The Coaling Outrigger System of *Titanic*

By Bob Read, D.M.D

Introduction

This article is a re-write of an earlier article I wrote on this subject. I have engaged in a more intensive study of this subject and better photos have become available. This new article will primarily be confined to the outrigger system itself rather than any detailed treatment of the entire coaling system and operations. Additionally, this article will have as its primary focus the upgrades to the outrigger system found on *Titanic.*

Basics of the Coal Loading Operation

In order to understand the coaling outrigger system, one must understand the basics of how the coaling operations were carried out on *Titanic*. Coal was brought to the ship by coal barges which were moored alongside the ship and below the coal doors on the ship's lower hull near the waterline. The procedure of loading coal aboard the ship was a very labor-intensive operation at this time. Loading platforms on which workers would stand were rigged below the coal doors. The doors were opened and chutes were attached at the door openings. Baskets were loaded with coal on the coal barge and hoisted by means of block and tackle attached to the ship. The baskets were hoisted to the loading platform where workers emptied them into the chutes and through the coal doors which opened directly into the coal bunkers of the ship. Workers inside the ship's bunkers then distributed the coal evenly in the bunker. Figure 1 shows the loading of coal on a ship of this era.

Go to next page

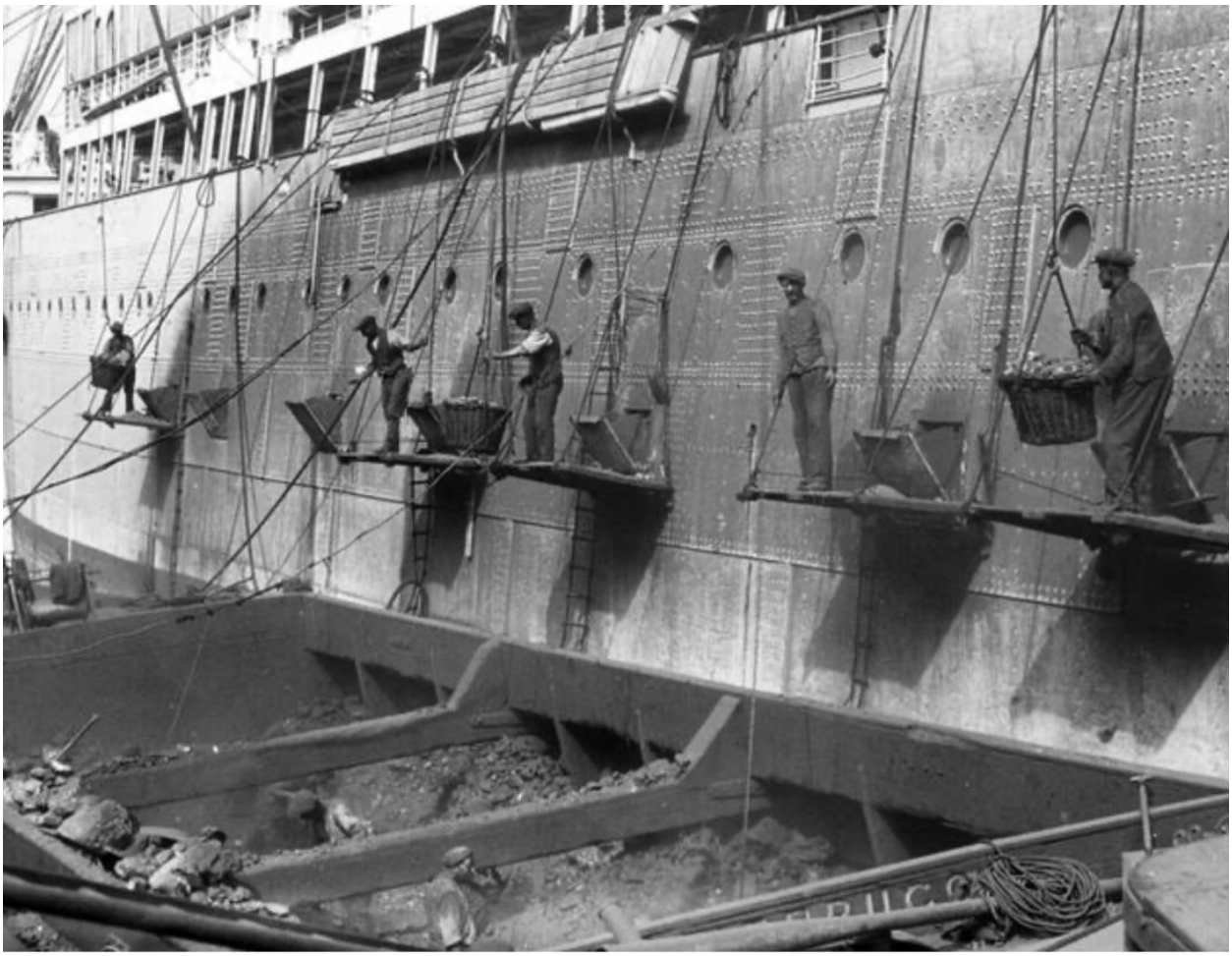

Figure 1

Representative photo of coal being loaded aboard a ship (not *Titanic)*

The Need for Coaling Outriggers

Many ships of this era used this system of loading coal aboard but did not require a system of outriggers. The problem that outriggers addressed on *Titanic* was that the slope of the sides of the ship inward, or "tumblehome", on *Titanic* was such that at the considerable height of the superstructure where the blocks and tackle were rigged, did not hold the them far enough away from the ship to be directly over the coal barge. Figure 2 show how an outrigger system allowed blocks and tackle to be positioned far enough outboard so that the lines from the blocks and tackle would be positioned directly over a coal barge.

Go to next page

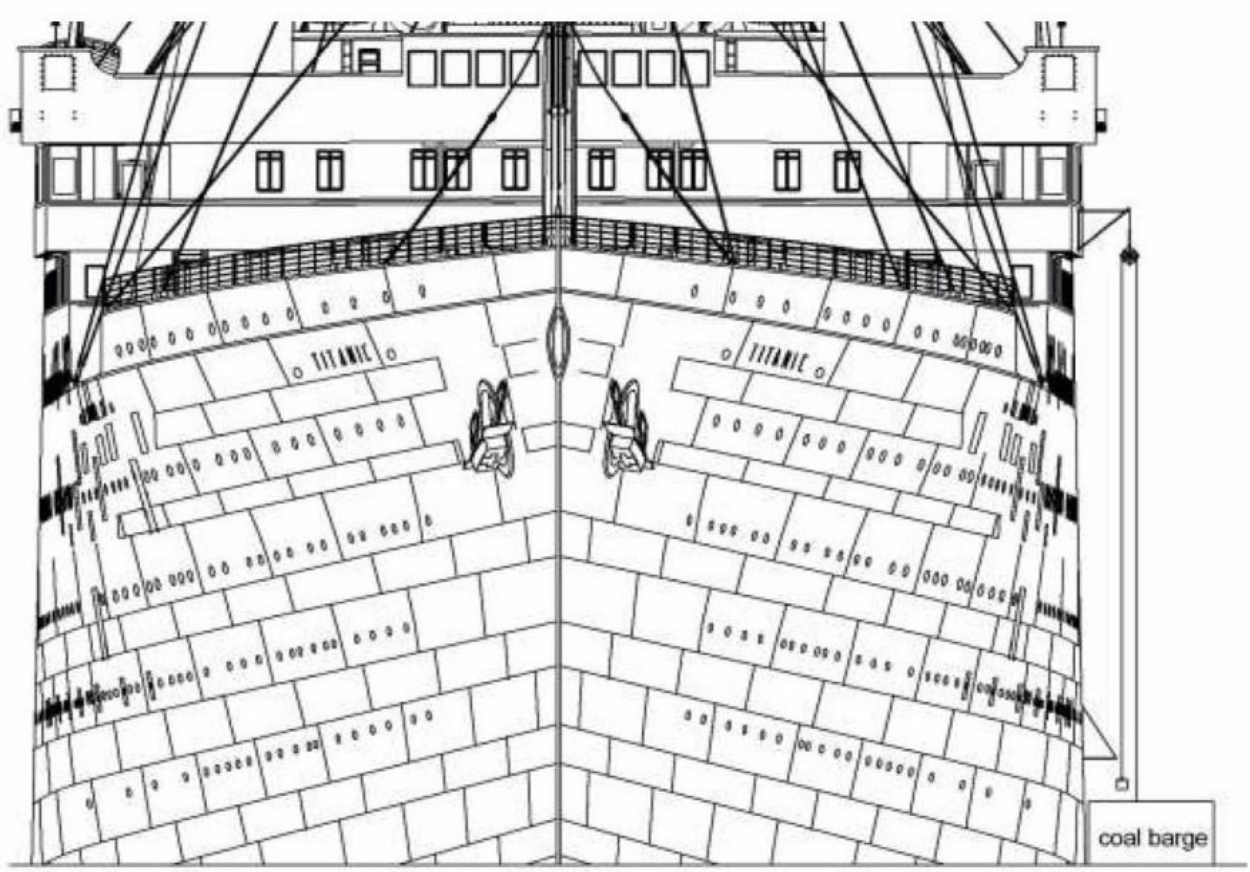

Figure 2

Drawing showing how an outrigger system is used to position blocks and tackle over the coal barge and not get fouled on the ship's side

The rigging to lift the coal baskets from the coal barge to the loading platform consisted of a block known as a "gin block" and the ropes which were rigged to the block. Figure 3 shows the basic gin block and tackle.

Go to next page

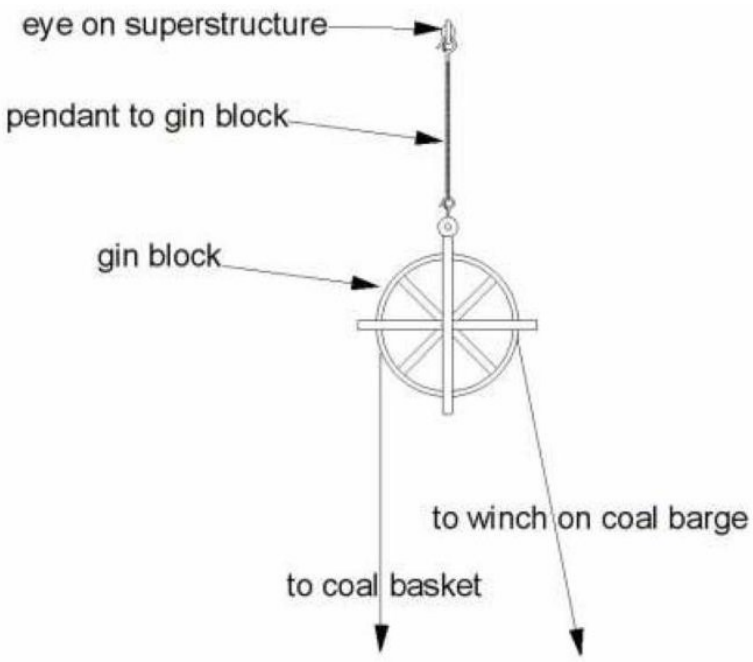

Fig 3

Block and tackle rigging used to lift coal baskets

Figure 4 shows how the gin block and tackle was slung out over the outrigger wire to begin lifting coal baskets in the coal barge.

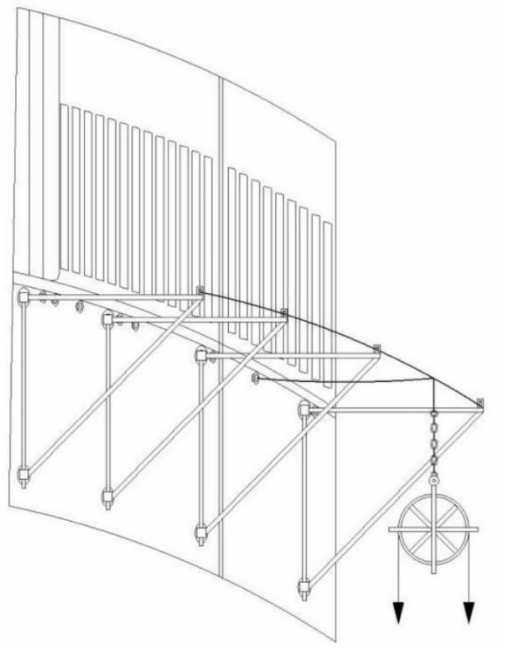

Figure 4

Gin block and tackle ready for use

The Coaling Outrigger Brackets

Figure 5 shows outrigger brackets and associated tackle along *Olympic's* A deck bulwark.

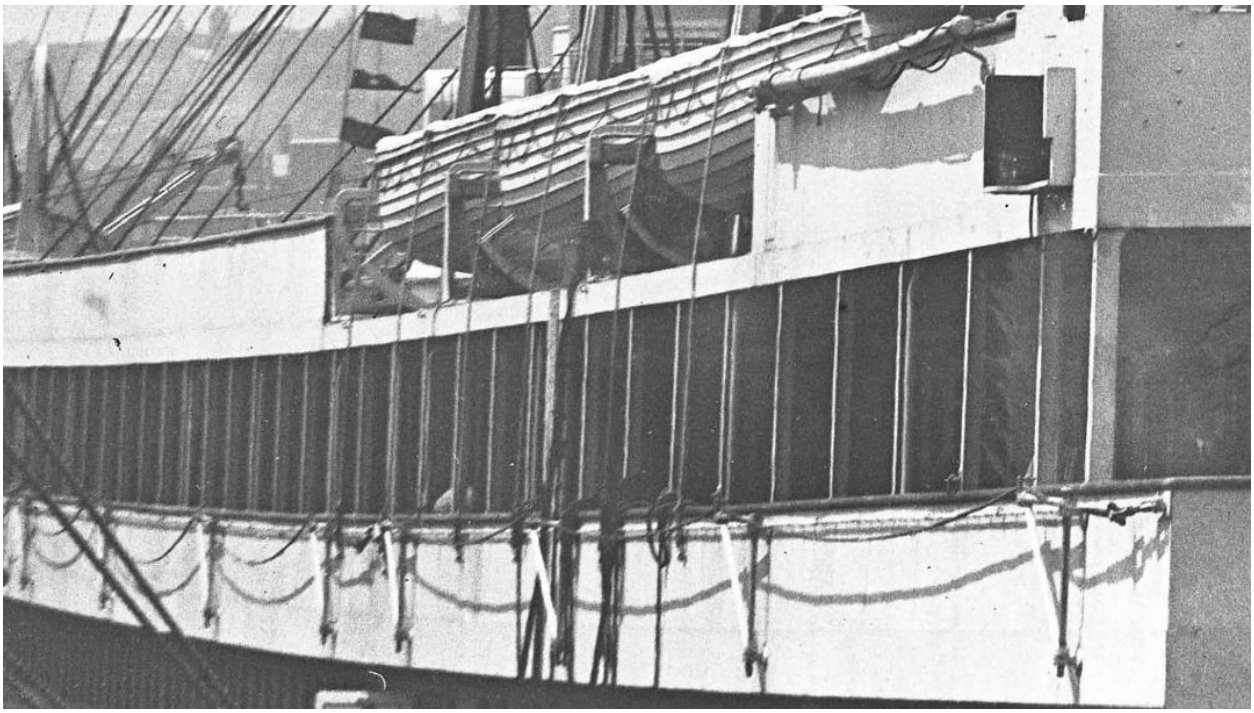

Figure 5

Outrigger brackets and associated tackle along *Olympic's* A deck bulwark

The brackets which suspended the outrigger wire were attached to *Titanic's* A deck bulwark. When stowed, the outer ends of the brackets were rotated so that the end faced aft. The brackets were locked into one of either two positions. They were either rotated aft and locked into the stowed position or they were rotated perpendicular to the ship's side and locked into this deployed perpendicular position. Figure 4 illustrates the outrigger brackets in their deployed perpendicular position.

The outrigger brackets could not be unlocked from either of their two locked positions by hand. Above each bracket on the Boat Deck level was a pad eye attached to the outboard superstructure. Blocks and tackle were attached to these padeyes to lift the brackets from their locked positions. Once an outrigger bracket was raised out of the locking position, it could be rotated to the alternate locking position where it was lowered into the locking position of the hinge.

Go to next page

Outrigger Groups

On each side of the ship, the coaling outrigger system consisted of two working sections formed by a forward and aft outrigger group. Figure 6 shows the location of these two outrigger groups.

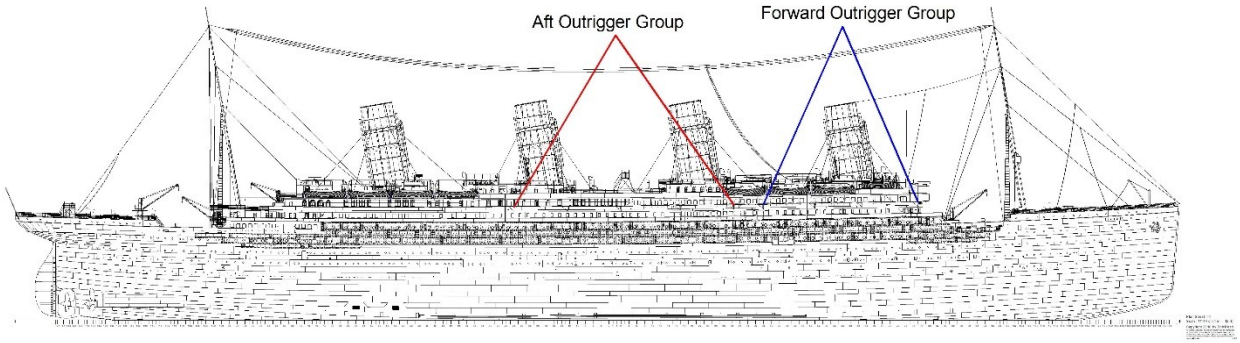

Figure 6

Location of forward and aft outrigger groups on the A deck outboard bulwark

There were ten outrigger brackets per side. The furthest bracket aft on each side was not a part of the aft outrigger group. These were independent brackets which served the first and second-class galley coal bunker. The forward outrigger group included outrigger brackets #1 through #4 numbered from forward to aft. The aft outrigger group included outrigger brackets from #5 through #9, also numbering from forward to aft.

Titanic's Upgraded Outrigger Brackets

On early *Olympic,* all of the coaling outrigger brackets were identical. They all consisted of triangular brackets with an eye incorporated in the end through which the outrigger wire was passed. We can surmise that the end brackets of the outrigger groups were of inadequate design because they were upgraded on *Titanic* and subsequently on *Olympic* herself.

The design of *Titanic's* coaling outrigger system was a modification and upgrade of *Olympic's* system. The design of a system like this is relatively simple but with *Titanic* there are elements which are difficult to identify with certainty due to the short life of *Titanic* and the relatively few photos taken of her which clearly show details of this system.

Because there are areas where the photographic record does not provide definitive answers, we must rely on engineering principles to guide out educated speculation regarding these elements. The elementary engineering principles applied to this system are:

1. The system should be the simplest design to adequately, safely, and expeditiously be used to perform the tasks for which it was designed.
2. The system should not be "over engineered" and thus it will perform the required tasks and be economical.
3. The system for *Titanic* was not an effort to "reinvent the wheel". It merely incorporated minor improvements.

There are several design parameters within which these outrigger end-brackets must operate:

1. **Since the bracket, when deployed, has its end over 4 ft. outboard from the bulwark, all attachment and operation of equipment must be performed while the bracket is in the stowed position against the bulwark. This is of paramount importance for safety's sake. I consider this rule to be inviolable.**
2. **Only one turnbuckle is required and desirable per outrigger group. To try to adjust two outriggers is not only unnecessary, it is impractical. If one examines all the other rigging on *Titanic* which uses a turnbuckle, you will not find a second turnbuckle used to take up slack on the same line.**

In Figure 7 which shows the forward port outrigger group of *Titanic,* we can see that the forwardmost bracket is the bracket with a horizontal bracket stay (indicated).

Go to next page

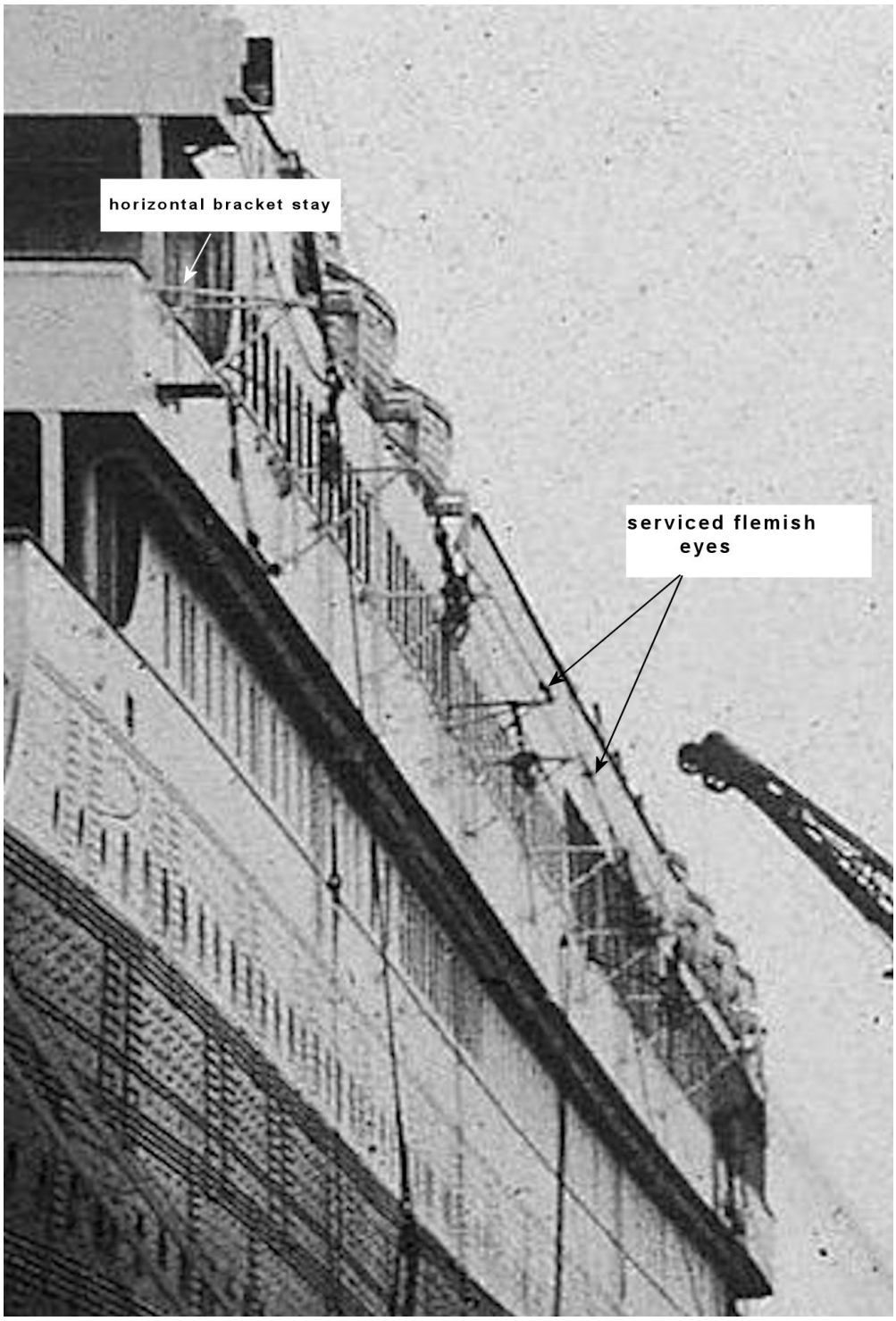

Figure 7

Titanic's two port side outrigger groups

The aft end-bracket should have a turnbuckle attached between the outrigger wire and the bulwark. There is a Flemish eye attached to the end of the outrigger wire forward of the aft

end-bracket. This Flemish eye serves to identify the location of the end-bracket which has a turnbuckle attached. The purpose of a Flemish eye is to provide a connection point to a second line which goes around the end of the outrigger bracket and attaches to a turnbuckle which attached to a bracket on the A deck bulwark. A representative serviced Flemish eye is shown in Figure 8.

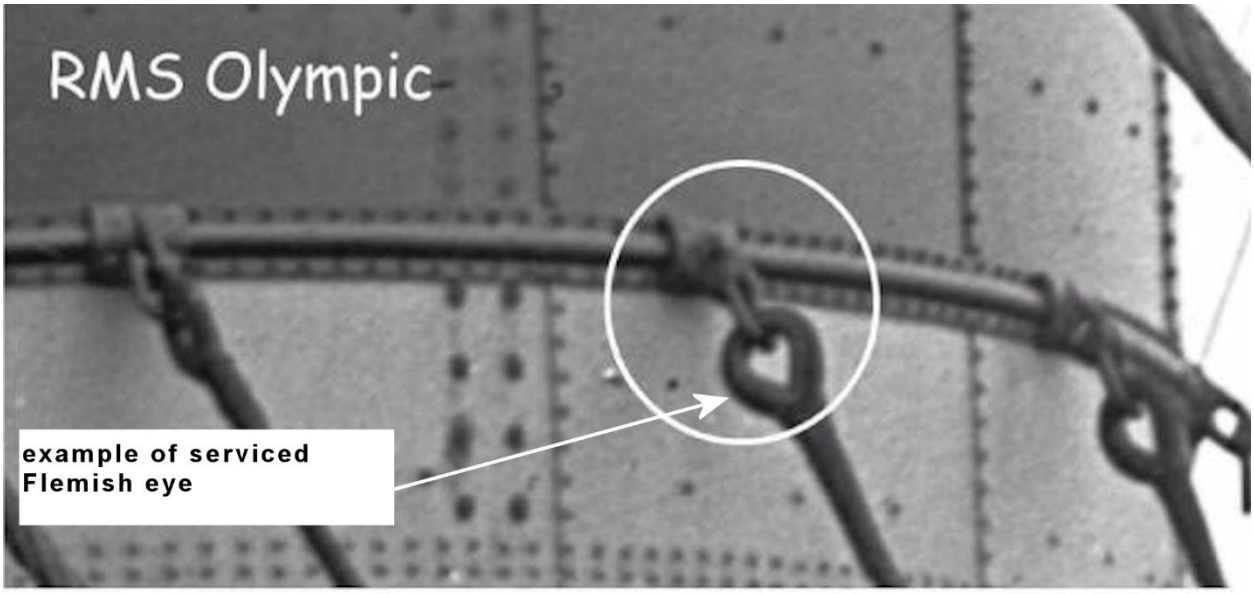

Figure 2

Representative example of a serviced Flemish eye

***Titanic's* upgrade:** There are many pieces or equipment on *Titanic* which were upgraded because of lack of optimal performance of similar equipment on *Olympic.* The coaling outrigger system is but one example. On Titanic we see the addition of horizontal bracket stays to the end brackets of each of the four outrigger groups. We also see a change in how the outrigger wire transitioned to its connection with the turnbuckle. Both of these upgrades suggest that the end brackets were not stable because of a combination of the forces used to tighten the outrigger wire and the weight placed on the outrigger wire by the coal loads. We don't really have a clear image of the modifications made to the end-brackets for each outrigger group. Fortunately, a H&W sketch, shown Figure 8, was found with a drawing of an upgraded end bracket for *Olympic.* There is no date on the document so the changes were probably made to Olympic sometime during her first year up through her 1913 refit. It is my opinion that this sketch of *Olympic's* end bracket represents the modifications which were made to *Titanic* and subsequently to *Olympic.* The two modifications were the addition of two swivel attachment points. One swivel attachment point was placed on the end of the bracket which eliminated the eye which was on *Olympic's* original end brackets. The other modification was a swivel attachment point inboard on the bracket. In order not to compromise the structural integrity of the bracket a strength device known as a

"strongback" was added to the top of the bracket. The specifics of the attachment details are not known but it created a second swivel attachment point on top of the bracket. With this second attachment point centered over the top arm of the bracket, the same bracket structure could be used for both end brackets of an outrigger group.

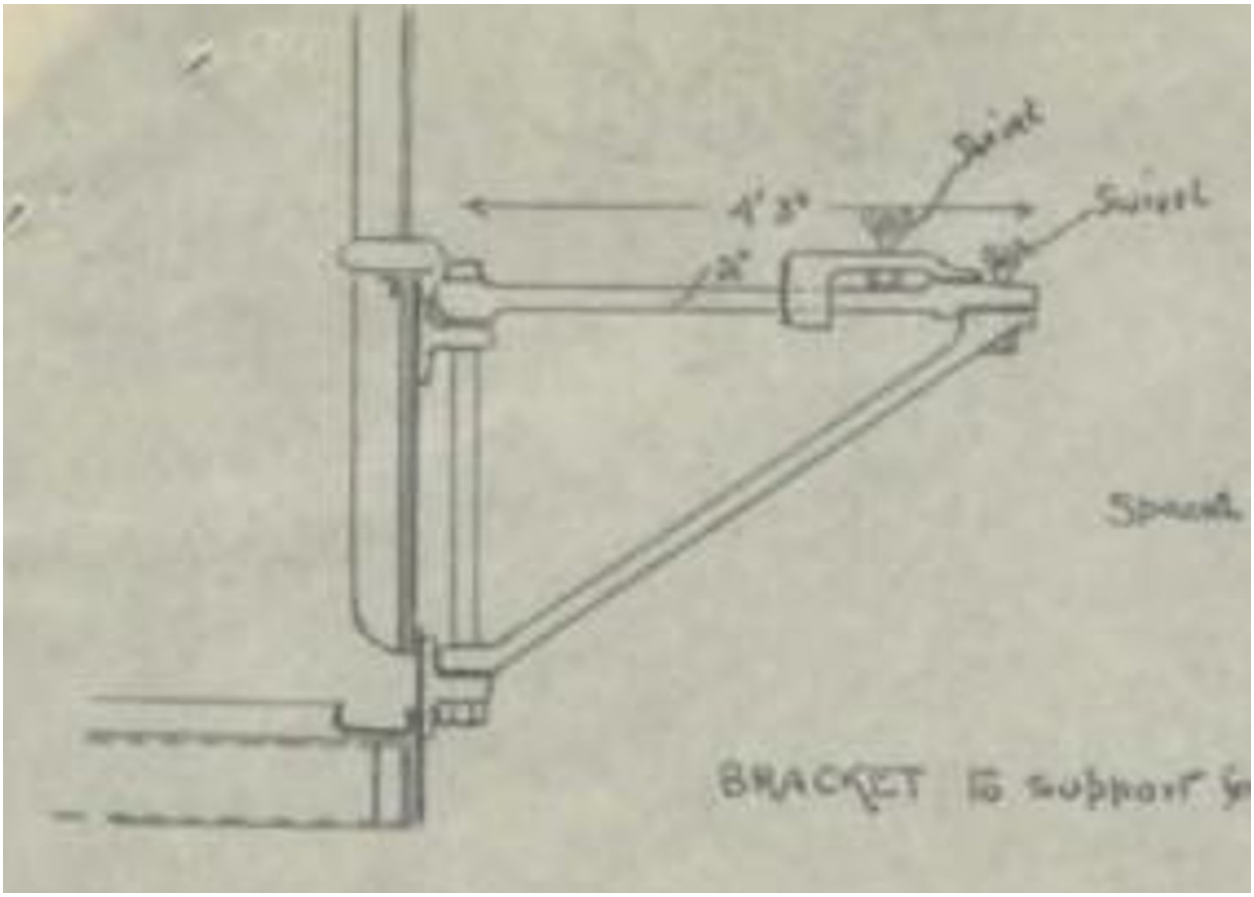

Figure 9

Sketch of an improved outrigger bracket in *Olympic's* coaling outrigger system

In this section I will describe the set-up of the end brackets on *Titanic* which used the improved design end bracket.

Forward, port bracket set-up – Figure 10 shows how I believe the forward improved outrigger bracket of *Titanic's* forward port outrigger group was set up.

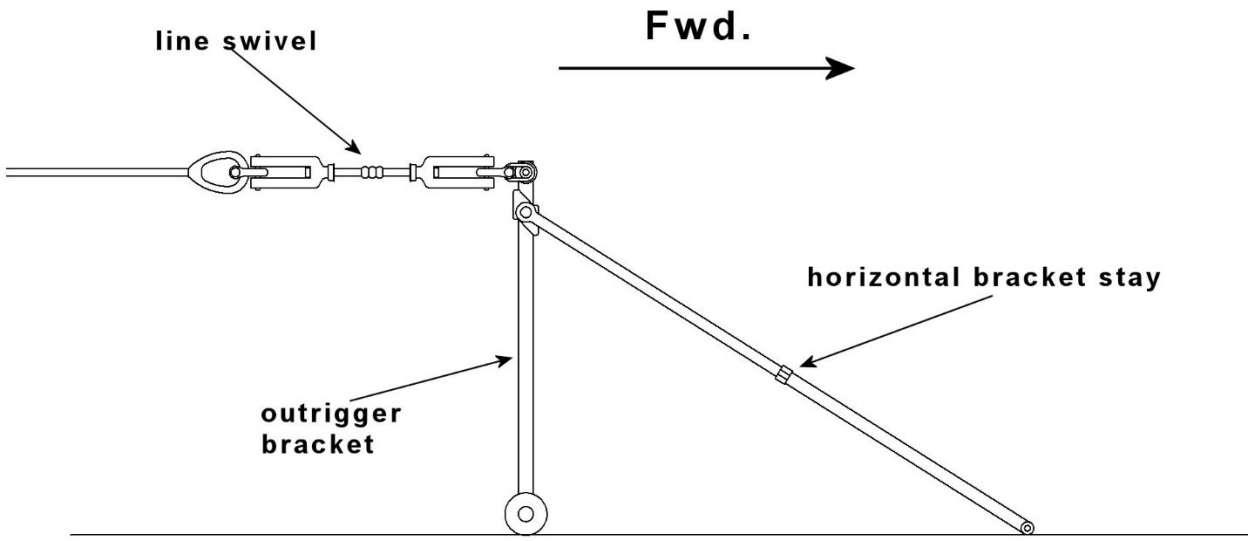

Figure 10

Titanic's improved forward outrigger bracket of the forward port outrigger group

The two new attachment points on *Titanic's* forward, port outrigger bracket accommodated a line swivel shackle assembly to prevent the twisting of the outrigger wire when tightened by the turnbuckle aft. The second attachment point accommodated the attachment point for a horizontal bracket stay. This stay resisted any pulling forces exerted on the bracket.

Aft, Port bracket set-up - Figure 11 shows how I believe the aft improved outrigger bracket of *Titanic's* forward port outrigger group was set up.

Go to next page

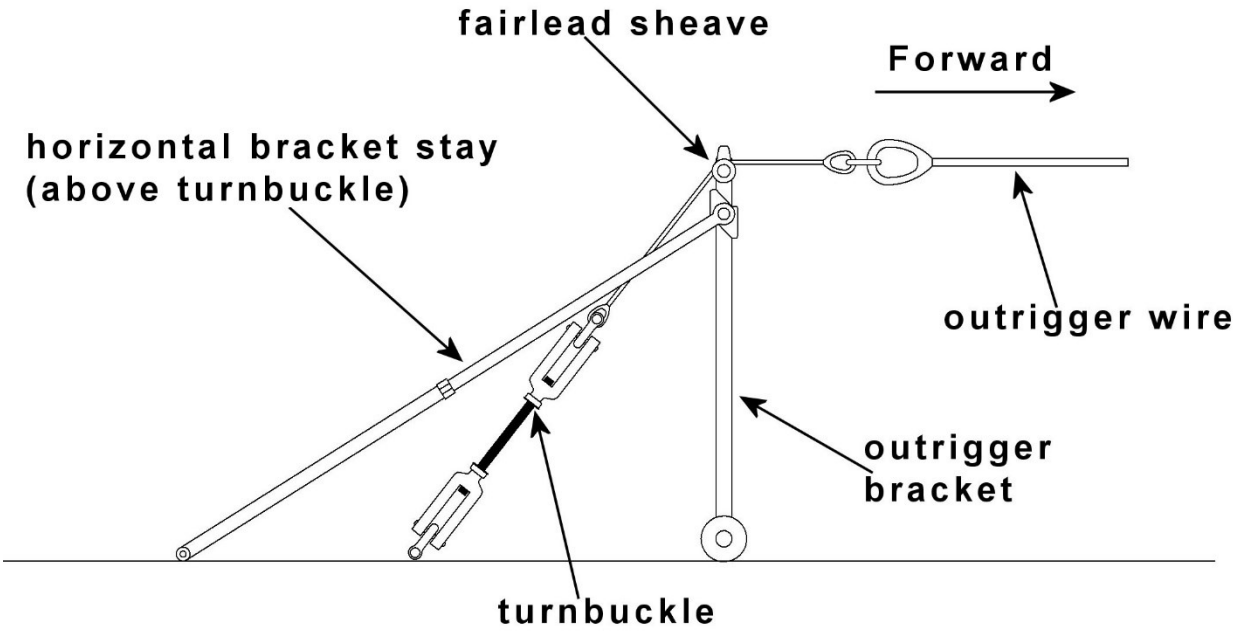

Figure 11

Titanic's improved aft bracket of the forward, port outrigger group

The first improvement of this aft bracket set-up is the addition of a sheave to the end swivel attachment point. It appears that they created a transition to a smaller diameter outrigger line (with equal tensile strength) forward of the bracket. This allowed the outrigger wire to transit the turn to the turnbuckle without undue resistance or chafing. The second improvement of this bracket set-up is the addition of a horizontal bracket stay to the second attachment point on the bracket like the forward bracket set-up.

Conclusion

This article has given a brief overview of the necessity and function of the coaling outrigger system to the overall process of loading coal on *Titanic.* Since *Titanic's* outrigger system was modified and improved over that found on early *Olympic,* particular emphasis has been given to those aspects of this upgrade. This applies primarily to the configuration of the end-brackets of the outrigger groups. While the basics of what was needed for this upgrade are known, some of the small details of the end-brackets and the associated equipment are impossible to know at this point due to lack of definitive photographic evidence.