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3,236,390

SHIP'S CARGO BOOM WITH PENDULUM PURCHASE BLOCK FITTING

Filed Oct. 2, 1964

8 Sheets-Sheet 1

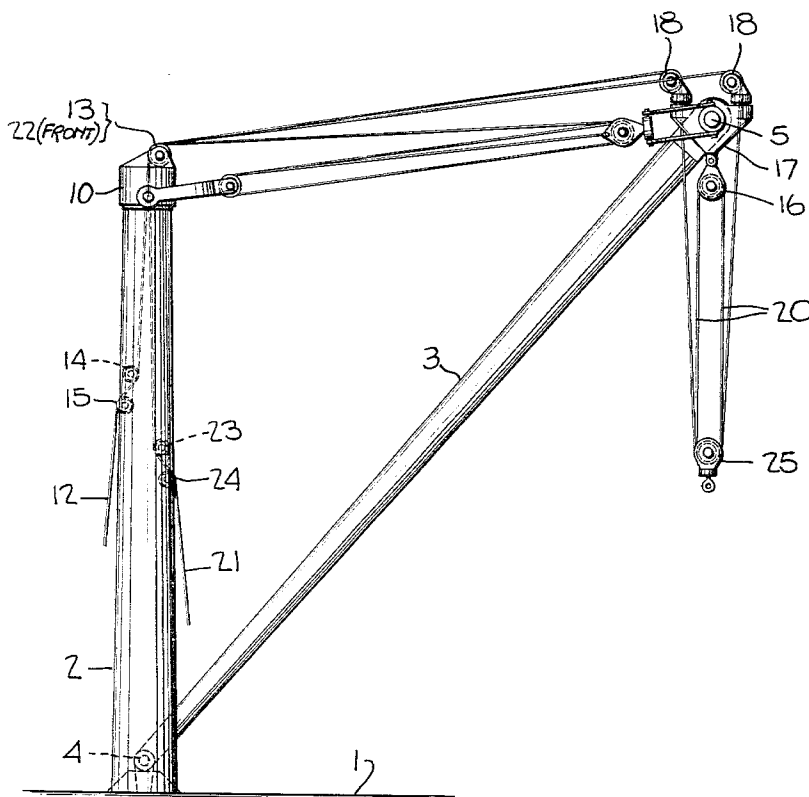


Fig. 1.

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8 Sheets-Sheet 2

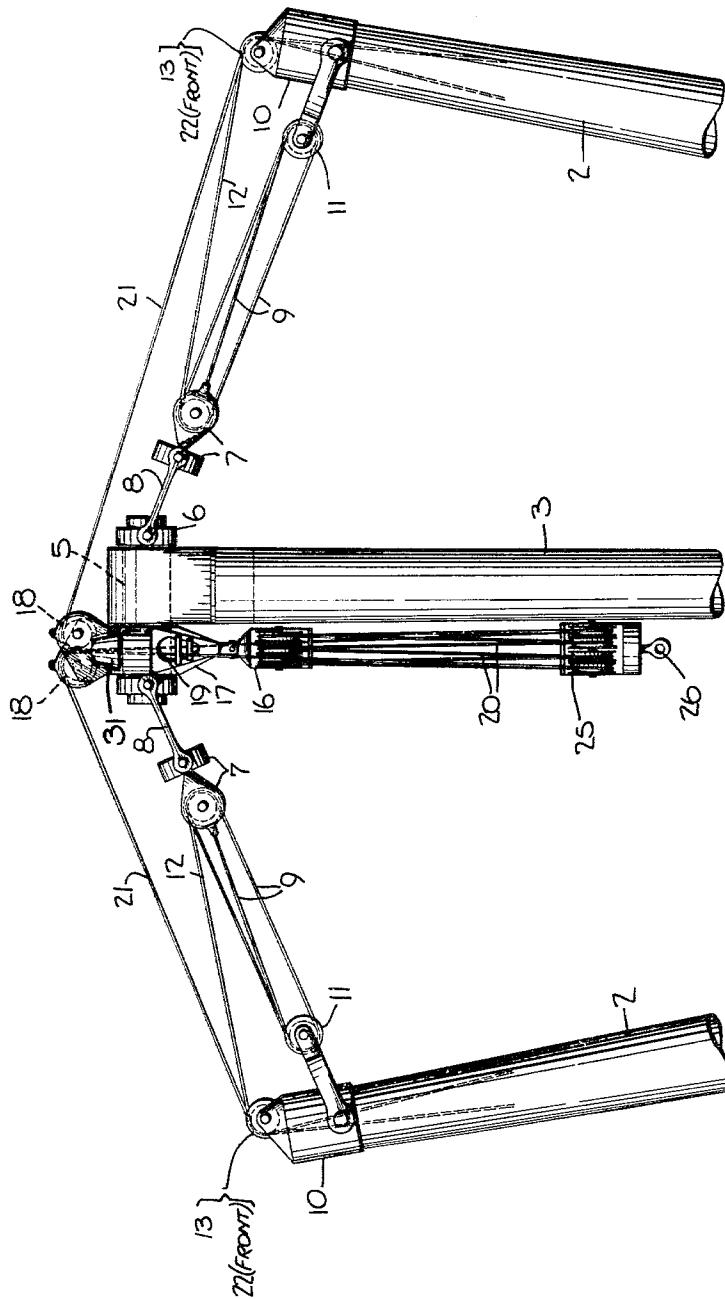


FIG. 2

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8 Sheets-Sheet 3

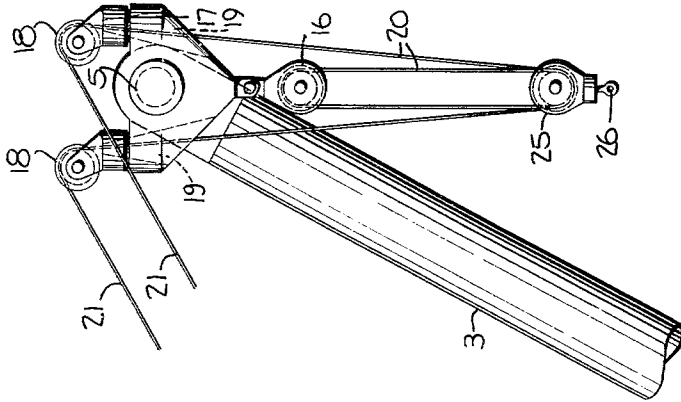


Fig. 3.

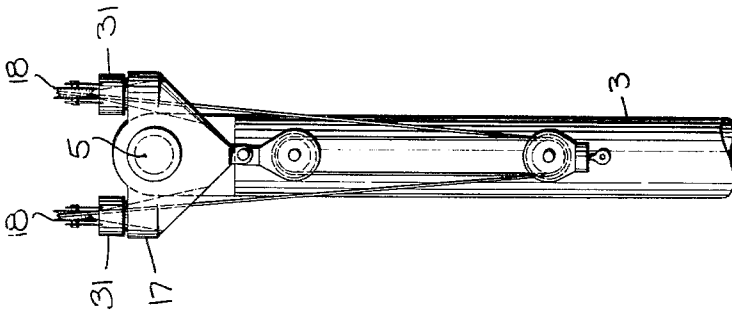


Fig. 4.

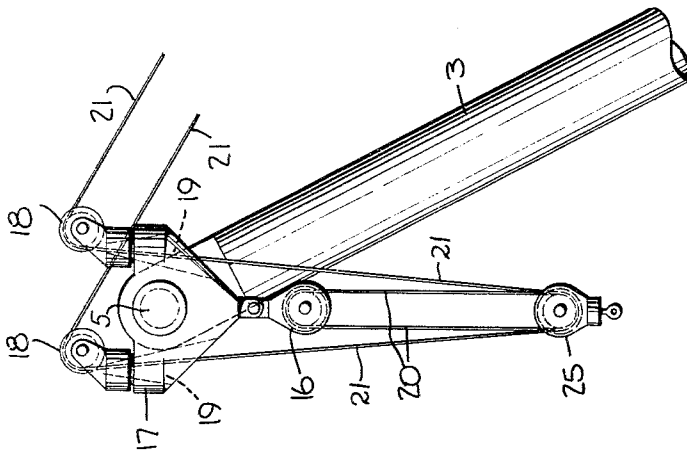


Fig. 5.

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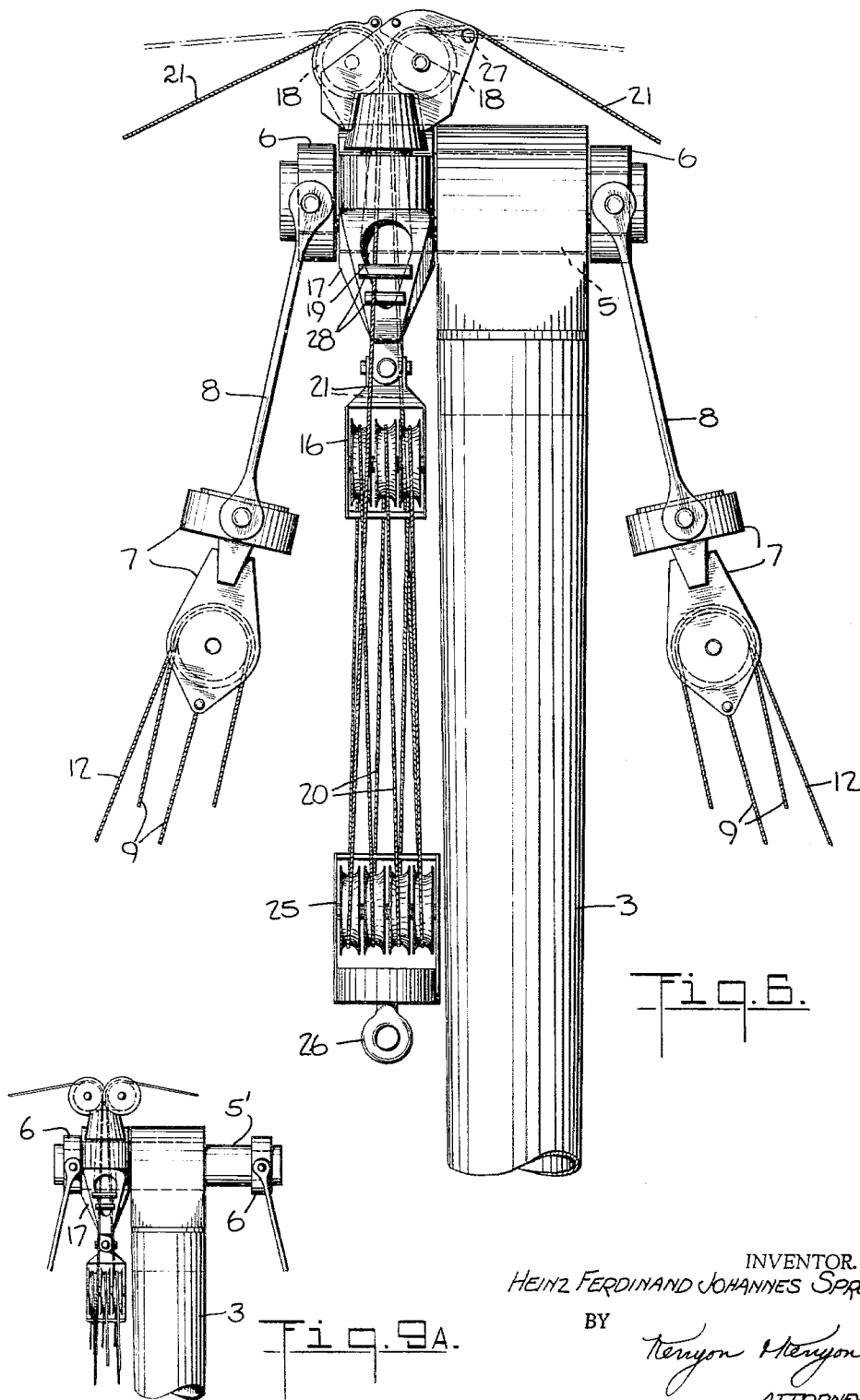
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SHIP'S CARGO BOOM WITH PENDULUM PURCHASE BLOCK FITTING

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8 Sheets-Sheet 6

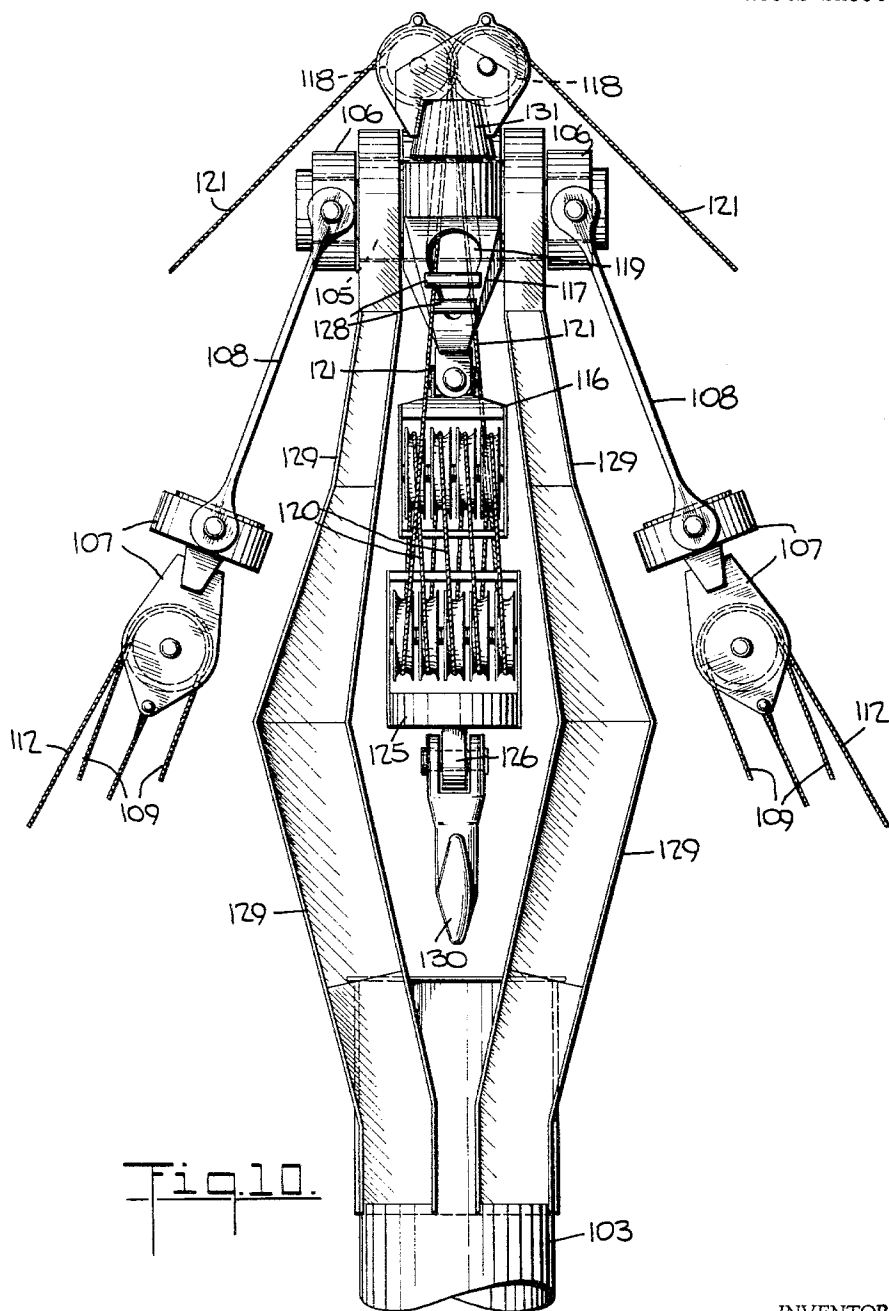


Fig. 10.

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8 Sheets-Sheet 7

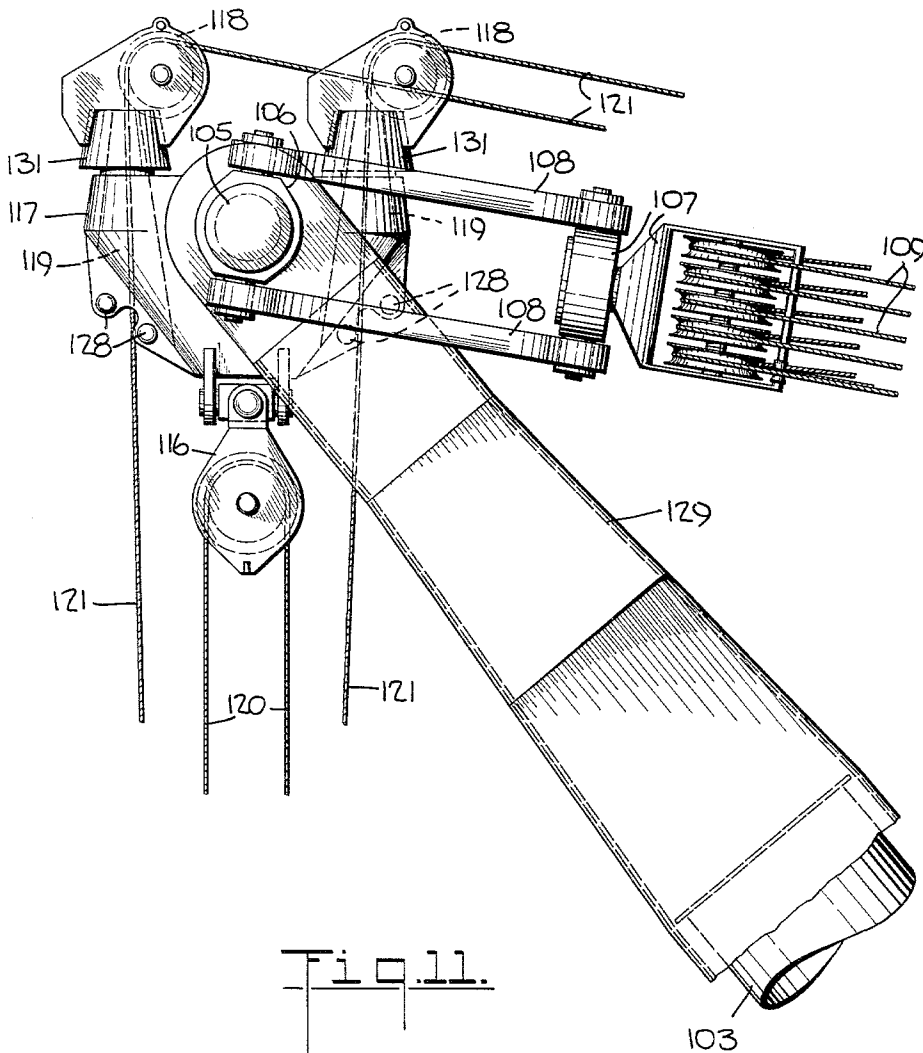


Fig. 11.

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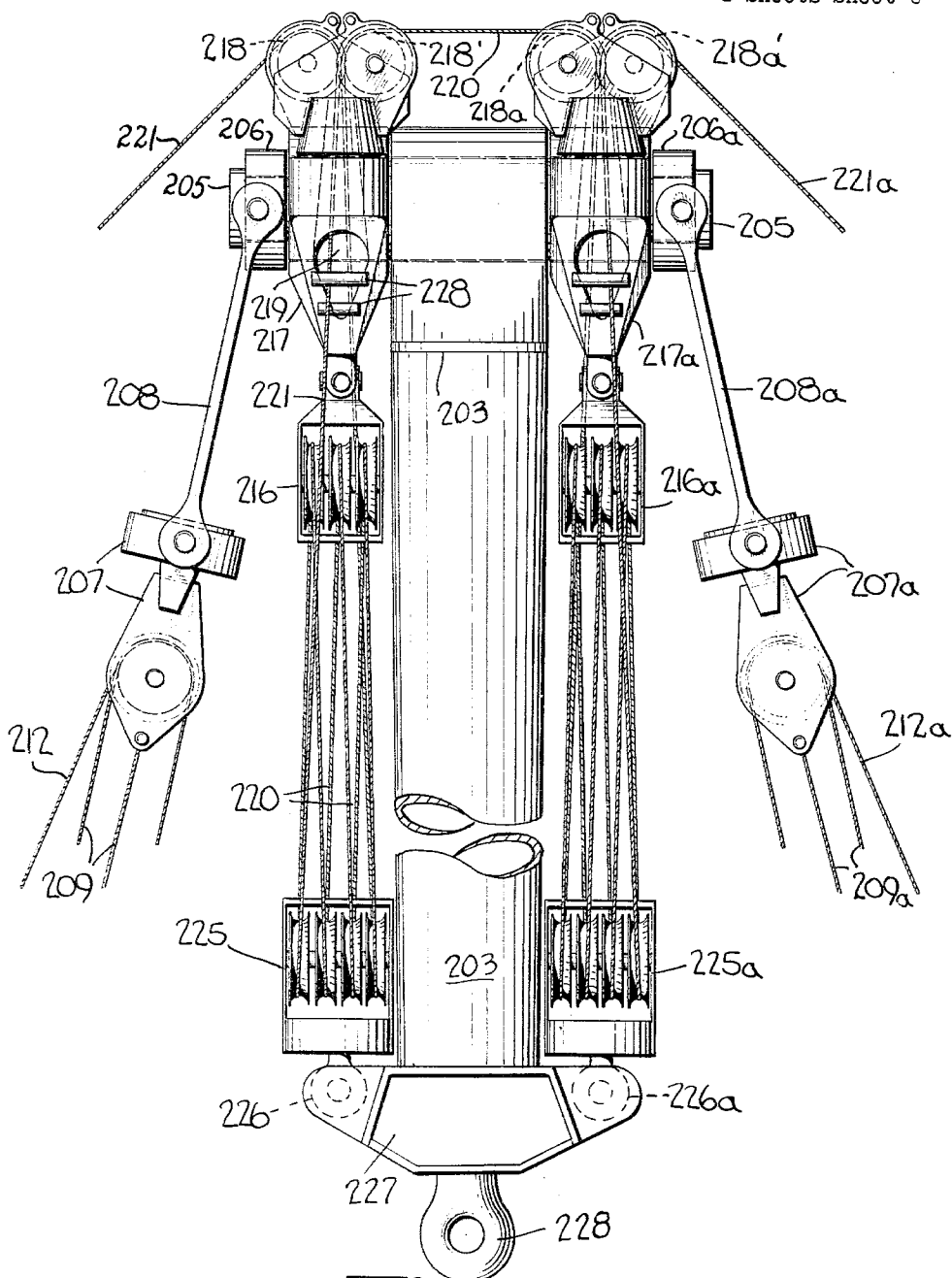


Fig. 12.

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3,236,390

SHIP'S CARGO BOOM WITH PENDULUM PURCHASE BLOCK FITTING

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Filed Oct. 2, 1964, Ser. No. 403,441

Claims priority, application Germany, Apr. 17, 1964,
St 21,981

18 Claims. (Cl. 212—3)

This application is a continuation-in-part of my co-pending application, Serial Number 361,422 for Ship's Cargo Boom With Pendulum Purchase Block Fitting, which was filed in the United States Patent Office on April 21, 1964 and which has since been abandoned.

This invention relates to a ship's loading apparatus. It relates particularly to a cargo boom for a ship. It relates more particularly to a cargo boom intended to be installed in through-swinging manner between uprights on a ship's deck to serve hatches both forward and aft of the boom mounting, and it relates still more particularly to a cargo boom of the kind described which has a pendulum purchase block fitting adapted to swing or be swung past the boom in either direction depending upon whether the boom is serving a forward or an aft hatch.

A cargo boom arrangement of the kind described above is shown generally, for example, in United States Patent No. 2,914,193, issued November 24, 1959, to J. D. Köhnenkamp et al. In the arrangement shown in this patent the lower purchase block is hauled up to interlock with the upper purchase block when the boom is to be shifted either forward or aft, and then the composite block is pivoted as an inverted pendulum through a fork in the upper end of the cargo boom to the opposite side thereof when the boom is in vertical position. The hauling parts of both the span tackles and the purchase tackles stay free and remain on their respective winch drums throughout the whole operation of shifting the boom.

Along with the advantages of the foregoing arrangement, however, there are certain operational shortcomings. As mentioned already, the lower purchase block must be pulled all of the way up to the upper purchase block in a boom shifting maneuver, after which simultaneous operation with both span winches and both purchase winches is necessary in order to swing the interlocked purchase blocks through the cargo boom fork, and then lower the lower block. This whole maneuver requires special training of and practiced coordination between the boom operating personnel, and requires furthermore a considerable amount of time. It is also practically impossible in the maneuver to swing through the Flemish hook or a cargo shackle with the required cargo straps when attached to the lower purchase block. These parts must be first removed before the operation and then attached again after swinging through.

It is an object of the present invention to simplify the swinging through maneuver so that relatively untrained operating personnel can carry it out safely and without difficulty, and to reduce the time required for this maneuver to a minimum.

It is another object of the present invention not only to permit a cargo boom to be moved in a continuous manner from a position over a forward hatch to one over an aft hatch and vice versa, but also to permit it to alternate for short periods of time between positions over the forward and aft hatches for the loading and unloading of cargo.

For the accomplishment of the foregoing objects the present invention provides a cargo boom having at least one purchase block fitting at its upper end which is mounted to swing from side to side of the boom, that is, from

forward to aft of the boom and vice versa, as a normal rather than an inverted pendulum, and which is provided with two turning heads each of which carries a guide sheave above the upper end of the boom proper. Specific embodiments of this invention include one in which the purchase block fitting is overhung on its pivot pin along-side the boom, another in which the boom is forked at its upper end with the purchase block fitting being pivotally mounted within the fork structure and thus adapted to swing through the boom, and another in which a pair of purchase block fittings are rotatively overhung along opposite sides of the boom.

In the utilization of the present invention the hauling parts of a purchase tackle are led from a lower purchase block through passages in a novel fitting from which the purchase tackle and purchase block are suspended, to and over guide sheaves on this fitting, and from there either directly to guide sheaves in hollow rotating heads on top of the uprights between which the boom is mounted and between which it swings, or intermediately to another fitting, tackle, and block arrangement similar to the first. From the guide sheaves in the heads on top of the uprights, the hauling parts are led to guide sheaves within the uprights and thence out through slots in the walls of the uprights, going finally to the drums of two cargo winches.

When the boom is swung back or forth between the adjacent uprights to serve an aft or a forward hatch, the hauling parts are carried over the top of the boom throughout its whole movement as the purchase block fitting is at all times oriented substantially vertically downwardly as a normal pendulum from its pivot point at or very close to the boom's upper end. Thus the hauling parts of the purchase tackle, led over the guide sheaves on the inventive pendulum purchase block fitting as aforesaid, do not interfere at all with the swinging through maneuver.

The nature and substance of this invention as well as its objects and advantages will be more clearly perceived and fully understood by referring to the following description and claims taken in connection with the accompanying drawings in which:

FIG. 1 represents a view in starboard side elevation of an installation of a first embodiment of a cargo boom having a pendulum purchase block fitting according to the present invention, the fitting being overhung along-side the boom, and the boom itself in this particular illustration being inclined forward;

FIG. 2 represents a somewhat enlarged view in front elevation of the upper portion of the installation of FIG. 1, the boom itself in this particular illustration being in a substantially vertical position;

FIGS. 3, 4 and 5 represent somewhat enlarged views in starboard side elevation of the upper portion of the cargo boom forming part of the installation of FIGS. 1 and 2 with the boom respectively inclined aft, in vertical position, and inclined forward;

FIG. 6 represents a further enlarged view in front elevation of the upper portion of the cargo boom forming part of the installation of FIGS. 1 and 2, the turning guide sheaves on top of the pendulum block fitting being clearly shown in respect of details as these sheaves are oriented with the boom in vertical position;

FIGS. 7 and 8 represent enlarged starboard side and front views respectively of the pendulum purchase block fitting of the present invention, showing particularly the rope passage holes through the fitting and details of the turning guide sheaves on top of the fitting as these sheaves are oriented with the cargo boom on which the fitting is mounted being inclined aft;

FIG. 9A represents a view in front elevation of the

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upper portion of a cargo boom having a pendulum purchase block fitting generally similar to the showings of FIGS. 1 and 2, but with the pivot or head pin whereby the fitting is mounted on the boom extended beyond the boom opposite the fitting to provide an attachment point for one of the span tackles such that the points of attachment of both span tackles to the boom are equally offset from the boom's longitudinal axis;

FIG. 9B represents a view in front elevation of the upper portion of a cargo boom having a pendulum purchase block fitting generally similar to the showings of FIGS. 1 and 2, but with the pivot or head pin whereby the fitting is mounted on the boom and the span tackles attached to the boom of a split or two-piece construction, and the head of the boom beveled on one side to insure clearance of one of the hauling parts of the purchase tackle;

FIG. 10 represents a view in front elevation of the upper portion of a second embodiment of a cargo boom having a pendulum purchase block fitting according to the present invention, the fitting being hung within a forked structure at the upper end of the boom, and the boom itself in this particular illustration being in a substantially vertical position;

FIG. 11 represents a view in starboard side elevation of the upper portion of the boom of FIG. 10, the boom itself in this particular illustration being inclined aft, and

FIG. 12 represents a view in front elevation of the upper portion of a third embodiment of a cargo boom having a pair of pendulum purchase block fittings according to the present invention overhung on a single pivot pin along opposite sides of the boom.

Referring now to the drawings in detail, especially to FIGS. 1 and 2 thereof, two outwardly inclined hollow uprights 2 are positioned athwartship on ship's deck 1 between cargo hatches not shown. One of the hatches is considered to be forward of the uprights (to the right according to the starboard side view of FIG. 1), and the other to be aft of them (to the left according to FIG. 1). A cargo boom 3 located between the uprights is supported in a known, universally pivotable manner by gooseneck fitting 4. The cargo boom has at its upper end a strong head pin or pivot pin 5 which is carried through and across the boom. The head pin carries on one side a cross-swivel 6 serving for attachment of a span block 7 by means of connecting straps or flat links 8 in a known manner. The same arrangement is found on head pin 5 on the other side of cargo boom 3, and outside of the novel pendulum purchase block fitting 17.

The span tackles 9 extend between span blocks 7 and span blocks 11, the latter being attached in a vertically movable fashion to hollow heads 10 mounted on and fully rotatable with respect to uprights 2. The hauling parts 12 of the span tackles lead from span blocks 7 to the corresponding winch drums via guide sheaves 13 which are located on and in rotating heads 10, thence down through these heads and into the uprights and over guide sheaves 14 and 15 within the uprights, and finally through slots in the walls of the uprights and out of the uprights to span winches, not shown. The upper purchase block 16 is suspended from pendulum purchase block fitting 17. This fitting is attached sideways in a turnable or rotatable manner to head pin or pivot pin 5.

On top of pendulum block fitting 17 there are mounted two guide sheaves 18, each of which may be swiveled around on a hollow vertical axle or turning head 31 and each of which extends somewhat above the upper end of cargo boom 3. The hauling parts 21 of purchase tackle 20 lead from the lower purchase block 25 with swivel eye 26 through tapered passages 19 in the body portion of fitting 17 and axially aligned passages in heads 31 to each one of the two guide sheaves 18, and from there to guide sheaves 22 which are mounted in hollow rotating heads 10 on uprights 2 alongside guide sheaves 13 but which may turn independently of the latter sheaves.

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Leaving guide sheaves 22, purchase tackle hauling parts 21 pass down through heads 10 and into uprights 2 and over guide sheaves 23 and 24 within the uprights. They finally pass through slots in the walls of the uprights and out of the uprights to purchase winches, not shown.

Referring next to FIGS. 3, 4, and 5, the cargo boom 3 is assumed to be broken out in the position of FIG. 3, that is, in a position in which it may be used to work the hatch aft of the uprights 2. The hauling parts 21 of purchase tackle 20 run through pendulum block fitting 17 via tapered passages 19, then over guide sheaves 18 on top of this fitting, and then to guide sheaves 22 (not shown in FIG. 3) on rotating heads 10 of the uprights. If the boom is now moved into the vertical or near vertical position shown in FIG. 4 by means of span tackles 9, then the purchase tackle moves sideways along one side of the cargo boom 3 as fitting 17 swings around head pin 5. In this operating position of cargo boom 3, that is, the position of FIG. 4, hauling parts 21 of the purchase tackle still lead to rotating heads 10 over guide sheaves 18 which have now turned around their vertical axes. The purchase tackle remains paid out, i.e., the lower purchase block 25 is raised only so high as not to interfere with the winches on deck and possibly other deck equipment. Cargo boom 3 can be moved by a light pull from its center or vertical position either to the left or to the right, that is, either aft or forward.

In its position of FIG. 5, cargo boom 3 has been moved over to the right, that is, moved forward. The hauling parts 21 are now running leftwardly or rearwardly to the upright heads 10, and the guide sheaves 18 on pendulum purchase block fitting 17 have turned further around on their hollow vertical axles so that the hauling parts of purchase tackle 20 are guided clear over the cargo boom. The purchase tackle and the swinging fitting 17 together with the lower purchase block 25 have turned about the head pin 5, which movement was caused by the weight of purchase tackle 20, including its upper and lower blocks 16 and 25, which is connected to and is suspended from fitting 17. Cargo boom 3 is now in a position in which it may be used to work the hatch forward of uprights 2.

The very simplified swinging through maneuver just described, that is, the maneuver of bringing cargo boom 3 from its position shown in FIG. 3 through that shown in FIG. 4 to that shown in FIG. 5, requires no specially trained operators. The cargo boom is pulled up from its aft inclination into almost vertical position by the span winches and is brought into the new or forwardly inclined working position after being pulled through the unstable vertical position by means of an attached wire pendant (not shown) which is led to any winch or other suitable pulling source. The purchase tackle remains essentially paid out in its natural working position.

The Flemish hook or cargo shackle and also the corresponding straps may remain attached to swivel eye 26 of the lower purchase block 25; that is, they need not be removed in order to swing the purchase blocks through as would practically be required in the course of using the apparatus shown in U.S. Pat. No. 2,914,193. The swinging through of the cargo boom and the parts hanging from it is thus simplified as well as quickened, so that the loading and unloading times for cargo are consequently shortened. All known special advantages of the split topping gear of the aforementioned patent remain fully intact in the apparatus of the present invention.

Referring next to FIGS. 6, 7, and 8, the details of the structural substance of the embodiment of the present invention so far described are illustrated in enlarged scale. The swivel 6, to which at one set of their ends are attached connecting flats 8 to which in turn at their other ends is attached span block 7, is supported on the right side (as seen in FIG. 6) in such manner that it can swivel around head pin 5. The span tackles 9 and their hauling parts 21 lead to one of the upright heads, neither of which

is shown in the figures particularly under discussion. The same parts arranged in identical manner on head pin 5 are located on the left side (as seen in FIG. 6) outside of the pendulum block fitting 17.

The upper purchase block 16 is suspended on fitting 17 in a hinged manner. Suspended on the purchase tackle 20 is the lower purchase block 25 with swivel eye 26 for receiving, for example, a Flemish hook or cargo shackle. The hauling parts 21 of the purchase tackle 20 lead to the guide sheaves 18, via each one of openings 19 through pendulum block fitting 17 which swivels or pivots around head pin 5. Guide sheaves 18 are located on fitting 17 and swivel around hollow vertical mounts and lead the purchase tackle hauling parts 21 to the heads of the uprights in a manner pointed out already. If the uprights are very short in relation to the length of the cargo boom, the left guide sheave 18 (as seen in FIG. 7) which leads the wire or hauling part 21 over the cargo boom can be equipped additionally as shown in FIGS. 6 and 7 with a small guide roller 27 by means of which one of the hauling parts 21 of the purchase tackle is cleared over the upper end of the cargo boom during the swinging through maneuver.

The purchase tackle 20 hangs on one side of the cargo boom so that when the boom is swung through from one hatch to the other across the vertical position, the purchase tackle clears the boom 3 sideways. In all topping positions of cargo boom 3, the pendulum block fitting 17 remains practically vertical because the upper purchase block 16 is centrally attached in a hinged manner to the underside of fitting 17, which turns around head pin 5. Hereby, the guide sheaves 18 which carry the hauling parts 21 to lead these wires or parts over the upper end of the boom toward heads 10 on uprights 2 are automatically so adjusted that the wires remain free. Only for very short uprights is it necessary to provide the aforementioned small guide roller 27 so that for very steep downward run-off angles the particular hauling part 21 that has to be carried across the top of cargo boom 3 is held sufficiently high by this guide roller 27. Another arrangement for insuring clearance of this hauling part is shown in FIG. 9B.

In order to avoid fouling the hauling parts 21 on the lower ends of passage openings 19, when said parts 21 pass through the pendulum block fitting 17, small guide rollers 28 are provided on this fitting parallel to the axis of pivot pin or head pin 5, sideways below the passage openings 19. Therefore, the hauling parts of the purchase tackle are always passing through the central area of openings 19 in pendulum block fitting 17.

The actual position of pendulum block fitting 17 relative to the cargo boom is shown in the assumed positions of cargo boom 3 in FIG. 7 when the boom is swung through from one hatch to the other. For example, the guide sheaves are shown on a boom that is reaching out to the left, i.e., the purchase tackle hauling parts are running to the right to each one of the hollow rotating heads on the uprights. The hauling parts are passing through the hollow rotating axles of the guide sheaves 18 which insures easy swiveling of these guide sheaves even when there is no load attached to the purchase tackle. If there be only one cargo winch provided for the operation of the purchase tackle, then one of the hauling parts 21 is attached to hollow head 10 on one of the uprights 2. The guide sheaves 22, 23, and 24 which belong to the purchase tackle hauling part of this particular upright are eliminated. The swinging through maneuver and the operation of the boom remain, however, unchanged.

Referring next to FIG. 9A, the situation is contemplated that a small ship or a slender one having a low margin of stability may be equipped with a large cargo gear, or generally that stability may be a consideration, and mirror-like symmetrical forces from the span tackles should become effective on the cargo boom when slewing cargo boom 3 to port side or starboard side by means of

the span tackles 9. A slight modification of the invention as so far disclosed provides that the span tackle 9 which is positioned on the side of the boom with only the swivel 6 on the extended head pin 5', that is, on the side of the boom opposite fitting 17, will have a point of attachment to the boom which is equally distanced or offset from the boom's longitudinal axis with the attachment point of the span tackle running to the swivel 6 which is positioned next to the pendulum block fitting 17.

Referring next to FIG. 9B, a slight further modification of arrangements at the upper end of cargo boom 3 is shown. In this modification, the pivot or head pin is in two pieces 5'' and 5'''. These two pieces or pin portions are set in the boom at slightly different levels with portion 5'' carrying the pendulum purchase block fitting being at the higher level. The head of the boom above oppositely disposed pin portion 5''' at the lower level is beveled downwardly to provide ample clearance in the swinging through maneuver of one of the purchase tackle hauling parts 21 above the upper end of the boom as well as above the lower level pin portion 5''' and the span tackle cross swivel mounted on it.

Through the substance of the present invention as so far disclosed, a novel ship's loading apparatus has been realized which, in comparison with known apparatuses where a cargo boom also swings between uprights, makes it possible that the associated tackles and hauling parts are automatically guided free so that these wires can remain on their winch drums, and so additionally that fittings such as the Flemish hook and the cargo shackle and straps need no longer be removed. Time and cost economies result from this for the loading operation which are particularly valuable for small size cargoes or medium weights which must be loaded on board in larger quantities than heavy cargoes in order to utilize more fully the ship's carrying capacity. However, for the latter cargoes also the loading and unloading by means of the apparatus of the present invention becomes operationally simpler, time-wise shorter, and consequently cheaper and safer than with cargo gears known until now.

Referring next to FIGS. 10 and 11, a second embodiment of a cargo boom provided with a pendulum purchase block fitting according to the present invention is illustrated. With particular reference to FIG. 10, located on the head pin 105 which closes the ends of fork sides 129 forming a boom extension at the upper end of a cargo boom 103 there are on the outside left and outside right one swivel 106, each with connecting straps or flat links 108 and span blocks 107. The span tackles 109 and their hauling parts 112 lead to guide sheaves on the rotating heads of the two uprights (not shown) and from there, via guide fittings, to the corresponding winch drums in known manner.

The purchase tackle 120 with the upper purchase block 116 and the lower purchase block 125 having a swivel eye 126 and a Flemish hook 130 is suspended on the universal joint of the pendulum block fitting 117. This fitting is located centrally between the fork sides 129 of cargo boom 103 on head pin 105 so that forces from the loading of the purchase tackle 120 can not be applied to the centerline of the boom unsymmetrically.

Pendulum purchase block fitting 117 itself is surmounted by two guide sheaves 118 over which the hauling parts 121 of purchase tackle 120 pass. These parts also pass through tapered openings 119 in fitting 117 and through hollow axles 131 about which guide sheaves 118 can turn, and lead from these sheaves to sheaves on the rotating heads on the uprights between which the cargo boom is mounted. From the sheaves on these heads, the purchase tackle hauling parts pass down through the heads and the uprights themselves and over appropriate guide devices, and are led finally to the drums of purchase or cargo winches. When swinging the cargo boom through, the purchase tackle hauling parts are al-

ways automatically freely guided by means of pendulum block fitting 117 and the guide sheaves 118 on this fitting.

FIG. 11 shows the upper end of cargo boom 103 with the arms of the fork 129, the whole structure being inclined for a working position over a hatch aft of the boom and its adjacent uprights, as an example. In a known manner, the span blocks 107 whose tackles 109 lead to the uprights are rotatably connected to either side of the head pin 105 by means of straps 108 and swivels 106. Pendulum block fitting 117 is located between the fork arms 129, and can turn around pivot pin or head pin 105. Coming from the lower purchase block, not shown in FIG. 11, are the purchase tackle hauling parts 121 which lead in a known manner to the uprights, being guided by guide rollers 128 through the tapered openings 119 in the pendulum block fitting and the hollow axles 131 of the guide sheaves 118 mounted on this fitting and forming part of the fitting assembly.

On account of the weight of the purchase tackle and purchase blocks suspended from it, fitting 117 is always held essentially perpendicular in all positions of cargo boom 103. As a consequence of this, the guide sheaves 118 always lead the hauling parts 121 of the purchase tackle 120 freely over the upper ends of the fork arms 129, and thus over the boom 103, whenever the cargo boom is swung through from a working position over a hatch forward of it to one over a hatch aft of it, and vice versa.

The embodiment of a cargo boom provided with a pendulum purchase block fitting according to the present invention which is shown in FIGS. 1 and 2 is not quite as suitable as that shown in FIGS. 10 and 11 for handling loads in the very high weight ranges. This is because the one-sided attachment or overhung or cantilever mounting of fitting 17 in the first embodiment requires quite a heavy construction of the boom apparatus itself to withstand columnar bending moments when massive weights are to be lifted. On the other hand, unlike the embodiment shown in FIGS. 1 and 2, the second embodiment of this invention shown in FIGS. 10 and 11 does require its lower purchase block 125 and Flemish hook 130 to be hauled up quite close to its upper purchase block 116 for the swinging through maneuver of the cargo boom. Thus the embodiment shown in FIGS. 10 and 11 is not quite as suitable as that shown in FIGS. 1 and 2 when there is to be frequent alternation of the boom between a working position over a hatch forward of the boom and one aft of it. It may reasonably be expected, however, that when the inventive embodiment shown in FIGS. 10 and 11 is handling the large and heavy loads for which it is well suited the normal pace of operations will be a relatively slow one and the requirements for alternation of working positions between hatches infrequent.

Referring finally to FIG. 12, a third embodiment of a cargo boom provided with at least one pendulum purchase block fitting according to the present invention is illustrated. Specifically, there is shown a cargo boom provided with two such fittings.

In this embodiment, topping blocks 207, 207a are connected to head bolt 205 by means of connecting flats 208, 208a and swivels 206, 206a. The hauling parts 212, 212a of the topping tackle as well as parts 209, 209a run, in known manner, to uprights and then to winches (not shown).

Hauling part 221 of the purchase tackle runs, in known manner, from a purchase winch (not shown), over the head of the left upright (not shown), to guide sheave 218, located on left hand purchase block fitting 217, which sheave is directed toward the left according to the orientation of the turning head which supports it. From there hauling part 221 goes through a tapered passage 219, past guide rollers 228, which are located at

the lower end of passage 219 to alleviate rubbing, and then to lower purchase block 225, which has padeye 226.

Purchase tackle runner 220 connects lower purchase block 225 with upper purchase block 216, and runs from lower purchase block 225 through tapered passage 219, past guide rollers 228, to guide sheave 218' of left hand purchase block fitting 217, which guide sheave is directed toward the right on its turning head.

From there, purchase tackle runner 220 goes to guide sheave 218a on right hand purchase block fitting 217a, which guide sheave is directed toward the left. Then, purchase tackle runner 220 proceeds mirror-like through the right purchase tackle half, through purchase blocks 216a and 225a which hang on the right hand purchase block fitting, to guide sheave 218a' located on and above fitting 217a, which guide sheave is directed toward the right. From there hauling part 221a runs in known manner to the head of the right hand upright, and then continues to the corresponding purchase winch. If only one purchase winch is provided, then one of the hauling parts 221, 221a is fastened to the head of the corresponding upright.

The cargo boom 203 can be brought into any desired position by means of the topping tackles 209, 209a. The work load hangs on the padeyes 226, 226a of the lower purchase blocks 225, 225a. Inasmuch as the purchase tackle runner 220 is guided through the purchase blocks right and left of cargo boom 203 in a continuous manner, substantially no uneven distribution of forces develops in the purchase tackle, if friction forces are disregarded. If desired, the two lower purchase blocks 225, 225a can be connected by a transverse traverse 227 which has a swivel padeye 228 in the middle.

In the embodiment of the present invention shown in FIG. 12, the topping blocks 207, 207a are preferably structurally identical, as are the purchase block fittings 217, 217a, the upper purchase blocks 216, 216a, and the lower purchase blocks 225, 225a. In this embodiment, by virtue of the symmetrical arrangement of two structurally identical pendulum purchase block fittings rotatively arranged on the head bolt on opposite sides of the cargo boom head, the cargo boom remains substantially free from the forces and moments which develop in the embodiment of FIGS. 1-6 due to the presence of a pendulum purchase block fitting on only one side of the cargo boom. As a result, with the invention embodiment shown in FIG. 12 a given cargo boom is suitable for a higher work load. Similarly, a given maximum work load capacity is obtainable with a cargo boom of smaller structural weight and, consequently, with a generally less expensive cargo boom.

The swinging through maneuver of the cargo boom takes place for the embodiment of this invention illustrated in FIG. 12 by pulling up the purchase tackle far enough so that any cargo slings which are left attached to it do not interfere with winches or other pieces of deck equipment, and then swinging cargo boom 203 through between the left and right purchase tackle halves. In such event, the transverse traverse 227 is first removed.

Protection by Letters Patent of the present invention in all its aspects as the same are set forth in the appended claims is sought to the broadest extent that the prior art allows.

What is claimed is:

1. The combination comprising (1) a ship's deck, (2) a cargo boom disposed above said deck, said cargo boom having an upper end and a lower end, (3) pivot mounting means for said cargo boom disposed between the lower end thereof and said deck, said mounting means permitting rotation of said cargo boom in a vertical plane to swing through between uprights, and (4) a purchase block fitting adapted to have an upper and a lower purchase block and associated purchase tackle suspended from it, said fitting being pivotally mounted on said

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boom near the upper end thereof in a manner permitting it to swing from side to side thereof as a normal pendulum in the direction of motion of said boom between uprights, and said fitting including guide means extending above the upper end of the boom which is adapted to receive the hauling parts of the purchase tackle and direct each of the same toward an upright.

2. The combination comprising (1) a ship's deck, (2) a pair of uprights mounted on said deck, each of said uprights having an upper head end, (3) a cargo boom disposed above said deck, said cargo boom having an upper end and a lower end, (4) pivot mounting means for said cargo boom disposed between the lower end thereof and said deck, said mounting means being located between said uprights substantially in line with them, and permitting rotation of said cargo boom in a vertical plane to swing through between the uprights, (5) span tackles extending from said boom near the upper end thereof to the upper head end of each of said uprights, and (6) a purchase block fitting adapted to have an upper and a lower purchase block and associated purchase tackle suspended from it, said fitting being pivotally mounted on said boom near the upper end thereof in a manner permitting it to swing from side to side thereof as a normal pendulum in the direction of motion of said boom between the uprights, and said fitting including guide means extending above the upper end of the boom which is adapted to receive the hauling parts of the purchase tackle and direct each of the same toward the upper head end of an upright.

3. The combination comprising (1) a cargo boom having an upper end and a lower end, and (2) a purchase block fitting adapted to have an upper and a lower purchase block and associated purchase tackle suspended from it, said fitting being pivotally mounted on said boom near the upper end thereof in a manner permitting it to swing from side to side thereof as a normal pendulum with said boom in substantially upright position, and said fitting including guide means extending above the upper end of said boom in upright position which is adapted to receive the hauling parts of the purchase tackle, and direct the same away from said boom.

4. The combination according to claim 3 in which said purchase block fitting is characterized by internal passage space through which the hauling parts of the purchase tackles can extend going to said guide means.

5. The combination according to claim 4 in which said internal passage space has at least one lower opening and in which said purchase block fitting further includes guide means below said lower opening to maintain the hauling parts of the purchase tackle substantially centered in said internal passage space.

6. The combination comprising (1) a cargo boom having an upper end and a lower end, and (2) a purchase block fitting adapted to have an upper and a lower purchase block and associated purchase tackle suspended from it, said fitting being pivotally mounted on said boom near the upper end thereof in a manner permitting it to swing from side to side thereof as a normal pendulum with said boom in substantially upright position, and said fitting including two turning heads and a guide sheave mounted on each of said heads, each of said guide sheaves extending above the upper end of said boom in upright position and each adapted to receive a hauling part of the purchase tackle, and direct the same away from said boom.

7. The combination according to claim 6 in which said purchase block fitting is characterized by two internal passages extending through a body portion of said fitting and continuing through said turning heads, each of said passages being adapted to receive a hauling part of the purchase tackle passing to one of said guide sheaves.

8. The combination according to claim in which said purchase block fitting further includes a guide roller mounted on one of said turning heads for giving addi-

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tional elevation to the hauling part of the purchase tackle passing over the guide sheave mounted on that head.

9. The combination according to claim 6 which further comprises (3) a first pivot pin extending from one side of said boom whereon said purchase block fitting is pivotally mounted immediately adjacent said boom, and which is adapted to have a first span tackle connected to it beyond said fitting, and (4) a second pivot pin extending from the opposite side of said boom at a level slightly lower than that of said first pivot pin and which is adapted to have a second span tackle connected to it, the upper end of said boom being beveled downwardly toward said second pivot pin.

10. The combination comprising (1) a cargo boom having an upper end and a lower end, (2) a head pin extending transversely from at least one side of said cargo boom near the upper end thereof, and (3) a purchase block fitting adapted to have an upper and a lower purchase block and associated purchase tackle suspended from it, said fitting being pivotally mounted closely adjacent said cargo boom on the extension of said head pin to swing from side to side of said cargo boom as a normal pendulum with said boom in substantially upright position, and said fitting including guide means extending above the upper end of said boom in upright position which is adapted to receive the hauling parts of the purchase tackle, and direct the same away from said boom.

11. The combination according to claim 10 in which said head pin extends transversely from two opposite sides of said cargo boom to provide attachment points for span tackles at equal distances from the longitudinal axis of the boom, one of these attachment points being beyond said purchase block fitting.

12. The combination comprising (1) a cargo boom having an upper end and a lower end, (2) a fork extension of said cargo boom at the upper end thereof, said fork extension being open at its end distant from the upper end of said cargo boom, (3) a head pin extending across said fork extension near the open end thereof, and (4) a purchase block fitting adapted to have an upper and a lower purchase block and associated purchase tackle suspended from it, said fitting being pivotally mounted on said head pin between the sides of said fork extension to swing from side to side of said cargo boom through said fork extension thereof as a normal pendulum with said boom in substantially upright position, and said fitting including guide means extending above the open end of said fork extension with said boom in upright position, said means being adapted to receive the hauling parts of the purchase tackle, and direct the same away from said boom.

13. The combination according to claim 12 in which the fork extension of said cargo boom is sufficiently long that an upper and lower purchase block and associated purchase tackle suspended from said purchase block fitting and a Flemish hook suspended from the lower purchase block can be swung through said fork extension from side to side of said boom above the upper end thereof by normal pendulum pivoting action of said purchase block fitting on said head pin.

14. The combination comprising (1) a cargo boom having an upper end and a lower end, (2) a head pin extending transversely from opposite sides of said cargo boom near the upper end thereof, and (3) a pair of purchase block fittings, each fitting adapted to have an upper and a lower purchase block and associated purchase tackle suspended from it, each fitting being pivotally mounted closely adjacent said cargo boom to swing from side to side of said cargo boom as a normal pendulum with said boom in substantially upright position, one fitting being so mounted on one extension of said head pin and the other fitting being so mounted on the opposite extension of said head pin, and each fitting including guide means extending above the upper end of said boom in upright position which is adapted to receive the hauling parts of

the purchase tackle, and direct the same away from said boom.

15. The combination according to claim 14 in which said head pin extends sufficiently transversely from two opposite sides of said cargo boom to provide attachment points for span tackles at equal distances from the longitudinal axis of the boom, each of these attachment points being beyond the purchase block fitting mounted on the respective extension.

16. The combination comprising (1) a cargo boom having an upper end and a lower end, (2) a head pin extending transversely from opposite sides of said cargo boom near the upper end thereof, (3) a pair of purchase block fittings, each fitting being pivotally mounted closely adjacent said cargo boom to swing from side to side of said cargo boom as a normal pendulum with said boom in substantially upright position, one fitting being so mounted on one extension of said head pin and the other fitting being so mounted on the opposite extension of said head pin, and each fitting including guide means extending above the upper end of said boom in upright position which is adapted to receive the hauling parts of the purchase tackle and direct the same away from said boom, (4) a pair of upper purchase blocks, each suspended from a purchase block fitting, (5) a pair of lower purchase blocks, each suspended from an upper purchase block and each having a padeye depending therefrom, and (6) a transverse traverse with a centrally located swivel padeye connected to the two aforesaid padeyes.

17. The combination according to claim 16 further characterized by (7) a purchase tackle runner which runs through both said purchase block fittings.

18. The combination comprising (1) a cargo boom having an upper end and a lower end, (2) a head pin extending transversely from opposite sides of said cargo boom near the upper end thereof, (3) a pair of purchase block fittings, each fitting being pivotally mounted closely adjacent said cargo boom to swing from side to side of said cargo boom as a normal pendulum with said boom in substantially upright position, one fitting being so mounted on one extension of said head pin and the other fitting being so mounted on the opposite extension of said head pin, and each fitting including guide means extending above the upper end of said boom in upright position which is adapted to receive the hauling parts of the purchase tackle and direct the same away from said boom, (4) a pair of upper purchase blocks, each suspended from a purchase block fitting, and (5) a pair of lower purchase blocks, each suspended from an upper purchase block and each having a padeye depending therefrom.

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