Nov. 12, 1963 W. T. SPARROW ETAL 3,110,403

CARGO HANDLING APPARATUS

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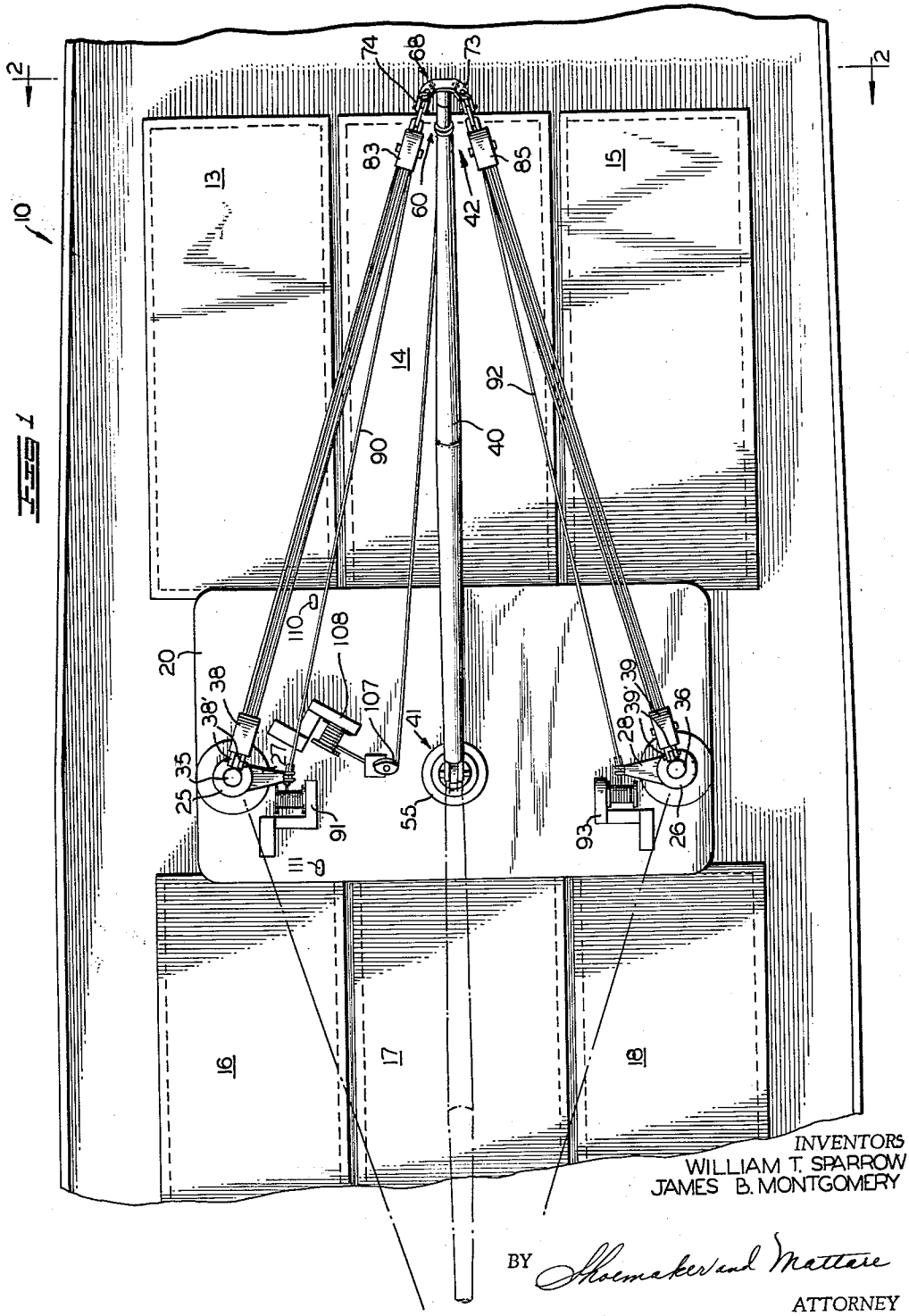


FIG. 1

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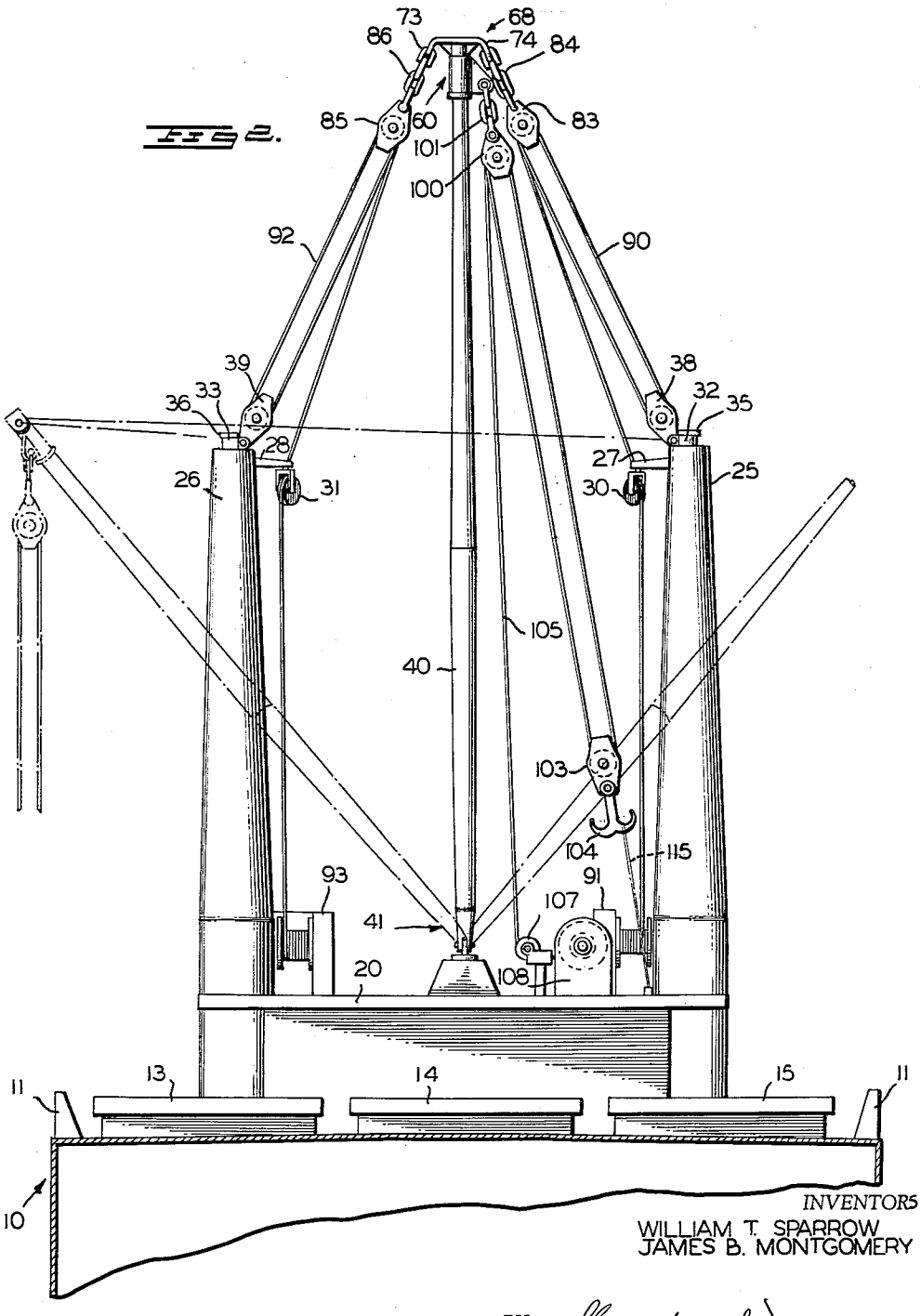
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CARGO HANDLING APPARATUS

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Fig 2.



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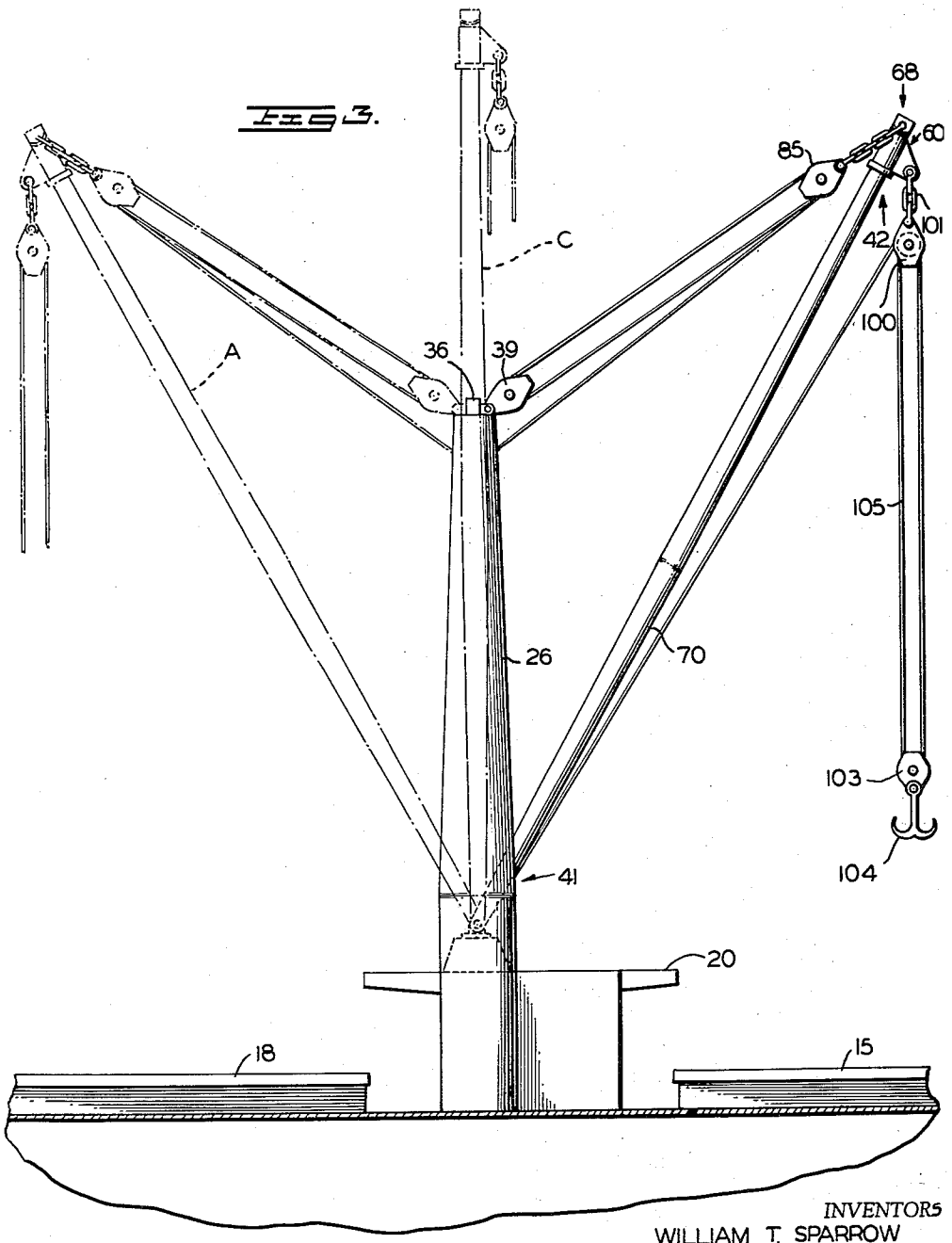
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CARGO HANDLING APPARATUS

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Fig 3.



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CARGO HANDLING APPARATUS

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Fig 4.

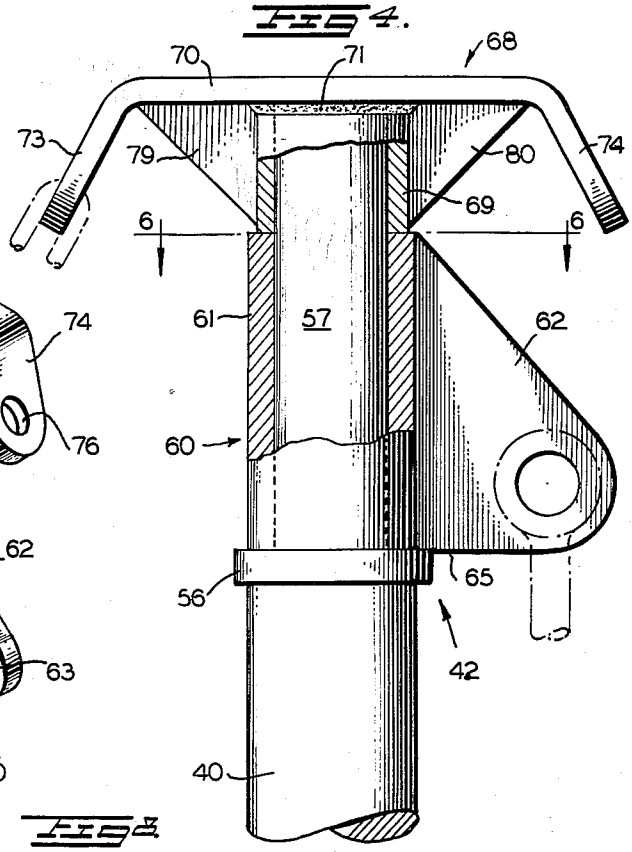


Fig 5.

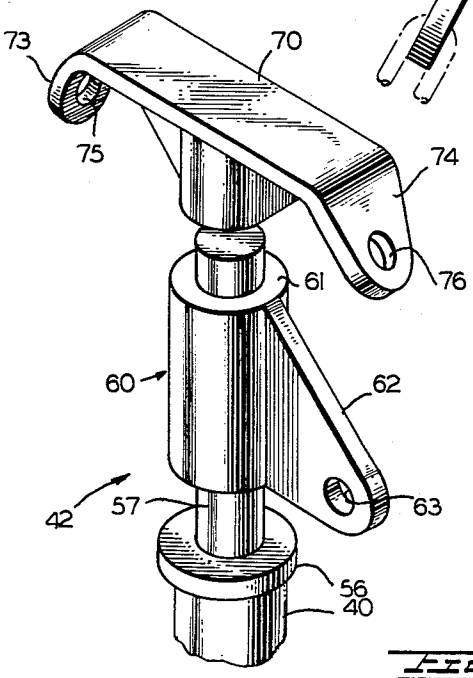


Fig 6.

Fig 7.

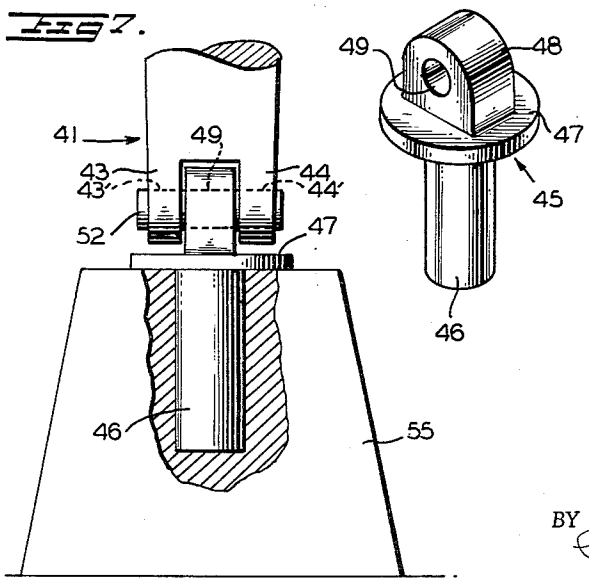
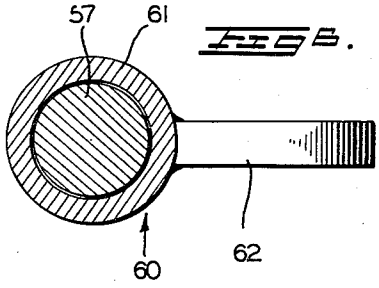


Fig 8.



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United States Patent Office 3,110,403 Patented Nov. 12, 1963

3,110,403

CARGO HANDLING APPARATUS

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Filed Jan. 31, 1962, Ser. No. 170,165
11 Claims. (Cl. 212—3)

The present invention relates to new and novel cargo handling apparatus, and more particularly to heavy lift gear.

In addition to the conventional rig employed for loading and discharging cargo, cargo vessels are generally provided with a heavy lift or "jumbo" boom for handling cargo which is too heavy to lift with the regular ship's gear. Since this heavy lift gear adds top weight and is expensive to install and maintain, it is usually rigged at only one hatch of the ship. Sometimes provision is made for utilizing the same heavy lift gear at an additional hatch by dismantling the heavy lift gear, removing it, and then reassembling it. The extra fittings required for carrying out this procedure add to the weight and expense of the rig and the operation is very time-consuming.

Accordingly, it is desirable to provide an arrangement whereby the same heavy lift boom structure can be employed at more than one hatch, that is to say, at one hatch forward of the boom step and at another hatch aft of the boom step. Prior art arrangements have been provided for utilizing the same heavy lift boom at two different hatches without disassembling the gear, but such prior art arrangements require the use of special, complicated and expensive fittings and mechanisms, and further require careful coordination of operations when switching from one hatch to another.

The arrangement of the present invention provides a heavy lift boom arrangement which is constructed to be employed with equal facility at a hatch both fore and aft of the boom step. No special blocks or complicated mechanisms are required in the present invention, and a particular advantage of the arrangement herein disclosed is that equipment readily available in conventional rigs can be employed for shifting the boom for use at either hatch.

In the arrangement of the present invention, the heel of the boom is mounted for substantially universal movement, and a topping lift attachment means is rigidly secured to the head portion of the boom, this attachment means being swivelly connected to a topping lift which is in turn connected with topping lift blocks supported at the upper ends of the king posts of the mast structure. The arrangement is such that the heavy lift boom can be swung fore and aft through a plane extending through the longitudinal axes of the king posts.

The cargo fall of the present invention includes an upper purchase block which is supported from a cargo fall support means mounted at the head portion of the boom. This cargo fall support means is rotatably mounted with respect to the boom and is axially fixed with respect thereto. This permits the cargo fall support means to be swung from side to side of the boom such that in moving from one hatch to another, the cargo support means can be swung through an angle of 180° for disposing the upper purchase block in proper operative position with respect to the boom over either of the two hatches with which the boom is employed.

The boom can be readily swung through the aforedescribed plane and the cargo fall support means rotated by attaching a pendant to the cargo hook and pulling the hook and lower purchase block through between the king posts, the pendant being lead through a guide in the

form of a padeye or the like and thence to a winch or other suitable means for applying the necessary force to the pendant.

A particular advantage in the operation of the device when moving from one hatch to the other is that it is only necessary to operate the topping gear while the hoisting gear remains idle. The apparatus is easily operated with a minimum of effort and with very little chance of damage due to mishandling or improper maintenance, and furthermore, replacement parts are readily available.

An object of the present invention is to provide cargo handling apparatus including a heavy lift boom arrangement constructed so as to be used with two different hatches, one forward and one aft of the boom step.

Another object of the invention is the provision of new and novel cargo handling apparatus including a heavy lift boom wherein no special blocks or complicated mechanisms are required.

A further object of the invention is to provide cargo handling apparatus including a heavy lift boom wherein the hoisting gear may remain idle when moving the boom from a position to operate with one hatch to a position to operate with another hatch.

Still another object of the invention is to provide cargo handling apparatus including a heavy lift boom arrangement which may be easily operated with a minimum of effort with little chance of damage from mishandling or improper maintenance and wherein replacement parts may be readily obtained.

A still further object of the invention is the provision of cargo handling apparatus which is relatively simple and inexpensive in construction, and yet which is sturdy, reliable and efficient in use.

Other objects and many attendant advantages of the invention will become more apparent when considered in connection with the specification and accompanying drawings, wherein:

FIG. 1 is a plan view of the apparatus according to the present invention as mounted on a ship;

FIG. 2 is an end view of the apparatus shown in FIG. 1 taken along line 2—2 of FIG. 1, looking in the direction of the arrows in an intermediate position wherein the boom apparatus is being moved from a position over one hatch to a position over the other hatch;

FIG. 3 is a side view of the apparatus shown in FIG. 1 with the winch mechanism removed;

FIG. 4 is a view partly in section through the outer end portion of the head of the boom and illustrating the details of construction of the topping lift attachment means and the cargo fall support means;

FIG. 5 is a perspective exploded view illustrating the manner of assembly of the components shown in FIG. 4;

FIG. 6 is a sectional view taken substantially along line 6—6 of FIG. 4 looking in the direction of the arrows;

FIG. 7 is a view partly broken away illustrating the mode of mounting the heel portion of the boom; and

FIG. 8 is a perspective view of one of the components shown in FIG. 7.

Referring now to the drawings wherein like reference characters designate corresponding parts throughout the several views, as seen most clearly in FIGS. 1–3, a portion of a cargo ship is indicated generally by reference numeral 10, the upper deck of the ship having the usual bulwarks 11 extending fore and aft at the sides of the deck, a forward hold having three hatch covers 13, 14 and 15 disposed thereover, and an aft hold having three hatch covers 16, 17 and 18 disposed thereover.

A winch house 20 is disposed between the fore and aft hatches and serves to support the heavy lift gear mechanism hereinafter described. It should be understood

that the usual ship's gear for loading and discharging cargo would also be mounted on and adjacent to the winch house, but the conventional gear has been eliminated from the drawings for the sake of simplicity in order that the heavy lift boom mechanism may be more readily understood. For example, the conventional gear which may be employed along with the heavy lift boom mechanism as shown herein may be of the type as shown in "Marine Cargo Operations" by Charles L. Sauerbier, published by John Wiley & Sons, copyrighted 1956.

A pair of king posts 25 and 26 extend upwardly from the winch house 20, the king posts being spaced apart athwartships as shown particularly in FIG. 1, and being of a symmetrical tapered configuration as indicated in FIG. 2.

A pair of laterally inwardly projecting lead block brackets 27 and 28 are provided, these lead block brackets being respectively fixed to the upper end of king posts 25 and 26. Single topping lift lead blocks 30 and 31 are movably supported from brackets 27 and 28 respectively.

A pair of swivel members 32 and 33 are rotatably supported on upwardly extending journal portions provided at the top of the king posts 25 and 26 respectively, the king posts including cap plate members 35 and 36 respectively which extend in overlying relationship to the journal portions for retaining the swivel member in operative position as shown. A pair of multiple sheave topping lift king post blocks 38 and 39 are provided, these blocks each including a pair of spaced integral ears 38' and 39' respectively, these ears being pivotally supported by the outwardly projecting end portions of swivel members 32 and 33 respectively, whereby these blocks are pivotally supported by the respective swivel members which are in turn rotatably supported at the upper ends of the king posts.

A heavy lift boom 40 is provided, this boom being provided with a lower or heel portion indicated generally by reference numeral 41, and an upper or head portion indicated generally by reference numeral 42. The boom is mounted such that the lower or heel portion thereof is substantially universally mounted, and as seen particularly in FIG. 7, the heel portion of the boom is bifurcated so as to provide two downwardly extending spaced portions 43 and 44 having bores 43' and 44' formed therethrough respectively. A boom support member as seen particularly in FIG. 8 indicated generally by reference numeral 45 is provided with a downwardly extending substantially cylindrical shank portion 46, an outwardly extending annular flange 47 being formed at an intermediate portion thereof, and an upwardly extending portion 48 being provided with an opening 49 extending completely therethrough.

As seen in FIG. 7, a heel pin 52 is supported within the aligned openings 43', 44' and 49 for pivotally supporting the boom about the axis of the heel pin. In addition, the shank portion 46 of the support member is rotatably supported within a recess provided in the boom pedestal 55, and accordingly, the support member 45 is adapted to rotate about the vertically extending longitudinal axis thereof with respect to the boom pedestal.

As will be noted particularly in FIG. 1, the boom pedestal is disposed at a central portion of the winch house 20, and the vertical axis of rotation of support member 45 is disposed along a center line passing through the longitudinal axes of the two king posts 25 and 26. It will also be understood that the horizontal boom heel pin axis is centered about the vertical axis of support member 45.

Referring now to FIGS. 4 and 5, the head portion 42 of the heavy lift boom is shown, and an enlarged annular collar 56 is formed on the boom, the outermost end portion 57 of the boom being of reduced diameter. A cargo fall support means or sleeve 60 is provided, this sleeve including a main tubular portion 61 which has a bore therethrough adapted to snugly receive the reduced portion 57 of the boom, whereby the support means is adapted to rotate about the longitudinal axis of the boom. Formed integral with the main tubular body portion 61 is a laterally extending pad 62 having an opening 63 provided through the outer portion thereof for supporting the upper purchase block hereinafter described.

As seen in FIG. 5, when assembling the apparatus at the head portion of the boom, the cargo fall support means 60 is slipped over the reduced end portion 57 of the boom and slid thereon to a point such that the lower edge portion 65 thereof engages the annular collar 56 formed on the boom, thereby limiting axial movement of the support means.

A topping lift attachment means indicated generally by reference numeral 68 comprises a tubular body portion 69 having a bore therein which snugly receives the outermost part of the reduced end portion 57 of the boom, a main spinning plate member 70 being secured as by welding indicated at 71 to the outermost end portion of tubular body portion 69, plate 70 being elongated as particularly seen in FIG. 5 with a pair of angularly spaced ears 73 and 74 at the opposite ends thereof, these ears being provided with openings 75 and 76 formed therethrough respectively.

In order to reinforce and strengthen the structure of the topping lift attachment means, a pair of gusset plates 79 and 80 are welded between the outer surface of tubular body portion 69 and the under surface of plate member 70. After having placed the cargo fall support means 60 in operative position as aforedescribed, the topping lift attachment means 68 is slipped over the outermost end of the reduced portion 57 of the boom and then suitably secured in operative position as by welding or any other suitable means.

After the completion of this assembly, it is apparent that member 68 is fixed to the outer end of the boom while member 60 is fixed against axial movement with respect to the boom since the lower end of tubular portion 69 of the member 68 is adjacent the upper end of the tubular portion 61 of member 60, while member 60 is additionally free to rotate with respect to the boom about the longitudinal axis of the boom.

It is also important to note that the topping lift attachment means 68 is disposed such that the longitudinal axis of member 68 is parallel with the axis of the boom heel pin 52 and furthermore, fitting 68 is symmetrical about a plane passing through the boom axis and the boom heel pin axis. A multiple sheave topping lift boom head block 83 is connected by means of a chain 84 to ear 74 of fitting 68, and a similar multiple sheave topping lift boom head block 85 is connected by means of chain 86 to ear 73 of fitting 68. It is apparent that chains 84 and 86 will serve to swivelly connect the associated blocks 83 and 85 to the associated ears of fitting 68.

A topping lift cable 90 is reeved through topping lift blocks 38, 83 and 30 and passes downwardly and is connected either to a topping winch 91 or through a fair lead and thence to the winch. A topping lift cable 92 is reeved through topping lift blocks 39, 85 and 31 and to a second topping winch 93 or through a suitable fair lead and thence to the topping winch. It is apparent that the topping lifts are attached to the tops of the king posts in such a manner that it will provide a wide range of operation from forward-and-outboard through any inboard angle to aft-and-outboard.

In operation, either fore or aft of the king posts, the boom is handled just like a conventional split topping rig, and it will be seen that in FIG. 1, the boom is disposed over the forward hatch.

As seen particularly in FIGS. 2 and 3, an upper purchase block 100 is supported by suitable means such as a chain or the like 101 from the pad 62 of the cargo fall support means 60. A lower purchase block 103 has

supported therefrom a conventional cargo hook 104, and a cargo fall cable 105 is reeved through the upper and lower purchase blocks and thence downwardly through a cargo purchase lead block 107 to a cargo winch 108. It will be noted that the cargo purchase lead block is disposed abreast the heel of the boom and is disposed substantially along a center line extending between the longitudinal axes of the king posts. A pair of guide means 110 and 111 which may be in the form of padeyes or the like are secured to the upper surface of the winch house, guide means 110 being disposed at the forward end of the house and guide means 111 being disposed at the aft end of the house. It will be noted as seen in FIG. 1 that these guide means 110 and 111 are disposed on opposite sides of a plane extending through the longitudinal axes of the king posts, and it will be further noted that the guide means are offset laterally, that is to say, to the port side of the heel portion of the boom, the cargo purchase lead block 107 also being offset laterally on the same side of the heel portion of the boom.

Assuming that the heavy lift boom is initially employed for loading and unloading with respect to the forward hatch, and it is desired to shift the boom such that it can be operated in conjunction with the aft hatch, the topping lift mechanism is utilized to swing the boom toward the plane passing through the axes of the king posts, and the boom is topped as high as possible, utilizing the topping lift gear, the hoist gear being idled during this operation. A pendant or other suitable means is then attached to the cargo hook, this pendant being indicated by phantom line 115 in FIG. 2. The pendant is then preferably passed through the guide means 111 and thence to a winch or other suitable means. Then, by pulling on the pendant the cargo hook is pulled through between the boom and king post 25, that is to say, the cargo hook is swung around on the same side of the boom as the cargo purchase lead block. By so pulling on the pendant, the cargo fall support means 60 will be rotated through an angle of approximately 180°, and the boom head will pass over dead center through the plane passing through the longitudinal axes of the two king posts, and the boom mechanism will then be in position to be lowered on the aft side of the king post for operating with the aft hatch, it being evident that the cargo purchase blocks will then be in the proper working position below the boom.

In moving the boom back again for operation with the forward hatch, the procedure is reversed, the boom first being topped as high as possible from the aft hatch, a pendant then being attached to the cargo hook, and the pendant then being passed through guide means 110 and thence to a winch or the like. Pulling on the pendant will then serve to pull the cargo hook and lower purchase block back between the boom and king post 25, the cargo fall support means 60 again rotating through an angle of approximately 180° and the boom moving back over dead center to the forward side of the king posts.

It is important to note that during movement of the boom from a forward to an aft position and vice versa, it is merely necessary to operate the topping lift gear while the hoisting gear remains idle. This eliminates the necessity of providing any coordination of operation of the hoisting and the topping lift gears during the shifting process.

It will also be noted that FIG. 2 indicates the position of the components during movement of the cargo hook and lower purchase block from one side to the other, with the cargo fall support means 60 being shown in the position it occupies after rotating approximately 90°.

The phantom line positions shown in FIG. 2 indicate outboard positions of the boom.

FIG. 3 illustrates in solid lines the position of the boom over the forward hatch, while the position indicated by phantom line C indicates the approximate dead center line of the boom, phantom line position A of this figure illustrating the position of the boom in overlying relationship to the aft hatch.

In addition to the specific arrangement shown, it will be apparent to one skilled in the art that the rig as described above can be modified to permit the use of dual leads from the upper cargo purchase block to two winches, or to permit the use of an upper cargo lead block near the upper cargo purchase block.

It is apparent from the foregoing that there is provided new and novel cargo handling apparatus including a heavy lift boom construction which may be utilized with two hatches, one of the hatches being disposed forward of the boom step and one of the hatches being disposed aft of the boom step. No special blocks or complicated mechanisms are required for operating and shifting the boom mechanism, and the hoisting gear remains idle while the boom is being shifted from a forward to an aft position and vice versa. The components necessary for operating the structure are readily available, and the arrangement may be easily operated with little chance of damage from mishandling or improper maintenance.

Replacement parts are, of course, readily available for this type of apparatus. The over-all structure is quite simple and inexpensive in construction, and yet is sturdy, reliable and efficient in use.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, and since the scope of the invention is defined by the appended claims, all changes that fall within the metes and bounds of the claims or that form their functional as well as conjointly cooperative equivalents are therefore intended to be embraced by those claims.

We claim:

1. Cargo handling apparatus comprising a mast structure, a heavy lift boom having a heel portion and a head portion, means mounting the heel portion of the boom for substantially universal movement, topping lift means connected between said mast structure and said boom, cargo fall support means mounted at the head portion of said boom, said cargo fall support means being movably mounted with respect to said head portion, and cargo fall means supported by said cargo fall support means, and means for receiving and guiding a portion of said cargo fall means and being offset laterally on only one side of said boom to permit the boom to be moved into any operative position without removing the cargo fall means from the associated receiving and guiding means.

2. Cargo handling apparatus comprising a mast structure including a pair of spaced king posts, a heavy lift boom having a heel portion and a head portion, means universally mounting the heel portion of the boom between said king posts for movement about vertical and horizontal axes, topping lift attachment means fixedly connected to the head portion of said boom, topping lift means connected between said mast structure and said topping lift attachment means, cargo fall support means mounted at the head portion of said boom and being rotatable with respect to said boom, and cargo fall means supported by said cargo fall support means, and means for receiving and guiding a portion of said cargo fall means and being offset laterally on only one side of said boom and disposed substantially on a center line between said king posts.

3. Cargo handling apparatus comprising mast structure including a pair of spaced king posts, a heavy lift boom having a heel portion and a head portion, means mounting said heel portion substantially on a center line extending between said king posts for substantially universal movement, topping lift attachment means fixedly secured to the head portion of said boom, topping lift means connected between said king posts and said topping lift attachment means, cargo fall support means mounted at the head portion of said boom and being

rotatably mounted with respect to the boom but axially fixed with respect thereto, and cargo fall means supported by said cargo fall support means.

4. Apparatus as defined in claim 3 including a cargo purchase lead block for receiving and guiding a portion of said cargo fall means, said cargo purchase lead block being disposed abreast the heel portion of the boom and substantially on a center line between said king posts.

5. Cargo handling apparatus comprising mast structure including a pair of spaced king posts, a heavy lift boom having a heel portion and a head portion, said boom being pivotally supported on a heel pin and being mounted for pivotal movement about the heel pin axis, said heel pin being mounted for swinging movement about a vertical axis to provide a universal mounting for said boom, topping lift attachment means fixedly mounted at the head portion of said boom and being substantially symmetrical about a plane passing through the longitudinal axis of the boom and the boom heel pin axis, topping lift means connected between said king posts and opposite end portions of said topping lift attachment means, cargo fall support means mounted at the head portion of said boom adjacent said topping lift attachment means and being mounted for rotation with respect to said boom about the longitudinal axis of the boom, and cargo fall means supported by said cargo fall support means.

6. Apparatus as defined in claim 5, including a cargo purchase lead block for receiving and guiding a portion of said cargo fall means, said cargo purchase lead block being mounted substantially on a center line extending between said king posts.

7. Apparatus as defined in claim 6, including a pair of guide means disposed on opposite sides of a plane extending through the longitudinal axes of said king posts, said guide means being offset laterally with respect to said boom on the same side as said cargo purchase lead block.

8. Cargo handling apparatus comprising mast structure including a pair of spaced king posts, a lead block bracket secured to the upper end portion of each of said king posts, a topping lift lead block movably mounted on each of said brackets, a topping lift swivel rotatably mounted at the upper end portion of each of said king posts, a topping lift block movably supported by each of said swivels, a heavy lift boom having a head portion and a heel portion, means mounting the heel portion of said boom substantially along the center line extending between said king posts for substantially universal movement, topping lift attachment means secured to the head portion of said boom and fixed against rotation relative thereto, a topping lift block swivelly connected to each opposite end portion of said topping lift attachment means, topping lift means reeved through said topping lift blocks, cargo fall support means mounted at the head portion of said boom and being rotatable with respect to said boom about the longitudinal axis of said boom and being axially fixed with respect to said boom, and cargo fall means supported by said cargo fall support means.

9. Apparatus as defined in claim 8, wherein said cargo fall means includes an upper purchase block supported by said cargo fall support means, a lower purchase block supported from said upper purchase block, a cargo hook supported by said lower purchase block, and a cargo purchase lead block receiving and guiding a portion of said cargo fall means, said cargo purchase lead block being mounted laterally of the heel of said boom substantially along a center line extending between said king posts.

10. Apparatus as defined in claim 9, including a pair of guide means for receiving and guiding a pendant adapted to be attached to the cargo hook for transferring the boom from one side to the opposite side of a plane extending through the longitudinal axes of said king posts, said guide means being disposed on opposite sides of said plane and being offset laterally of the heel of the boom on the same side of the heel of the boom as the cargo purchase lead block.

11. Cargo handling apparatus comprising a ship having a winch house disposed at the upper portion thereof and including a first hatch disposed forwardly of said house and a second hatch disposed aft of said housing, a pair of king posts extending upwardly from said house and being spaced athwartships, a lead block bracket fixed at the upper end portion of each of said king posts, a topping lift lead block movably supported by each of said lead block brackets, a topping lift swivel rotatably mounted at the upper end portion of each of said king posts, a topping lift block movably supported by each of said swivels, a heavy lift boom having a head portion and a heel portion, said heavy lift boom being supported by said house and being mounted at its heel portion for substantially universal movement on a center line extending between said king posts, a topping lift attachment means secured to the head portion of said boom and fixed against rotation relative thereto, a topping lift block swivelly connected to each end portion of said topping lift attachment means, topping lift means reeved through said topping lift blocks, a winch connected with said topping lift means and supported by said house for selectively operating same, cargo fall support means mounted at the head portion of said boom and being rotatably mounted with respect thereto and axially fixed with respect thereto, an upper purchase block supported by said cargo fall support means, a lower purchase block supported from said upper purchase block, a cargo hook supported from said lower purchase block, a cargo purchase lead block supported by said house and being disposed abreast the heel of said boom substantially along the center line extending between said king posts, cargo fall means reeved through said cargo blocks, a winch connected with said cargo fall means and being supported by said housing, and a pair of guide means for receiving a pendant attached to the cargo hook when moving the boom from one side of a plane passing through the longitudinal axes of said king posts to the other side of said plane, said guide means being disposed on opposite sides of said plane and being offset laterally of the heel of the boom on the same side as said cargo purchase lead block.

References Cited in the file of this patent

UNITED STATES PATENTS

2,914,193	Kohnenkamp	Nov. 24, 1959

FOREIGN PATENTS

937,992	Germany	Jan. 19, 1956
1,020,544	Germany	Dec. 5, 1957