United States Patent [19]

Bauer et al.

[11] **3,768,664**

[45] **Oct. 30, 1973**

[54] **SHIP LOADING BOOM INSTALLATION HAVING LOADING AND SUSPENSION TACKLES AND AUTOMATIC GUIDE BLOCKS FOR POSITIONING THE SUSPENSION TACKLE BY THE LOAD TACKLE**

[75] Inventors: **Ralf Bauer; Nils Schummer,** both of Warnemunde, Germany

[73] Assignee: **Veb Warnowwerft,** Warnemunde, Germany

[22] Filed: **Jan. 12, 1972**

[21] Appl. No.: **217,103**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 877,693, Nov. 18, 1969, abandoned.

[52] **U.S. Cl.** **212/3,** 212/58

[51] **Int. Cl.** **B66c 23/52**

[58] **Field of Search** 212/3, 58

[56] **References Cited**

UNITED STATES PATENTS

3,512,655	5/1970	Kuhtz	212/3
3,236,390	2/1966	Sprengel	212/3
3,384,246	5/1968	Cochran	212/3
3,567,040	3/1971	Thomson	212/3
3,446,363	5/1969	Sprengel	212/3
3,042,222	7/1962	Lehmann	212/3
3,365,074	1/1968	Bradshaw	212/3

Primary Examiner—Harvey C. Hornsby

Attorney—Nolte and Nolte

[57] **ABSTRACT**

Ship loading installation having boom suspension tackle and boom controlling load tackle. The suspension blocks of the boom have guide blocks mounted on their undersides by swivel means. The loading rope runs over the guide blocks to the load-hoisting blocks. As a result this rope, when swinging the boom into a new position, automatically positions the suspension blocks by the guide blocks, so as to avoid twisting of the suspension tackle. The several blocks and swivel means form a simple inexpensive and stable unit whereby the boom manipulated with safety, speed and simplicity, heavy loads can be lifted.

6 Claims, 9 Drawing Figures

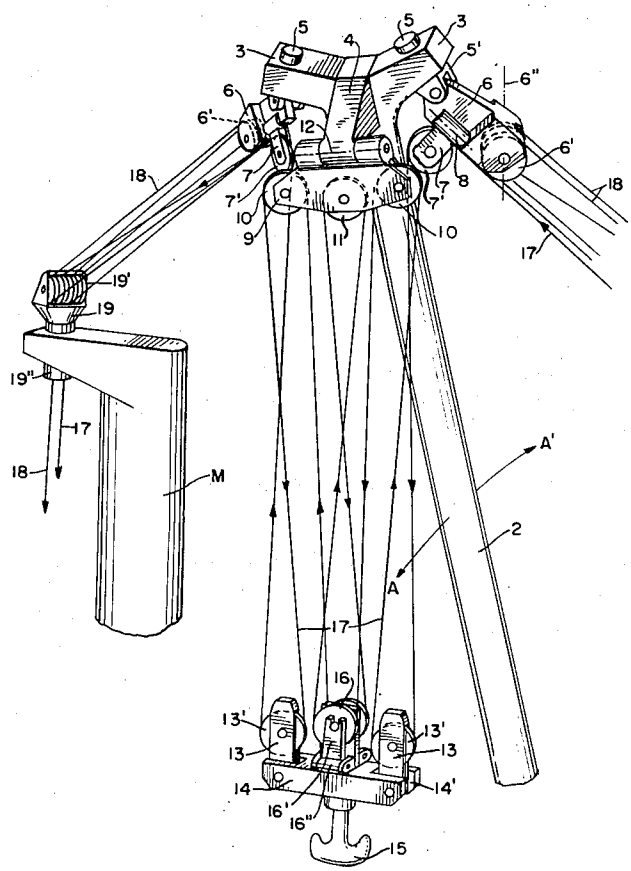


FIG. 1

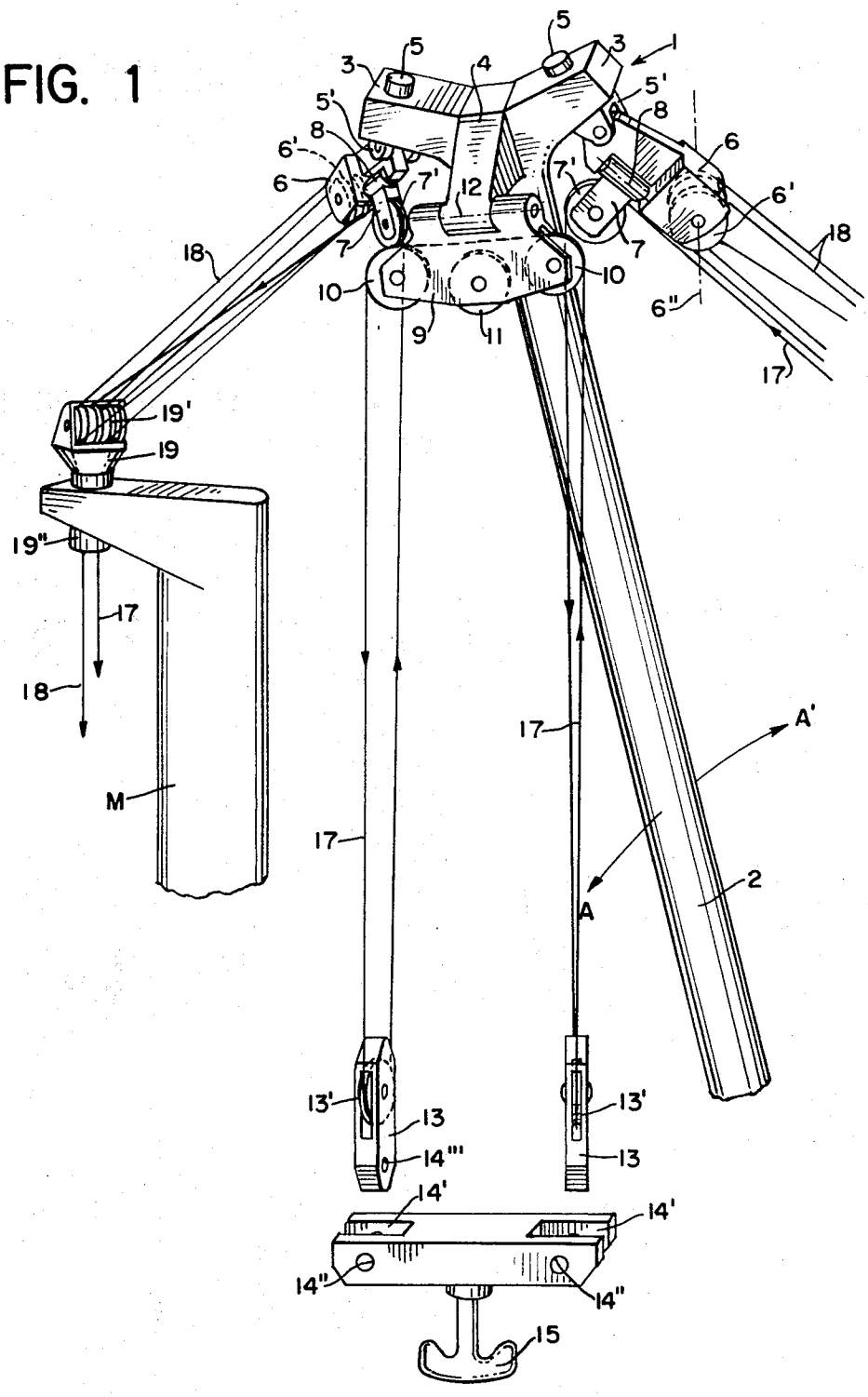


FIG. 2

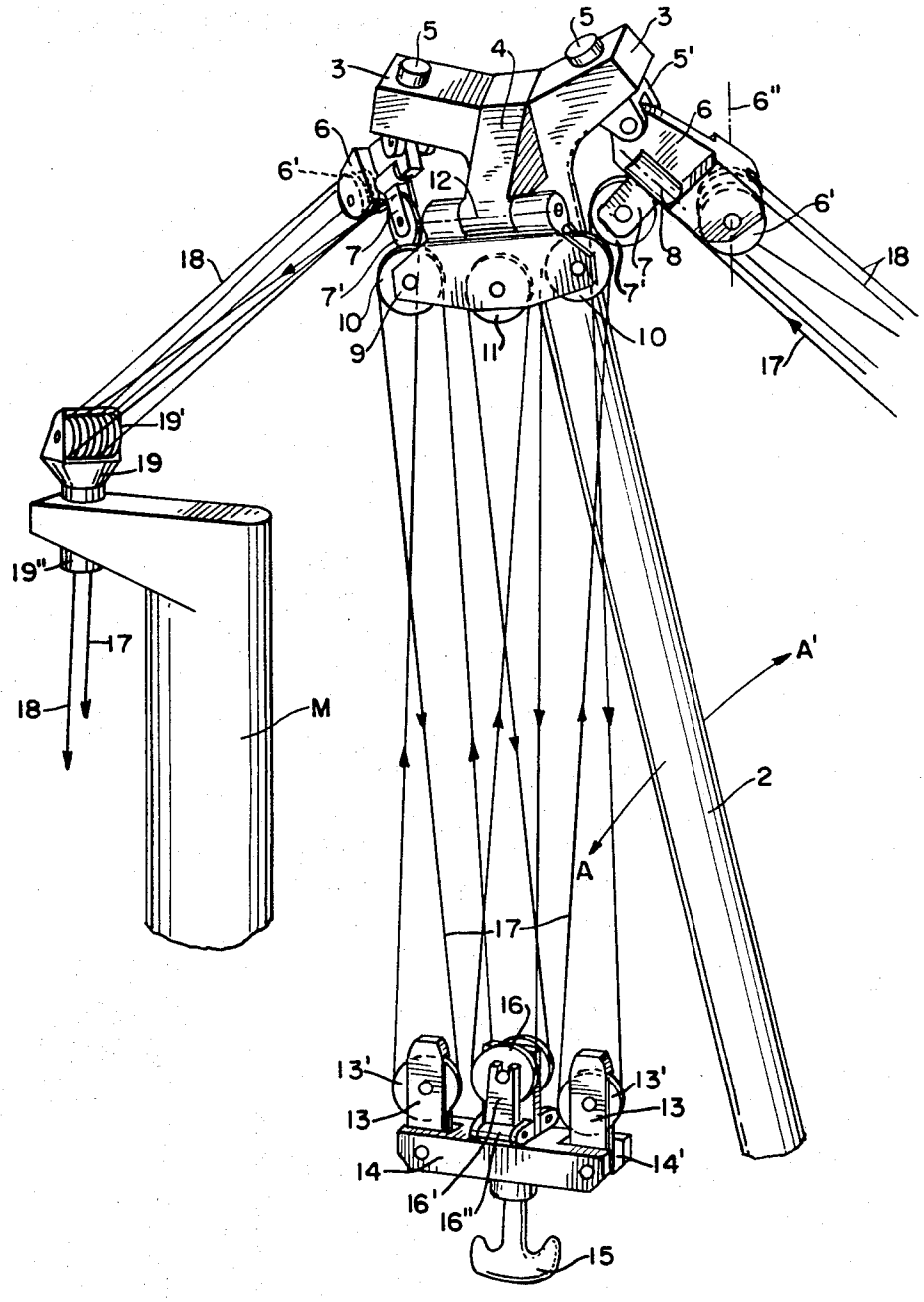

5
5
3
3
4
5'
6
6"
6'
12
6
6'
18
18
7
7'
8
7
7'
10
9
11
10
17
19'
19
19"
17
18
M
A'
2
A
17
16
13'
13'
13
13
14
14'
16'
16"
15

FIG. 3A

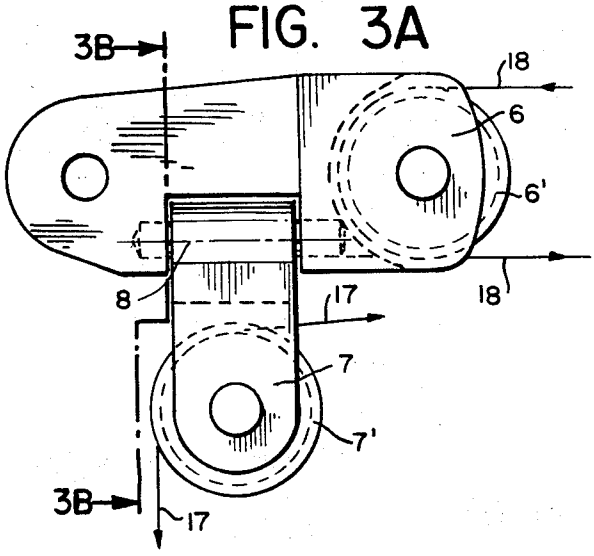


FIG. 3B

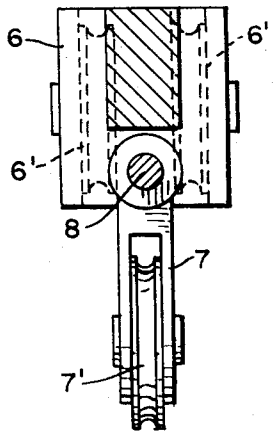


FIG. 4A

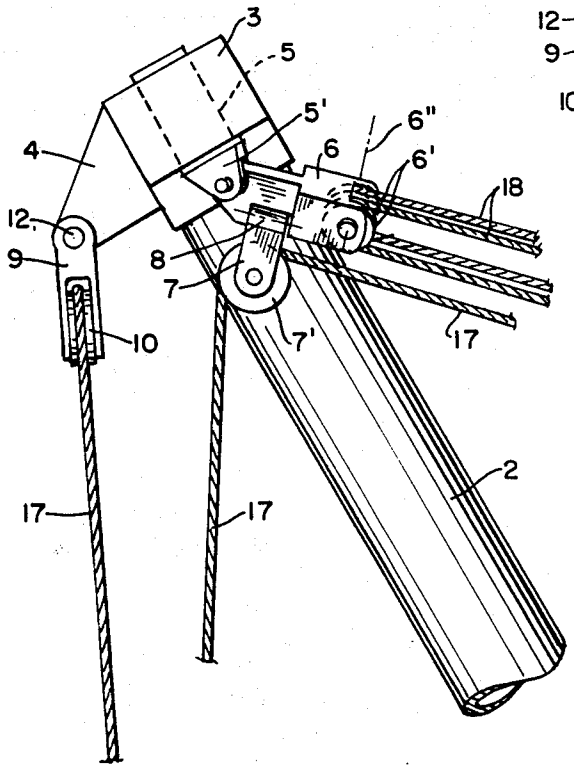


FIG. 4B

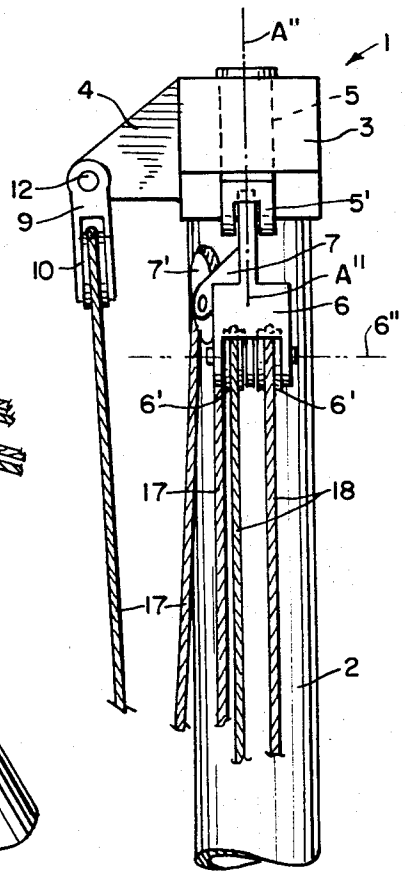


FIG. 5

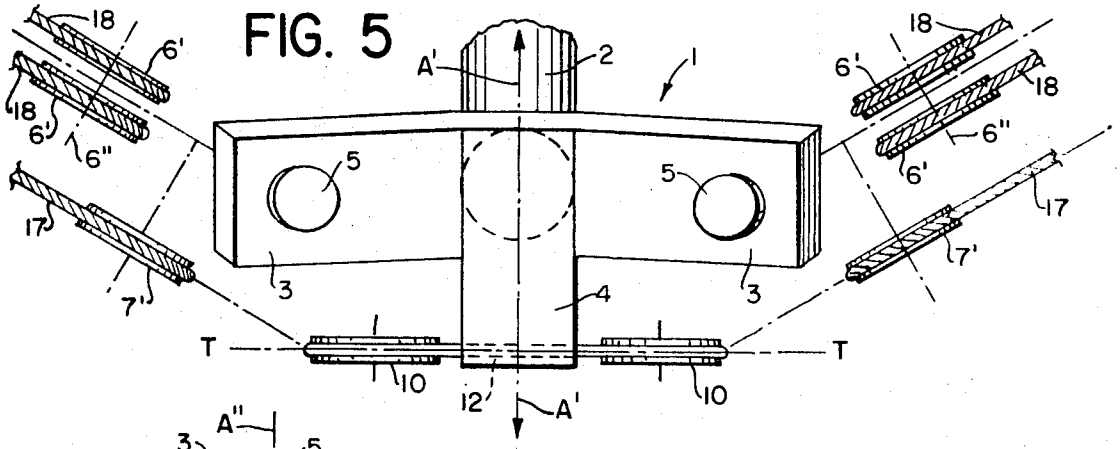
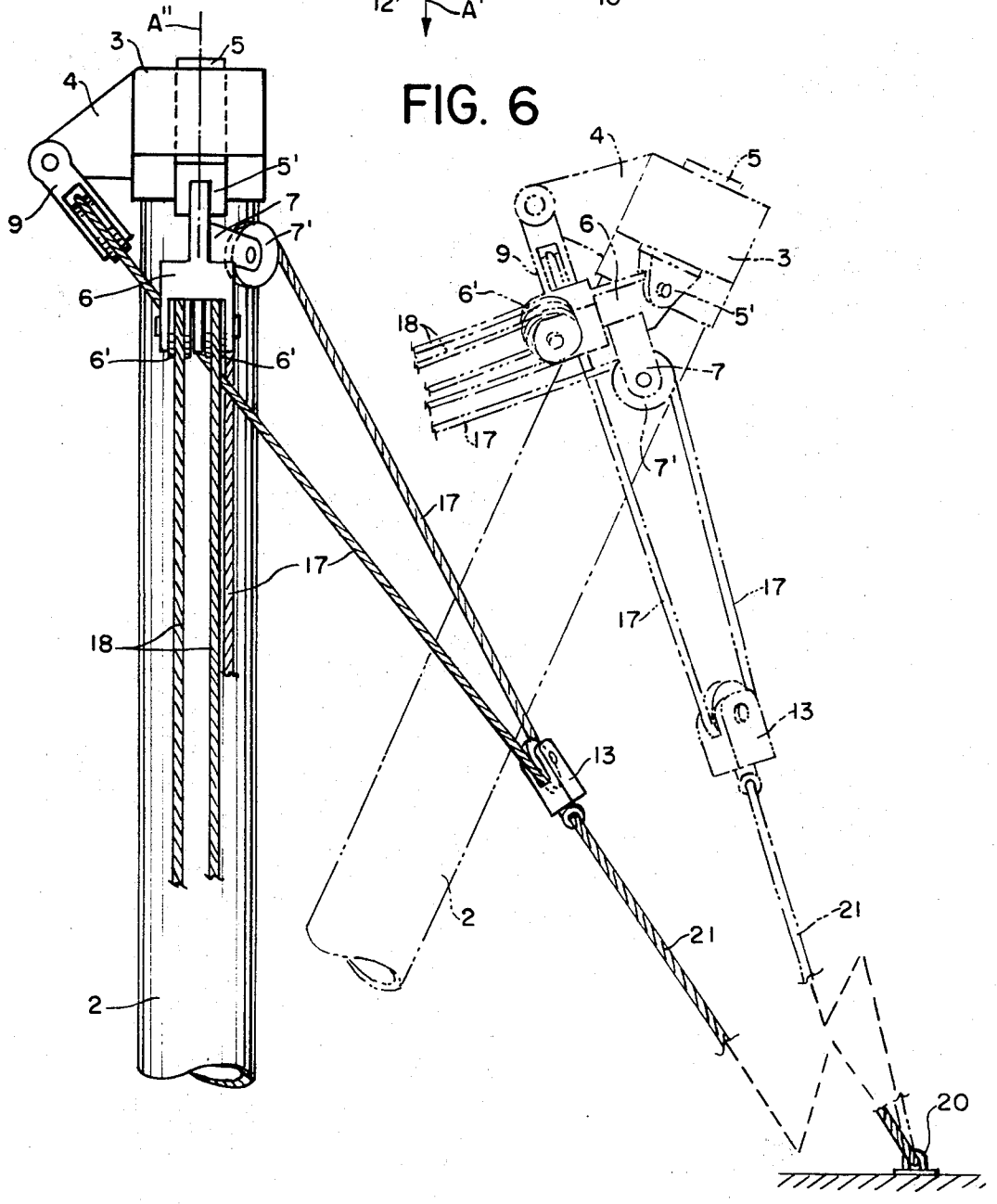


FIG. 6



SHIP LOADING BOOM INSTALLATION HAVING LOADING AND SUSPENSION TACKLES AND AUTOMATIC GUIDE BLOCKS FOR POSITIONING THE SUSPENSION TACKLE BY THE LOAD TACKLE

This is a continuation-in-part of Ser. No. 877,693, filed Nov. 18, 1969 and now abandoned.

BACKGROUND AND NATURE OF THE INVENTION

Cranes, booms and other loading installations have been known for a long time. They have also been known to be subject to distinct limitations. A frequently preferred type of installation uses a loading boom pivoted to a ship's deck between two side posts and held by suspension tackle between the side posts and the boom. It is operated for the lifting of loads, as well as certain boom-positioning operations by loading tackle running from one side post onto the boom and its load blocks and then to the other side post. Many constructions are known for swinging the boom through the plane between the side posts, mainly in order to use the boom to service hatches on different sides of this plane; however, in prior attempts to effect such swinging by the load tackle, arrangements were needed which were complicated, expensive and sometimes unreliable.

It is therefore an object of this invention to provide a boom installation with more effective, economical and reliable control means.

This has been achieved by a new construction, featuring a pair of guide blocks, each pivotably secured to one of the suspension blocks. The loading rope runs over the guide blocks and, when swinging the boom into a new position, automatically positions the suspension blocks, by the guide blocks, so as to avoid twisting of the suspension tackle. Thus the guide blocks serve as part of the load tackle system and also as part of the suspension tackle system. No other suspension controls are needed, and the construction is as economical as it is effective.

IN THE DRAWINGS

FIG. 1 is a perspective view of the new installation, shown here in position for swinging the boom across a mid-plane of the ship;

FIG. 2 is a similar perspective view, showing the installation arranged for hoisting loads;

FIG. 2A is a further similar view, showing a modified boom and tackle system;

FIG. 3A is a front view of the suspension and guide block unit, a principal part of the invention;

FIG. 3B is an end view, partly in section and taken along lines 3—3 in FIG. 3A;

FIGS. 4A and 4B are fragmentary side views of the new unit, in two positions thereof;

FIG. 5 is an approximate plan view of the unit in the position of FIG. 4B, omitting certain parts; and

FIG. 6 is a fragmentary side view of the boom showing further positions of the same and of equipment thereon.

Referring first to FIGS. 1 and 4A, wherein the installation is shown in perspective and elevational views, respectively: the head 1 of loading boom 2 is arranged generally between two boom supporting masts or posts, one of which is shown in FIG. 1 at M. The foot of the boom is pivoted to the ship's deck, not shown in these figures, exactly between the side posts.

FIG. 4B shows a vertical center line and mid-plane C of the boom operation, which may also be called a plane transverse of the ship. While not shown here, both posts M have their center lines in this center plane. The boom can swing forwardly and rearwardly across this plane 1, in arcuate motions designated in FIG. 1 by arrows A, A', in order that the load tackle of the boom may service loading areas on either side of this mid-plane

Boom head 1 comprises a pair of sides arms 3 and a center arm 4 perpendicular to these side arms. This center arm, together with the boom, lies in the plane of swing A, A' and extends from the boom in one of the directions A. The side arms 3 are symmetrical to the center arm and boom and extend, as shown, transversely of the plane of swing A. The side arms and boom as a unit define a plane which in FIG. 4B and 6 coincide with A. In this plane a swivel bolt 5 extends through each side arm 3. It supports a lower extension piece or swivel fork 5' below the side arm, as will be clear from FIG. 1. In each swivel fork, a suspension block 6 for the boom suspending tackle can swing, in various planes, as is shown for one position in FIG. 1 and for two different positions in FIGS. 4A, 4B. Evidently ball 5 and fork 5 constitute a universal joint for three-dimensional swivelling of suspension block 6 on boom arm 3.

In accordance with the invention, boom suspension blocks 6 have not only the usual tackle pulleys 6' pivoted therein, but each suspension block has a guide block 7 pivotably suspended therefrom by an axle 8, constituting a second swivel means. This axle or second swivel 8 lies in a plane which also constitutes the major plane of the suspension block. This plane is normal to the direction 6'' of the axis of the pulleys 6' for the suspension tackle. It will further be seen that each guide block pulley 7' lies in a plane which includes the axis of its axle 8. When boom 2 is in a vertical position as shown in FIG. 4B the axis of each guide block 7 lies in the center plane A while the guide block itself, as shown in that figure, may lie on one side of that plane — the side of center arm 4 — and may only subsequently begin to swing to the other side of the center plane. These motions of the guide block are caused by the load tackle, as will be described presently.

On center arm 4 of boom head 1, an upper loading block 9 is provided, which according to FIG. 1 comprises two lateral pulleys 10, one on each side of the boom and both mounted on pivots parallel to the plane of swing A. The entire upper loading block 9 is pivotable around a horizontal axle 12 normal to this plane, and parallel to side arm plane S, as best shown at T in FIG. 5. As further shown in these FIGS. 1 and 6 the spacing of pulleys 10 is fairly wide, in comparision with this boom, thereby allowing the loading tackle to swing, unobstructed by the boom, from one side of the center plane A to the other side thereof, when the lower loading blocks, to be described presently, are disconnected from one another.

The bottom portion of the loading block system consists of two loading blocks 13, each being shown as having a pulley 13'. These lower loading blocks can be connected with one another by horizontal bar 14 wherefrom a loading hook 15 depends.

A one piece loading tackle or loading rope **17** is provided, which runs from a winch, not shown, through a post M, over the adjacent guide block **7** provided according to the invention; then to one of the lower loading blocks **13**, from there to the overlying load pulley **10**, across to the other side of the boom, down to the second, lower block **13**, and up to the second guide block **7**. It then continues to the other side post and winch. It is this arrangement of the load tackle and guide blocks which enables the load tackle not only to operate normally and effectively for loading purposes, but also to swing the boom across the center plane without any of the ill effects to the suspension system, formerly encountered, which required much more costly and complex devices as a corrective measure.

Suspension tackle **18**, which is basically known to the art, is shown here only insofar as it relates to the present invention and mainly to its relationship with guide blocks **7**, which hold this tackle against twisting, under the control of the load tackle. The suspension ropes on each side of the boom run back and forth between suspension block **6** of the boom and an outer suspension block **19** on a side post, as a group of ropes, which must be kept in proper orientation, as shown, for proper suspension of the boom. The outer end of these ropes runs over one of pulleys **19'** and then down to a winch, not shown, for operation of the boom, when the boom is on either side of the center plane. Suspension blocks **19** are turnable in vertical bearings **19''**, to keep their pulleys **19'** oriented in the planes of boom suspension pulleys **6'**, by tension of tackle **18**. These bearings **19''** can be hollow to conduct the end of the suspension tackle downwards through them, as shown.

As already indicated, an important part of the operation of the new ship loading boom installation has to do with swinging the boom through the center plane, for operations on either side of that plane. The installation according to the invention serves particularly to facilitate this boom-swinging operation or a phase of it, with the aid of the load tackle and of simple, inexpensive and highly effective load tackle-controlled and suspension tackle-controlling guide means. The suspension tackle alone could bring the boom only to the center plane, not beyond the same. The boom swinging operation performed with the aid of the new load tackle and suspension tackle equipment is illustrated in FIG. **6**. The figure illustrates, at left, the position of the essential parts, existing when the boom has been brought to the center plane, where it is in vertical condition. At this time, if not before, the operators attach lower load block to suitable hook or anchor means **20** on the ship's deck D, by a rope **21**. Load tackle **7** then converges to the lower load block, from upper load block **9** and guide block **7**, as shown. An end part of load tackle **7**, identified by number **17'**, runs from guide block **7** to the adjacent side post, along suspension tackle **18**. This guide block is, in this position of the installation, pulled from its former position (FIG. **4B**) to the side of the center plane where the load tackle connecting rope **21** is fixed to the deck. Such pulling of the guide block is affected by the new arrangement of the load tackle, and by the tension applied to it through its winch (not shown).

At this time, suspension block **6** is not exposed to significant tension of the suspension tackle, since block **6**, which moves with boom **2** in the plane of swing, then has minimum distance from the side post. At least the major force that orients the suspension block at this time is the force of the load tackle, applied to the suspension block by the guide block.

Three-dimensional swivelling of the suspension block, in its universal swivel bearing **5**, **5'** takes place as the boom moves from this center position. Again the swivelling of the suspension block, as well as the moving of the boom (against a restraining force which now begins to be applied by the suspension tackle), is effected mainly by tension of the load tackle. The motions of the reversal parts can be visualized on consideration of the broken line showing of the boom head. This three-dimensional swivelling of the suspension block, together with the now re-established tension of the suspension tackle, tends to keep that block in one and the same plane with the adjacent outer suspension block, although this no longer is the center plane of the ship. The load tackle continues to pull guide block **7** toward anchor point **20**, and to keep this guide block in a plane which intersects attachment point **20**.

What is claimed is:

1. Ship loading installation of the type wherein a boom having a boomhead is pivotably arranged on a ship's deck between two side posts fixed to the deck, for loading operations on either side of a vertical center plane which passes through the side posts, and suspension tackle extends between the boomhead and each side post, while load tackle passes from one side post to upper and lower load blocks suspended from the boomhead and then to the other side post; said installation comprising:

a pair of rigid arms symmetrically extending a short distance from the boomhead, generally toward the side posts;

a pair of first swivel bearings, one on each side arm, each bearing extending across the arms along the boom and having an extension piece at a free end of the bearing;

a suspension block on each of these extension pieces, each block being pivoted to the extension piece for swinging in a plane which includes the swivel bearing, and each block having pulleys, for the suspension tackle;

a pair of second swivel bearings, one on each suspension block, extending generally in the direction of the suspension tackle;

a guide block on each suspension block, pivoted to the last mentioned swivel bearing of the block and having a guide pulley, in a plane parallel to the suspension tackle and to the load tackle portion extending to the side post;

whereby the load tackle can be brought from the side posts over the guide pulleys to the load blocks, so that the load tackle, through the several swivel bearings, keeps the suspension blocks in such positions that the suspension tackle will not be twisted when the boom is swung through the center plane by the load tackle.

2. Ship loading installation according to claim **1** wherein the first swivel bearings extend through the side arms and have their extension pieces below the side arms.

3. Ship loading installation according to claim **2** wherein the second swivel bearings are mounted in the lower parts of the suspension blocks.

4. Ship loading installation according to claim **1** wherein the boomhead also has a center arm, normal

to the side arms, and the load blocks are pivoted to the center arm for swinging motions about an axis parallel to the center plane.

5. Ship loading installation according to claim **4** wherein the upper and lower load blocks have pulleys on both sides of the boom, for said load tackle, and also have central pulleys between the pulleys on both sides, for additional load tackle.

6. Ship loading installation according to claim **4** wherein said upper load blocks are pivoted to said boom head between said two said side arms.

* * * * *