction lengthwise thereof; said crane comprising an upstanding rigid frame straddling the cargo hatch and including a pair of fore-and-aft spaced standards rising from the deck on each side of the hatch, a longitudinal side beam rigidly connecting the lower end portions of each pair of standards, spaced transverse beams each rigidly coupling the top of a standard of one pair with the top of an opposite standard of the other pair and said beams being continued laterally beyond the outer sides of the adjacent standards, a platform structure supported on said transverse beams and arching across the space therebetween at a substantial elevation above the beams and comprising a horizontal beam having vertical supporting leg portions fixed at their lower ends upon said transverse beams at locations midway between the ends of the latter, track rails upon and extending longitudinally of said transverse beams upon the inner sides of the platform leg portions, an elongate traveling bridge extending across between said transverse beams and lying in a horizontal plane passing between said transverse beams and the platform beam, supporting wheels upon the ends of said bridge and resting upon said track rails, extension arms pivotally connected to the laterally extended ends of said transverse beams for swinging from a depending position to a horizontal position, said arms carrying track rails for alignment with the first named track rails, removable bracing means between said arms and the adjacent standards for securing the arms in horizontal position, a lifting frame, cable means suspending the lifting frame from said bridge, power mechanism carried by said platform, an operative

connection between said cable means and the power mechanism for effecting raising and lowering of the lifting frame, power transmitting means between the power mechanism and the bridge for moving the latter on said first named track rails and on the track rails of the extension arms, and means driven by the power mechanism for moving said frame lengthwise of the vessel.

3. The invention according to claim 1, wherein the said power transmitting means between the power mechanism and the bridge comprises cable carrying drums carried by the platform, a drive connection between the drums and the power mechanism for driving the drums in opposite directions, the cables running from the drums to sheaves secured at remote points on opposite sides of the frame structure and thence back to and secured to opposite sides of the bridge.

4. The invention according to claim 1, wherein the last stated means comprises a pair of cable carrying drums carried by the platform at one end of the latter, the cable from each drum having its two ends passing about sheaves carried by the frame and located adjacent to the lower ends of said standards and then extending in opposite directions longitudinally of the ship and fixed to remotely located terminals.

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