July 23, 1963 V. C. FARRELL 3,098,569

BOOM RIGGING

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Fig. 1

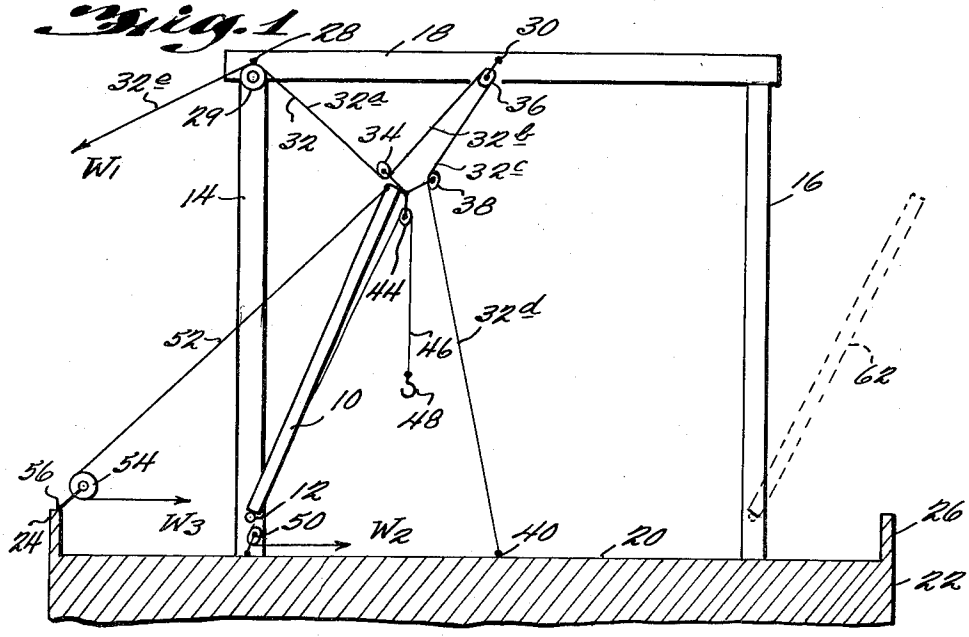


Fig. 2

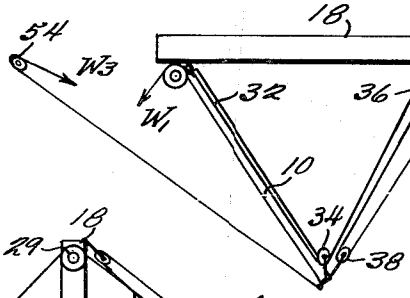


Fig. 3

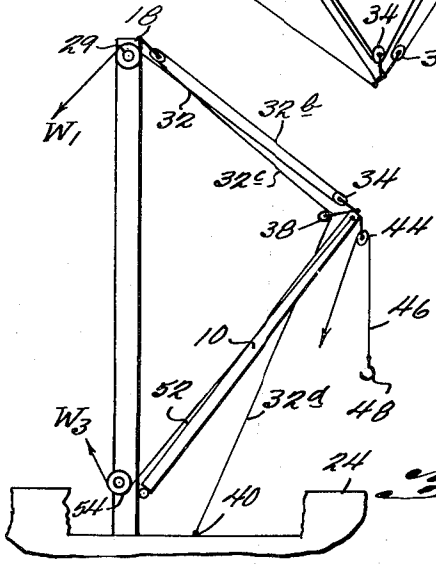
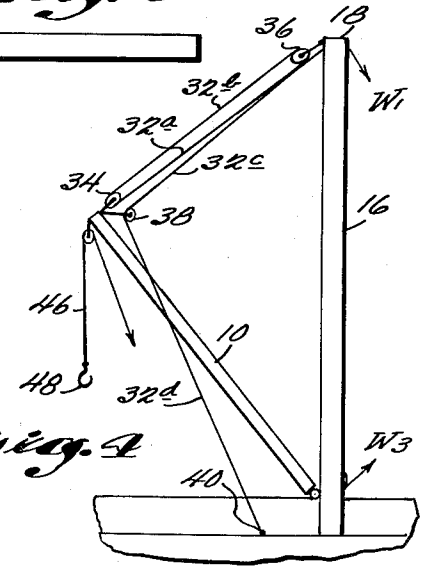


Fig. 4



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Fig. 5

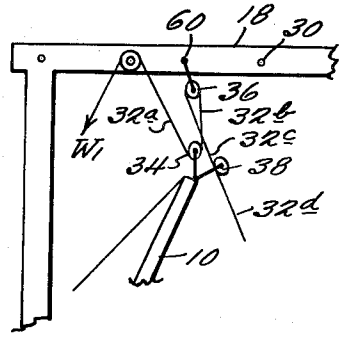


Fig. 6

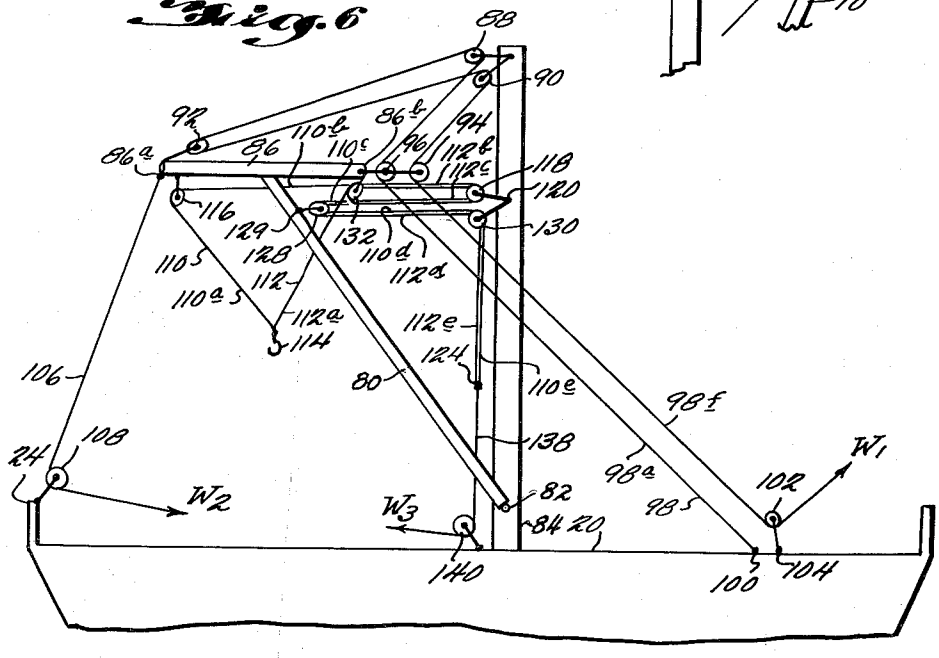
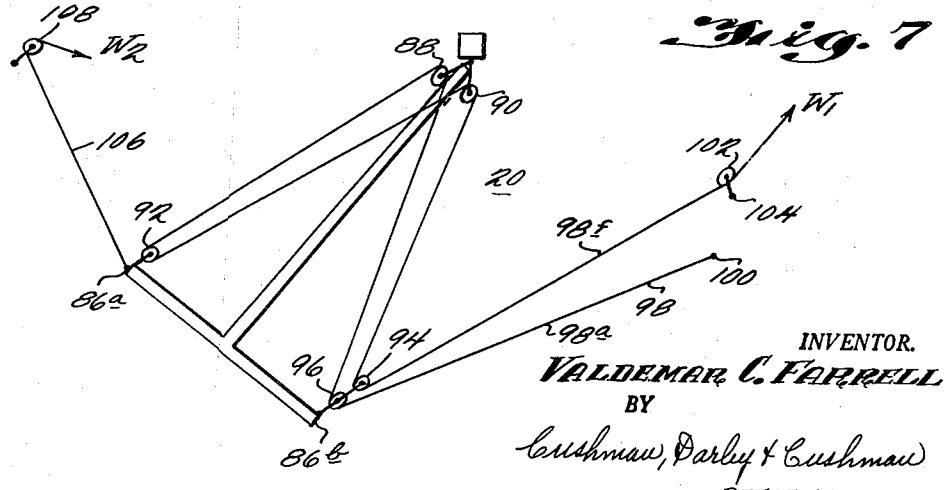


Fig. 7



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Fig. 8

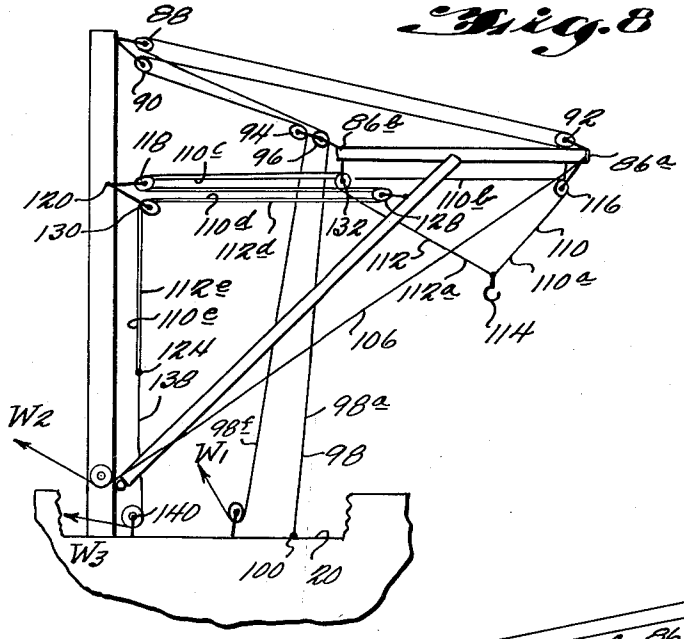


Fig. 9

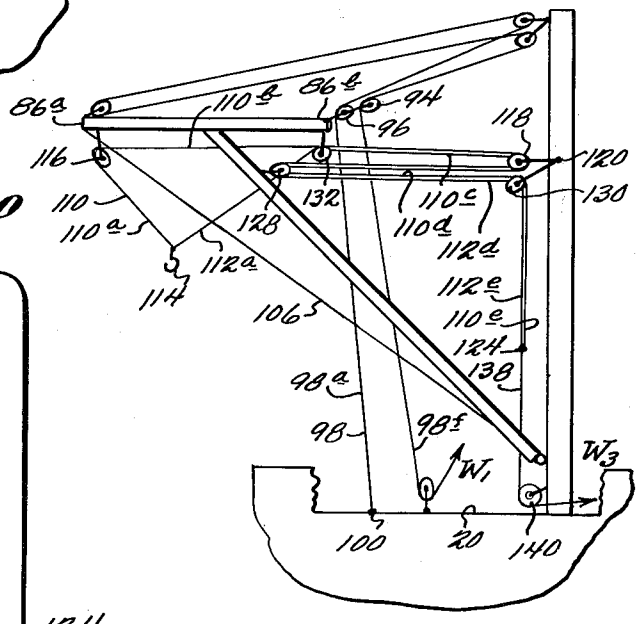
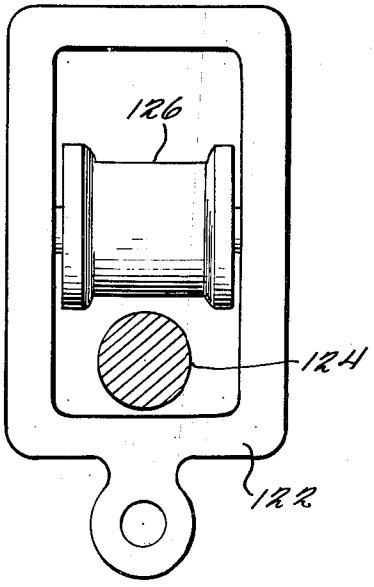


Fig. 10



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3,098,569

BOOM RIGGING

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10 Claims. (Cl. 212—3)

This invention pertains to the rigging of booms to facilitate the slewing thereof about a given point. The invention is particularly useful in the handling of booms on unstable mountings, such as upon the deck of a ship subject to rolling.

In accordance with the invention the boom will be pivotally heeled at a given point. If the boom is mounted upon ship, which is taken as illustrative and not in any limiting sense, the boom heel may be upon or a short distance above the weather deck of the ship. In any event, the present invention involves the provision of means for supporting the head of the boom upwardly of the deck and also provides means for causing the boom head to move sidewise, as it were, so that cargo can be handled from a point of the ship, as through a hatch, to another point over the side of the ship where there may be a dock or other vessel.

Therefore, it is a primary object of this invention to provide an improved boom rigging combination.

It is a particular object of the invention to provide such a rigging combination wherein the boom will not get out of control should the structure upon which it is mounted undergo a severe rotary translation, as might be experienced by the roll or pitch of a ship.

Further objects and the entire scope of the invention will become apparent from the detailed description of illustrative embodiments which is set forth hereinbelow, and from the appended claims.

The illustrative embodiments may be best understood with reference to the drawings wherein:

FIGURE 1 shows a front elevational view of a boom rigged upon a ship in accordance with the invention.

FIGURE 2 shows a top plan view of the rig of FIGURE 1.

FIGURE 3 shows a side elevational view of the rig of FIGURE 1 taken from the left of FIGURE 1.

FIGURE 4 shows a side view of the rig of FIGURE 1, taken from the right of FIGURE 1.

FIGURE 5 shows a modification of the rig of FIGURES 1–4.

FIGURE 6 shows a second embodiment of the invention,

FIGURE 7 shows a top view of the embodiment of FIGURE 6,

FIGURE 8 shows a side view of the embodiment of FIGURE 6, taken from the right side of FIGURE 6.

FIGURE 9 shows the opposite side view of the embodiment of FIGURE 6.

FIGURE 10 shows a pulley for passing a splice between double and single cables.

In FIGURES 1–5 of the drawings the boom is designated by reference character 10 pivotally held at a point 12 to a king post 14, there being a companion king post 16 and a beam 18 joining the tops of 14 and 16 at a considerable elevation above the weather deck 20 of a ship. A portion of the hull 22 of the ship is shown in cross section. The usual bulwarks 24 and 26 are also shown in FIGURE 1.

In accordance with the present invention, upon the beam 18 are anchor points 28 and 30 which serve as points fixed relative to the structure of the ship for providing a topping lift effect to the boom. The latter effect is carried out by use of what will be termed a cable herein for convenience, the term "cable" being intended to include all of the various types of flexible elongated means suitable

for the purpose, such as wire rope, manila rope, etc. Attached to anchor point 28 is a pulley 29 over which runs a cable 32, this cable having a part 32*a* running from pulley 29 over a pulley 34 fixed to the head of the boom. Cable 32 then further extends as part 32*b* to and over a pulley 36 supported at anchor point 30. The cable 32 then extends as part 32*c* over a further pulley 38 secured to the boom head. The cable 32 then extends as part 32*d* to an anchor point 40 which is fixed to the deck 20. From pulley 29 the cable 32 extends as part 32*e* to any suitable winch W_1 (not shown). At this point it may be observed that the cable 32, the anchor points 28 and 30, together with the pulleys 34, 36 and 38, provide a means positioned at an elevation above the boom heel point 12 and to one side therefore for providing at least one topping anchor point to one side of a vertical line through the heel point 12. Additionally, the attachment at point 40 to the deck provides still another anchor point at an elevation below the topping anchor points, and this is located to the same side as the vertical line through the boom heel 12 as is the anchor point 30.

It may be mentioned that the boom is also provided with a pulley 44 attached to the boom head over which runs a fall cable 46 extending to hook 48. Cable 46 otherwise runs over block 50 to any suitable load fall winch W_2 (not shown) in the usual manner.

The boom rigging in accordance with the present invention further includes a cable 52 attached to the boom head and otherwise running over the pulley 54 to any suitable winch W_3 (not shown). Pulley 54 is attached to the ship at some point below the anchor points 28 and 30, and preferably is mounted thereby at a point 56 which is substantially upon a horizontal athwartship line extending through the boom heel 12. The advantage of having the anchor point 56 upon the said horizontal athwartship line, is that boom head will move precisely fore and aft when only the length of the cable 32 is changed by action of the winch W_1.

It will be observed that the rigging of cable 52, including the pulley 54 and its mounting at point 56 provides means positioned to the side of the vertical line through boom heel 12 opposite to the side whereat appears anchor point 30, the anchor point 56 being at an elevation below the topping anchor points 28 and 30.

Referring to the rigging of FIGURES 1–4 inclusive it will be observed that, starting with the boom position shown (and for convenience not considering the operation of the fall winch W_2) if only the winch W_3 is operated so as to take in the cable 52, then pulley 34 will run in the bight of parts 32*a* and 32*b* of cable 32. Therefore, as the boom head moves outboard (to the left in FIGURE 1) it also will be elevated. Next, assuming the boom head has been taken over the side of the ship and it is then desired to bring it back over the deck, by simply operating winch W_3 to pay out cable 52, the force of gravity will cause the boom head to return to its original position.

If for purposes of discussion at this point, it be assumed that the part 32*b* of cable 32 were fixed to anchor point 30, this would be a type of boom rigging I have previously described and covered in my prior Patent 2,754,975. However, in accordance with the present invention, the part 32*b* of cable 32 is not anchored at point 30, but is taken over the pulley 36 and extends as part 32*c* and runs over the pulley 38 which is fixed to the boom head. The cable 32 then proceeds directly as part 32*d* to point 40, and thence may proceed to a suitable winch W_1, if one desires such winch at this end of cable 32, rather than on part 32*e*. The contribution imparted by this novel arrangement of pulleys 36 and 38 and the parts 32*c* and 32*d* is that the boom head as it moves outboard in re-

sponse to intake on winch W_3 (and assuming W_1 stationary) shortens the combined parts 32*a* and 32*b* wherefore the boom head moves upwardly more steeply than is the case if part 32*b* were anchored at point 30. Thus, where in the earlier rig the degree of rise in the boom head might be offset by a given roll of the ship, now a far greater roll of the ship would be required before gravity would take over and permit the boom to swing outbard out of control.

Referring to FIGURE 2 it is preferable that the point 40 be located a certain distance forward of the vertical transverse plane which includes point 30 thus preventing the boom rigging from going "over center" as the boom reaches its extreme outboard position.

As shown in FIGURE 5, the rigging may be modified and certain components of the tackle eliminated, if the topping anchor points 28 and 30 are consolidated at a point 60 located between points 28 and 30 and preferably midway therebetween.

It is of course, to be understood that the various rigs may be "heavied up" as desired, by adding more parts to the cables, without departing from the invention. For example, instead of cable 52 being connected directly to the boom head it could be brought over the pulley at the boom head, returned to the point 56 and thence proceed to winch W_3, or even more loops could be used. The effect would still be the exercise of force between the boom head and the point 56. Similarly, taking the embodiment of FIGURE 1 as exemplary the cable 32 after passing pulley 36 could come back over another pulley on the boom head and extend to still another pulley at point 28 then return over still another pulley at the boom head and over an additional pulley at point 30 before extending as what is now part 32*c* over the pulley 38 and thence to pulley 40. Even the run between the final pulley at point 30 and pulley 40 could be doubled back as desired over pulleys corresponding to pulley 38. Nevertheless the same function would be achieved, because all of the pulleys corresponding to pulley 34 would be running in the bight of the parts extending between points 28 and 30, and also all of the pulleys corresponding to pulley 34 would be running in the bight of the parts extending between points 30 and 42. Because of these multiple possibilities, where the appended claims refer to cable means extending between certain points, the expression is intended to be generic to the case of (1) but a single strand or (2) plural parts.

While the present invention is primarily intended for the case of slewing a boom, it will be quite apparent that if a companion boom such as the boom 62 shown in chain line in FIGURE 1 be employed, and similarly rigged, or rigged according to conventional practice, the boom 10 may be used with it in the usual burtoning operation. Stated otherwise, the rigging shown for the boom 10 in accordance with the present invention, which facilitates its use as a slewing boom, does not detract from the usefulness of the boom for a burtoning operation.

A still further embodiment of the present invention is shown in FIGURES 6–9 inclusive. In this embodiment a boom 80 is pivotally heeled at 82 to a king post 84 extending above the deck 20. Boom 80 is provided at its outermost end with a cross member 86 extending equal distances from the boom as shown and having ends 86*a* and 86*b*. Attached to the top of king post 84 are two pulleys 88 and 90. Attached to end 86*a* of cross member 86 is a pulley 92. Attached to the end 86*b* of cross member 86 are pulleys 94 and 96. A cable 98 extends between an anchor point 100 on deck 20, over the pulleys 88, 90 92, 94, and 96, and back to a pulley 102 attached at point 104 to the deck 20 near the point 100. Starting from point 100 and tracing the cable 98, it extends as part 98*a* over the pulley 96, thence as part 98*b* over the pulley 88, thence as part 98*c* over the pulley 92, thence as part 98*d* over the pulley 90 and thence as part 98*e* over the pulley 94 and thence as part 98*f* over the pulley 102, from whence it proceeds to a suitable winch W_1 (not shown).

Further connected to end 86*a* of cross member 86 is a cable means 106 which extends over pulley 108 to any suitable winch W_2 (not shown), the pulley 108 being attached to the bulwark 24, preferably upon a horizontal athwartship line passing through the boom heel pivot point 82. The general specification for the location of points 100 and 104 is that the latter be to the opposite side of the king post 84 from the anchorage of pulley 108.

Two load fall cables 110 and 112 are attached to the cargo hook 114. Load fall cable 110 extends as part 110*a* over pulley 116 attached to end 86*a* or cross member 86 and thence proceeds as part 110*b* over a pulley 118 attached to a point 120 on the king post a substantial distance above the boom heel point 82. For reasons explained below, pulley 118 is to be capable of passing either two cables or a single cable, and a splice joining two cables into the single cable. A suitable pulley is diagramed in FIGURE 10, where frame 122 is large enough to pass a splice 124, and the groove 126 is broad enough to handle two cables side-by-side. The cable 110 further extends from pulley 118 as part 110*c* to and over a pulley 128 of the FIGURE 10 type attached at point 129 on the boom a substantial distance above the boom heel point 82. Cable 110 then proceeds from pulley 130 as part 110*d* to and over a pulley 128 of the FIGURE 10 type also attached at or near point 120 to the king post 84. Cable 110 then extends as part 110*e* to a junction point or splice 124.

Similarly, the load fall cable 112 extends as part 112*a* to and over a pulley 132 on end 86*b* of cross member 86 and thence proceeds as part 112*b* over pulley 118, thence as part 112*c* over pulley 128, thence as part 112*d* over pulley 130 and then as part 112*e* to the splice 124 where it joins cable 110. From here a single cable 138 runs over pulley 140 which is anchored at the base of the king post 84. From pulley 140 cable 138 depends to any suitable winch W_3 (not shown).

In operation, the embodiments of FIGURES 6–9 will provide level luffing as the boom head may be topped or lowered. This is because the load fall cables 110 and 112 operate back and forth between points on the boom and points on the king post. Assuming that winch W_3 is not operated, nevertheless passing out or taking in on the topping, or the boom elevation changing due to slewing, will not result in the hook 114 going up or down. Of course, the locations of the anchor point 129 on the boom and the anchor point 120 on the king post structure must be adjusted in terms of the number of runs back and forth between the boom pulleys and the king post pulleys, to provide the level luffing. The novel feature of the load fall arrangement is that while two load fall cables 110 and 112 are employed going to spaced apart points on the boom head, for suppressing pendulation of the load, these two falls are joined as at junction 124 before proceeding to the winch W_3. This means that an ordinary winch can be employed, whereas in the past complicated dual drum winches have been necessary where two load falls are to be operated.

As was the case in the embodiment of FIGURES 1–4, and modification of FIGURE 5, the cable 98 of FIGURES 6–9 in all of its parts exercises forces between the boom head and the top of the king post, and also between the boom head and the points 100, 104 on the deck. Therefore the boom head will normally tend to slew toward the points 100, 104 due to gravitational force on the boom, plus any load that may be carried by the hook 114. Such slewing toward points 100, 104 is opposed by the cable means 106. In operation, the boom may therefore be slewed entirely by operation of winch W_2. When the operator pays out cable 106 from winch W_2 the boom head will tend to gravitate downwardly because movement towards points 100, 104 permits parts 98*a* and 98*f* to be shortened and as they shorten these parts are payed

into the other parts of cable **98** which lengthen the distance between the boom head and king post.

It is to be particularly noted in the case of all of the embodiments of the invention that useful forces are exerted solely by the bom head and the king post, and between the boom head and the deck points. There is no wasted force exerted between the king post and the deck points, thus eliminating unused strains known in prior art rigs. Specifically in the embodiments of FIGURES 1–5, the cable **32** operates entirely between the king post structures and the deck points via pulleys on the boom head. The same is true of cable **98** in the embodiment of FIGURES 6–9. There is no part of cable **32** which comes off king post to winch on deck nor any part of cable **98**, proceeding from a pulley on the king post directly to a deck point.

An important aspect of the rig of FIGURES 6–9 is to provide, as shown, an equal number of parts of cable **98** (1) between the king post and boom points **86***a* and **86***b* and (2) between point **86***b* and deck points **100**, **104**. For use abroad a rolling ship, the points **100** and/or **104** are preferably as far removed as possible in an athwartship direction from the boom heel point. The greater these points are thusly removed from the boom heel the further the ship may roll or list and the boom rig remain effective. With this novel arrangement of equal parts the force required to top up the swinging end of the boom will always be greater than the force required to slew the boom. Such arrangement facilitates slewing the boom rather than topping it by use of W_1 unless the vang cable **106** is held, in which case the boom can then be topped up or lowered by winch W_1.

The foregoing details of illustrative embodiment have been presented only to facilitate explanation of the invention, and the true scope of the invention is to be determined from the appended claims.

What is claimed is:

1. In combination with a boom which is pivotally heeled at a given point, means positioned at an elevation above said heel point for providing at least one topping anchor point, means positioned to one side of said heel point and at an elevation below said topping anchor point for providing a vang anchor point, means positioned to the other side of said heel point for providing a further anchor point, first cable means acting between a point on the boom spaced from the heel point and said vang anchor point, and second cable means acting between said topping anchor point thence over pulley means on the boom to said further anchor point, the arrangement being such that all forces exerted by the second cable means are exerted from the boom to the topping and further anchor points.

2. In combination with a boom which is pivotally heeled at a given point, means positioned at an elevation above said heel point and to one side thereof for providing at least one topping anchor point, means positioned to the other side of said heel point and at an elevation below said topping anchor point for providing a vang anchor point, means positioned to said one side of said heel point for providing a further anchor point, first cable means extending between a point on the boom spaced from the heel point and said vang anchor point, and second cable means extending between said topping anchor point and said further anchor point and means on said boom running in the bight of said second cable means whereby parts of said second cable means in the bight of which run said boom means extend to both the topping and further anchor points.

3. Apparatus as in claim 2 wherein the means positioned at an elevation above said heel point provides two topping anchor points, one substantially directly above the boom heel **12**.

4. Apparatus as in claim 2 wherein the means positioned at an elevation above said heel point consists of one anchor point.

5. Apparatus as in claim 2 wherein the means positioned on said other side of said heel point and at an elevation below said topping anchor point is located upon a horizontal athwartship line passing through said boom heel point.

6. Apparatus as in claim 2 wherein the means positioned to one side of said heel point and at an elevation below said topping anchor point is located forward of a vertical plane which includes the boom heel point and the topping anchor point.

7. In combination with a pivotally heeled boom, two transversely spaced apart pulley means on the boom, means for engaging cargo, a cargo fall winch, cargo fall cable means extending between the cargo engaging means and the winch, said cable means being divided at the cargo engaging means and passing over said pulley means on the boom, said divided cables being rejoined as a single cable in advance of engaging the winch drum with the cargo fall cable means completely taken in by said winch.

8. Apparatus as in claim 7 wherein said second cable means comprises plural parts in the runs acting between the topping anchor point and the boom and the latter to the further anchor point and there are an equal number of parts in the just recited runs.

9. Apparatus as in claim 1 wherein the number of parts of the second cable means acting between the boom and topping anchor point does not exceed the number of parts from the boom to the further anchor point.

10. Apparatus as in claim 1 wherein the lead part of the second cable means acting between said topping anchor point, the said boom and said further anchor point is taken to a winch which serves the dual purposes of slewing the boom when the vang is simultaneously payed out and topping or lowering the boom when the vang is held.

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