

The Structure and Function of Anchor Handling Equipment Aboard *Titanic*

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Introduction

At various times and in various forums, aspects of the equipment used to handle *Titanic's* bower anchors have been discussed. This article will seek to examine and explain the structure and function of the anchor handling equipment seen on *Titanic's* forecastle deck. The handling of the center anchor on the forward forecastle will not be discussed. A detailed examination of the steam engines which power the windlass gear will also not be covered in this article.

The Anchors and Cable

The bower anchors on *Titanic* were Hall's patent stockless anchors. Each anchor weighed just over 7-3/4 tons. Each bower anchor was shackled to 165 fathoms of anchor cable. The anchor cable was stud-link cable and the steel forming each link was 3-3/4 inches in diameter.

The 165 fathoms of cable consisted of eleven 15 fathom lengths of cable which were joined by detachable links. Each of these 15 fathom lengths of cable was known as a "shackle" British ships. On American ships each of these 15 fathom lengths of cable was known as a "shot". The junction of these "shackles" was marked so that the crew could tell how much cable had been paid out or hauled in. The approximate depth at an anchorage was known from depth charts. With multiple detachable sections of anchor cable, a damaged link or links in a shackle could be removed by removing the shackle section.

The immense weight of the anchor cable and anchors required powerful steam engines to move them and strong equipment to bear the strain of the cable. Anchor handling operations could be dangerous so experienced crew exercising extreme caution was necessary.

Figure 1 shows the Hall's patent stockless anchor. Figure 2 shows stud link anchor cable. Figure 3 shows a detachable link for joining anchor cable shackle sections.

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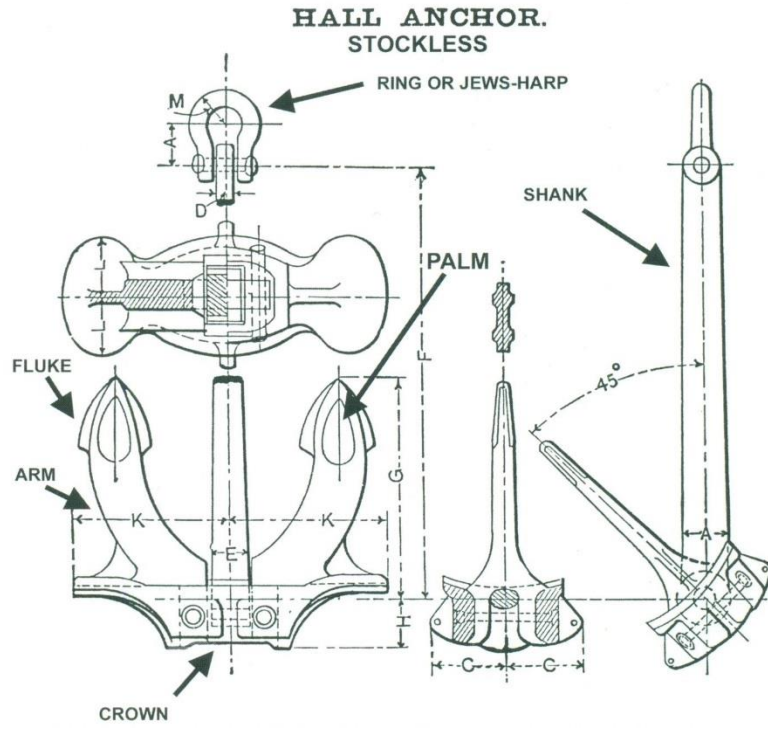


Figure 1



Figure 2



Figure 3

The Windlass

Titanic had two Napier Bros. patent vertical windlasses. An identical windlass is shown on *Titanic's* sister ship *Olympic* in Figure 4.



Figure 4

Many windlass turn around a horizontal axis but *Titanic's* turned around a vertical axis. Power to the windlass was supplied by a steam engine on the deck below the forecastle where the windlass was located. A vertical spindle was connected to the engine by a worm gear. The spindle was connected to the body of the windlass on the forecastle. The body of the windlass had was cast steel and had four "stops" or "snugs" which engaged the anchor cable. A cross sectional elevation and plan view of a similar windlass found on S.S. *Oceanic* is shown in Figure 5.

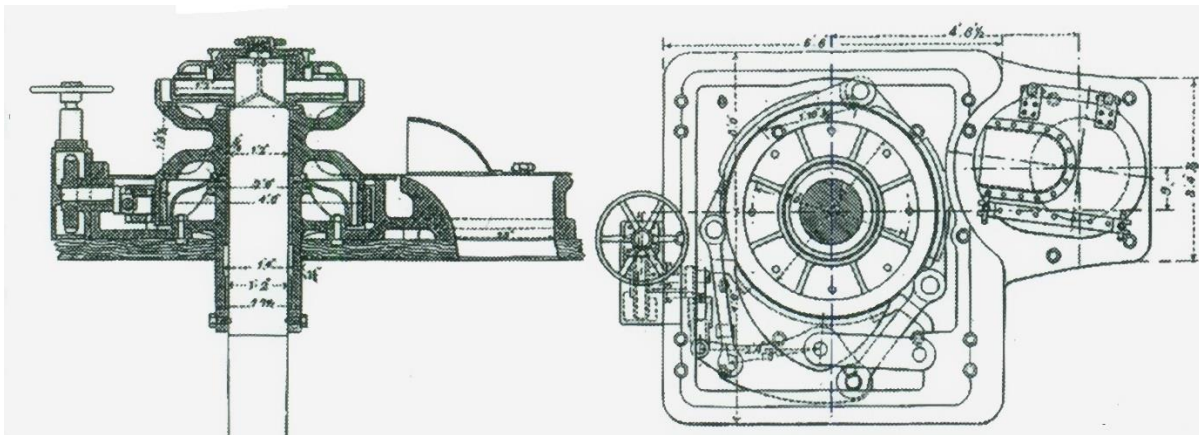


Figure 5

The body of the windlass could rotate freely on the drive spindle. In older types of windlasses the body of the windlass was keyed to the spindle by means of a friction clutch. On the more modern Napier windlass found aboard *Titanic*, the spindle was keyed to the body of the windlass with a "dog" clutch. Steel drive pins engaged the body of the windlass to connect it with the spindle and these drive pins were withdrawn from windlass body to allow it to rotate freely on the spindle.

The drive pins of the windlass are moved outward and inward by means of either an hand wheel shown in Figure 6 on top of the windlass or by inserting a bar tool into slots in a hood directly below the hand wheel as shown in Figure 7.

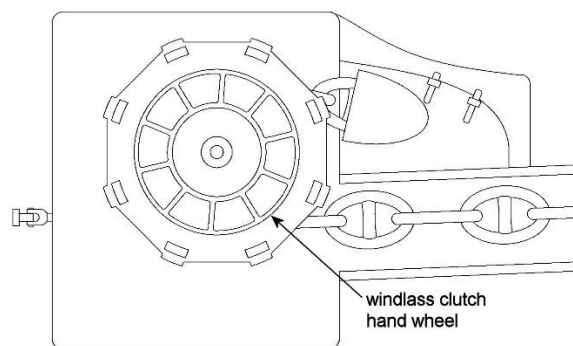


Figure 6

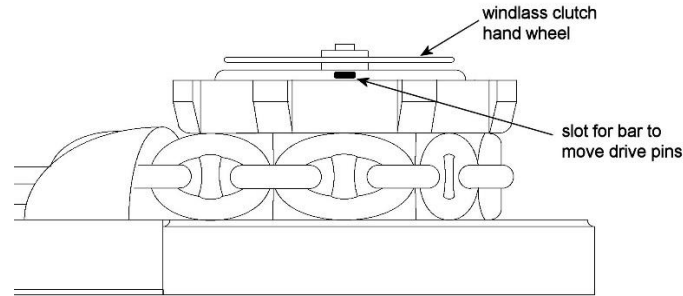


Figure 7

Figure 8 shows an internal view of the windlass under the clutch hand wheel. In this view the drive pins are shown in red. The hand wheel is rotated fully counterclockwise and the drive pins are in the fully retracted position. In this position, the body of the windlass is disengaged from the spindle and the windlass body can turn freely.

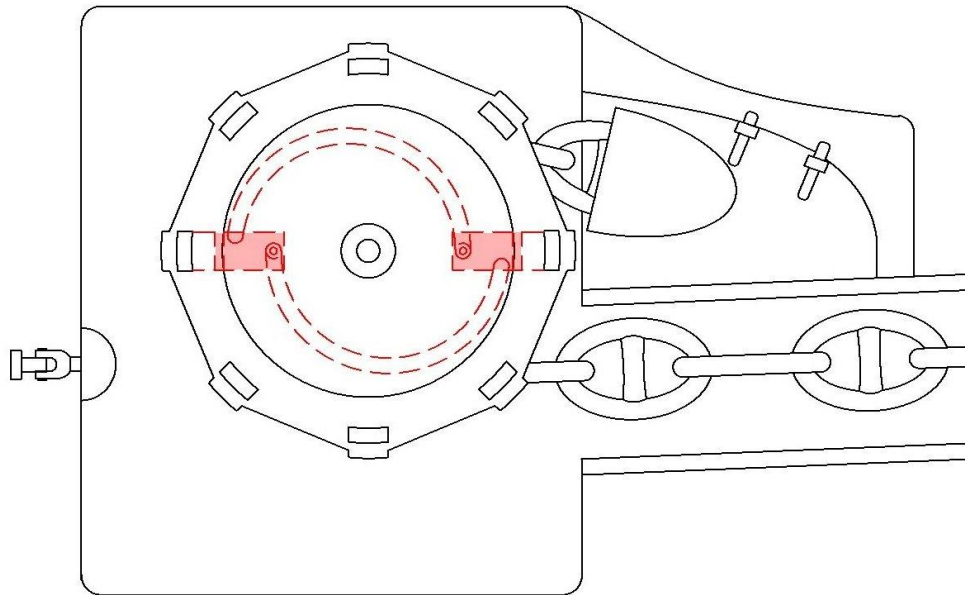


Figure 8

Figure 9 shows the same mechanism but in this view the hand wheel has been rotated fully clockwise and the red drive pins are moved fully outboard in their slots to engage the windlass body. In this position the body of the windlass is connected to the drive spindle and moves under the power of the windlass engine.

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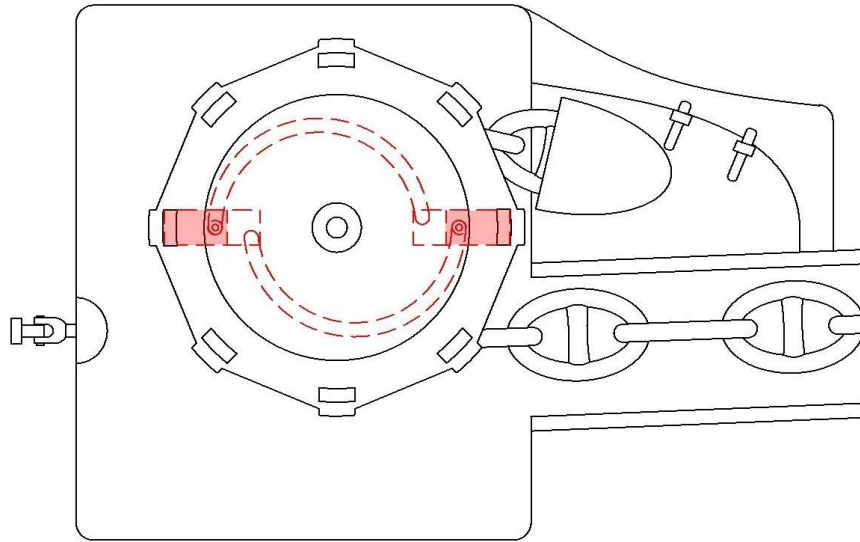


Figure 9

The Windlass Brake

Once the windlass is either put in gear or taken out of gear its rotation can be further controlled by the windlass brakes. A photo of the windlass brake control gear box and control wheel is shown in Figure 10. This photo is taken aboard S.S. *Oceanic*.



Figure 10

On *Titanic*, this brake controller is found directly forward of #1 hatch. The rotation of this hand wheel controls the internal windlass brake by a universal joint and rod set-up from the brake wheel gear box to the brake in the base of the windlass.

The brake control box and wheel has a pointer on the body of the box which indicates three positions for the wheel. When the wheel is rotated to one extreme by turning the wheel clockwise, the pointer points to the “brake to brake” position. At this position the brake exerts its full force on the windlass and prevents it from turning. When the wheel is rotated counter-clockwise and the pointer is at the midpoint of the two extreme positions, this mid-point position is the “free” position. In this position the brake is completely released from the windlass. Further turning of the wheel counter-clockwise toward the furthest extreme position puts the pointer in the “brake to veer” position. In this position braking force is applied to the windlass while the anchor cable is either being paid out. The brake controller in the “brake to veer” position cannot completely arrest the motion of the windlass. That can only be done in the “brake to brake” position.

The Compressor

The control of the movement of the anchor cable is a redundant system. The windlass drive pins and the windlass brake are the primary system for controlling windlass movement. The next system used as a safety back-up is the compressors. There is one for each anchor cable. In a previous article this system was explained. This information will be repeated here.

Nomenclature

Normally it is not necessary to belabor any discussion of the nomenclature of pieces of shipboard equipment. The problem with the compressor is that it has been referred to in the literature by many different names. Just a few of the alternative names found in the literature are compressor, controller, bow stopper, and riding chock. The reason the nomenclature becomes an issue is because when trying to do searches of patents or other references, there is no name for this device which appears to predominate. In the *Britannic Specification Book* the term “compressor” is used as can be seen in the excerpt from the book shown in Figure 11. Therefore, to avoid confusion the term “compressor” will be used in the remainder of this article.

Cable compressors to be of cast steel, arranged to suit special
hawse pipe mouth, and made to template and model.
The tongues to be raised by suitable worm gear, not levers.

Figure 11

Structure

No patent was found for the compressors used on *Titanic*. The closest illustration of the structure of this type of compressor was found in the *Admiralty Manual of Seamanship – 1915*. The diagram and legend for the component parts is shown in Figure 12.

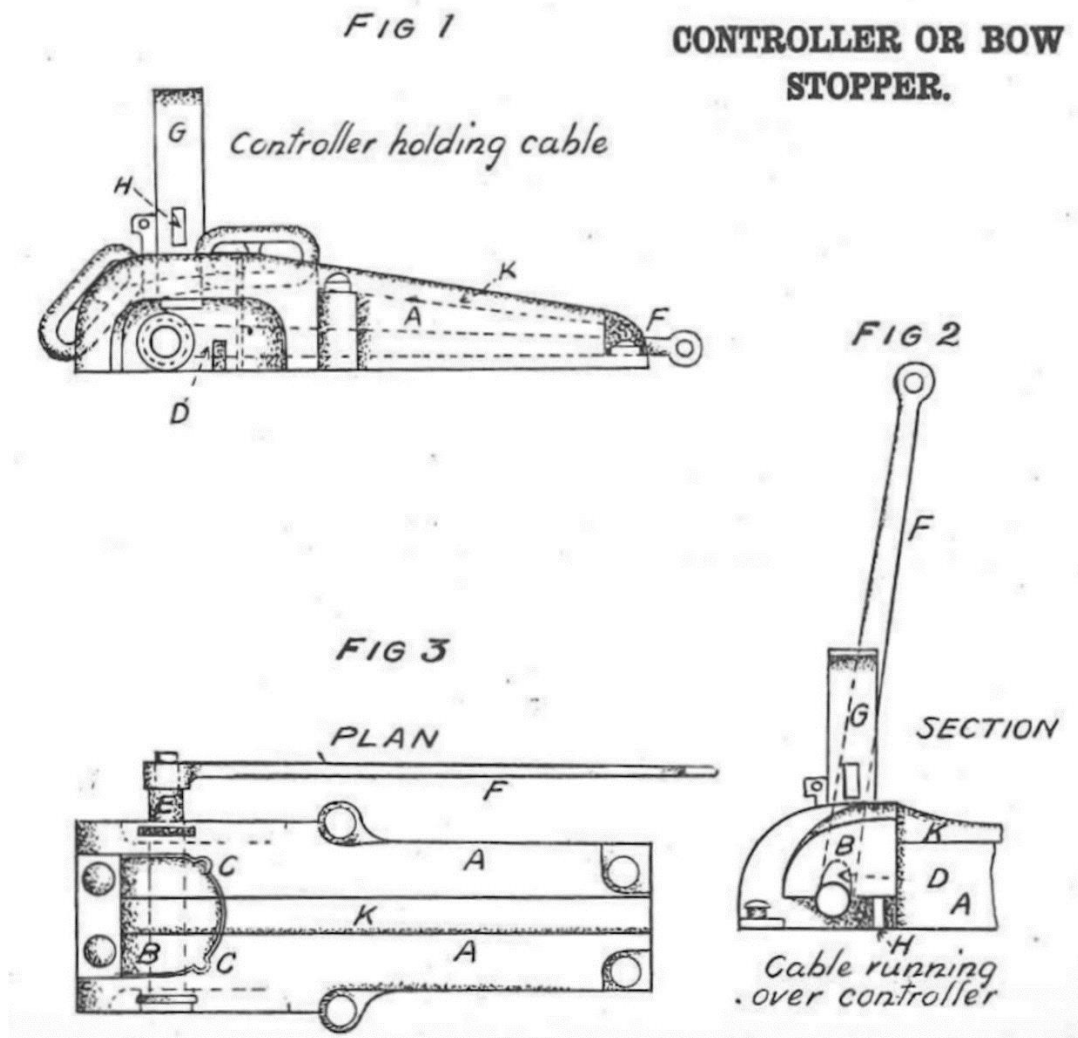


Figure 2

Legend for Figure 12

A – steel bed, B – “hoof”, C – horns, D – cam, E – shaft, F – lever, G – guard, H – fid, K – groove

Figure 13 show a photo of S. S. *Nomadic's* compressors.



Figure 13

Figure 14 shows one of the compressors aboard *Britannic*.

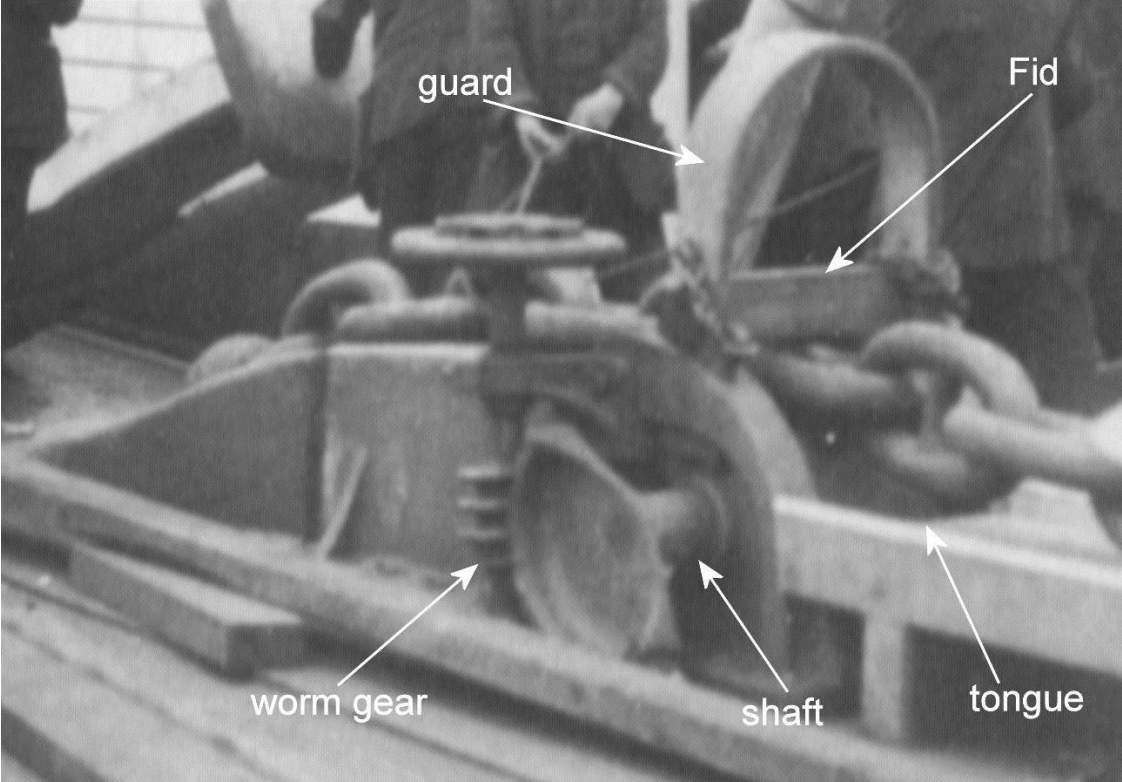


Figure 14

Figure 15 is a drawing of what I believe is a close representation of the compressors aboard *Titanic*. The drawing is an elevation of the port compressor.

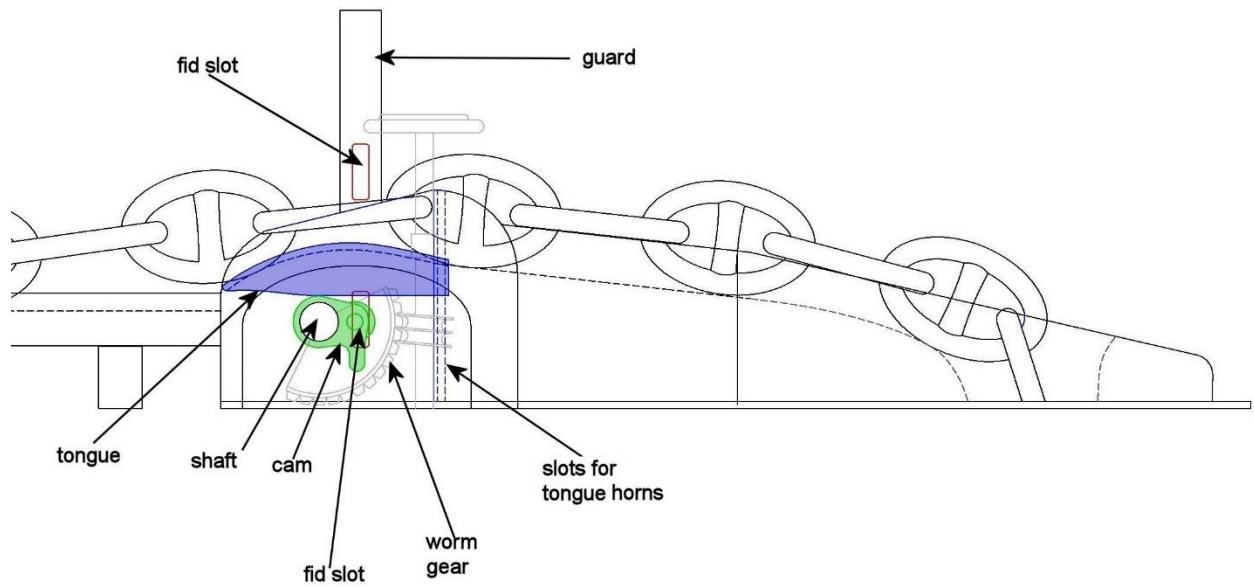


Figure 15

Figure 16 is a plan view of *Titanic's* port compressor with chain cable removed.

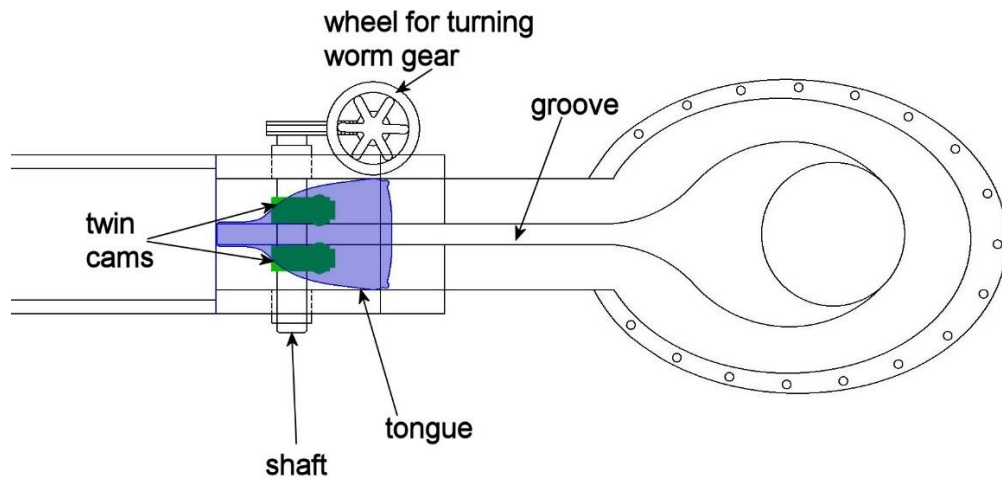


Figure 16

Several modifications are apparent in *Titanic's* compressor. The part which controls the compressor on *Titanic* is a wheel connected to a worm gear vs. the levers seen on the Admiralty diagram and on the *Nomadic* photo. Second, the Admiralty diagram shows that the levers raise

and lower what they refer to as a “hoof”. On *Titanic*, this part is referred to as a “tongue”. I believe this is not just a difference in names. It appears from photos that the tongue was different from the shoe. Figure 4 shows the tongue on *Britannic’s* compressor. It is narrower and designed to support a vertical link on its aft end.

Function

The primary function of *Titanic’s* compressors was to hold the anchor cable fast while riding at anchor. The windlass was capable of the doing this but the compressor allowed the strain to be taken off the windlass brakes while riding at anchor.

A second function of the compressor was that it could be adjusted to help prevent slippage of the cable while the anchor was being heaved in. When the anchor was let go, the compressor was adjusted so the cable would run freely over it.

To accomplish its functions, the compressor was adjusted between two operational positions. The first operational position was with the tongue of the compressor fully lowered. This is shown in Figure 17.

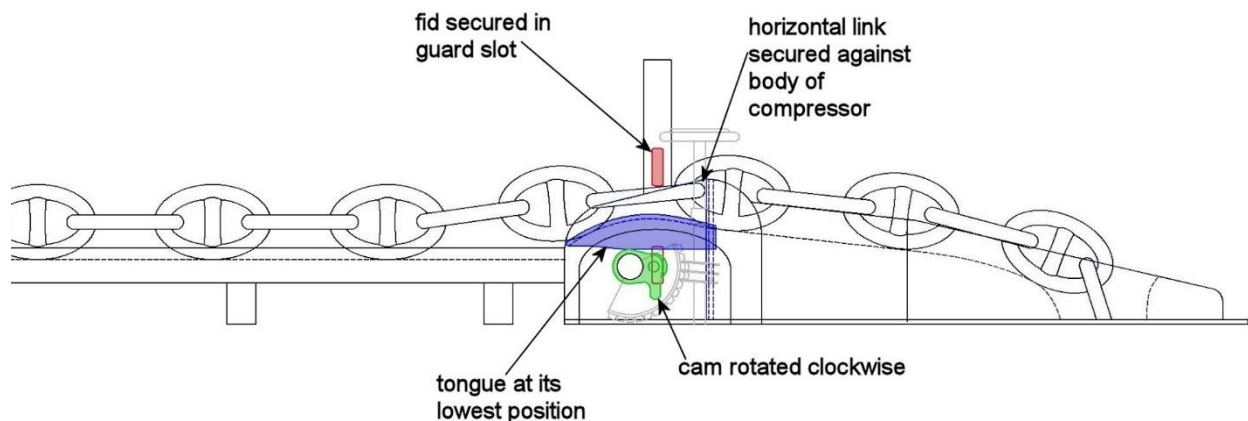


Figure 17

The worm gear control wheel is rotated clockwise which rotated the cams on the shaft which lowered the tongue. Once the tongue was lowered fully, the fid was inserted in the guard slot.

In this position two functions were possible. The first function was to secure the anchor cable while riding at anchor. In this position a horizontal cable link at the top of the compressor was in a position which prevented the cable from moving forward. The horizontal link was stopped against the interior of the compressor body. In order to prevent this horizontal link from rising, it was locked in position when the fid was placed in the slot in the guard.

The second function for this position is seen in Figure 18. The only difference here is that the fid is removed from the guard. In this function, the compressor is configured so that the cable can be heaved in and slippage of the cable forward will be minimized or prevented. As the

horizontal links pass over the top of the compressor, they drop down and are restricted from moving forward.

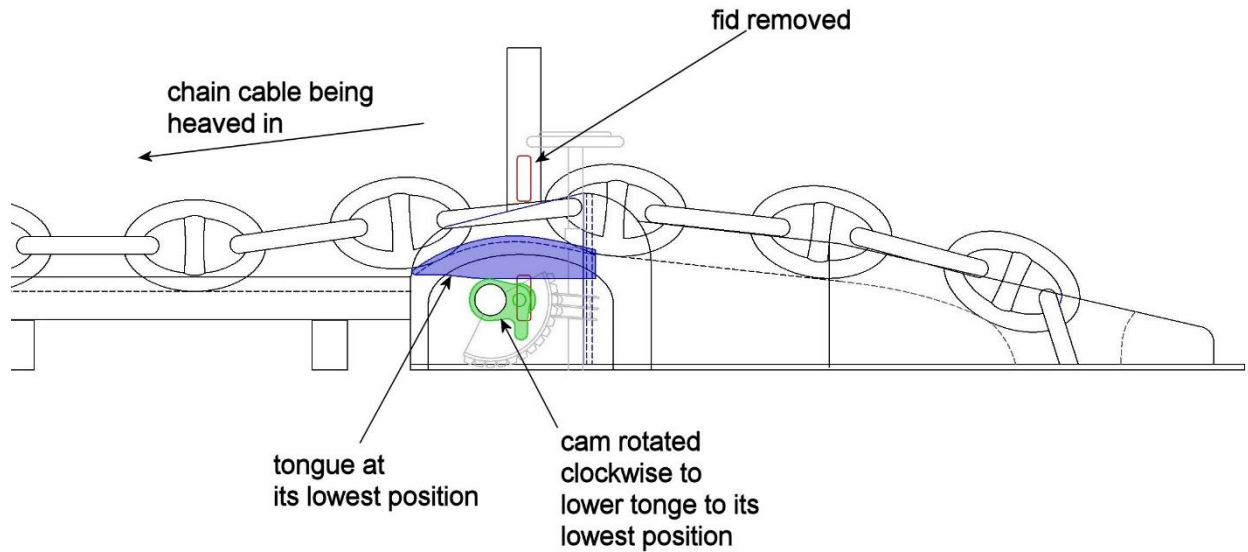


Figure 18

The second operational position is with the tongue of the compressor fully raised as can be seen in Figure 19.

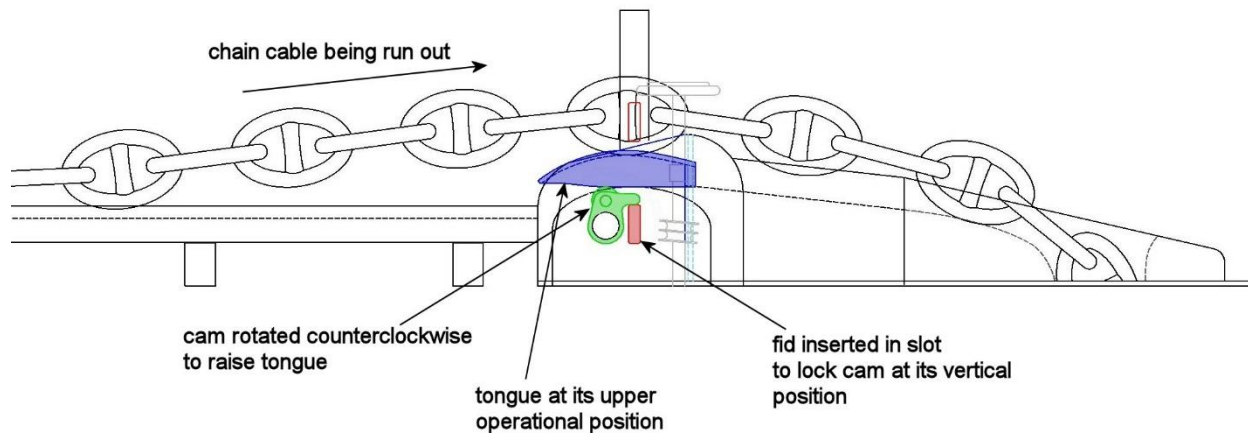


Figure 19

The worm gear is rotated counterclockwise which rotated the cams which raised the tongue. The fid was placed in the slot in the body of the compressor where it locked the cam in position and kept the tongue at its elevated position. This operational position was for the purpose of letting go the anchor and allowing the cable to run out freely without restriction.

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The Lashings

When the anchor was fully heaved in, the cable was secured by anchor strops or “lashings”. These can be seen in Figure 20. When the lashings are rigged, the position of the compressor is largely irrelevant because it is the lashings which bear the strain of the anchor cable. However the fid is not placed in the guard slot when the anchor lashings are rigged.



Figure 20

Anchor Handling Procedures

There are many considerations which are taken into account when anchor handling procedures are undertaken. Among these are: weather, current, depth of anchorage, character of bottom, wind, and others. This article is not meant to address all these factors but will only outline in general terms those procedures for letting go an anchor and for hauling an anchor. The anchor handling equipment found on *Titanic* will be discussed.

Veering Anchor

1. Windlass brake is tightened to “brake to veer” position.
2. If the windlass body is not free on the drive spindle, the drive pins are retracted either by the hand wheel atop the windlass or by the use of the bar inserted in one of the windlass hood slots.
3. The cable lashing turnbuckles are loosened and the lashings are removed.
4. The compressor hand wheel is turned either by hand or by spanner to raise the compressor tongue to allow the cable to run freely over the compressor tongue.
5. The compressor fid is placed in the slot under the compressor tongue to prevent accidental dropping of the compressor tongue.
6. The windlass brake is slowly moved from the full “brake to veer” position toward the “free” position to allow the anchor to start dropping and the cable to begin moving.

7. The number of shackle lengths of cable are counted as they run out. Standard practice is to pay out several times the depth of the anchorage in anchor cable. The specific length is determined by the specific application.
8. When the cable is veered, the windlass brake is set tight to “brake to brake”.
9. The compressor fid is removed and the compressor tongue is lowered by the compressor hand wheel to its lowest position.
10. The compressor fid is placed in the slot in the compressor guard and secured.

This completes the basic procedures for veering an anchor on Titanic.

Heaving the Anchor

1. Deck crew is stationed with hoses and brushes to clean mud and debris from the anchor cable as the anchor is heaved.
2. The compressor fid is removed from the compressor guard.
3. The windlass brake is eased to the “free” position and the drive spindle is turned slowly until the drive pins align with the drive slots on the windlass body.
4. The wheel atop the windlass is rotated to move the drive pins into the slots in the windlass body which places the windlass “in gear”.
5. Power is applied to the windlass engine and the anchor cable is heaved until the anchor is near being seated in the hawse pipe.
6. The lashings are run through the anchor cable and the anchor is heaved to its final position.
7. The windlass brake is tightened up to the “brake to brake” position.
8. The wheel atop the windlass is turned to withdraw the drive pins from the windlass body.
9. The turnbuckles of the lashings are tightened.
10. The anchor is now secured by the lashings with the compressor and the windlass brake acting as back-ups.

Hand Wheel Wrench

During this discussion a tool was mentioned that is used to tighten and loosen the hand wheels on the windlass brake and the compressor brake. This tool is also used to tighten and loosen the hood atop the windlass. This tool is shown in Figure 21 while engaged in the control wheel for the windlass brake. The control wheel has sockets in the ends of the spokes into which a lug in the end of the hand wheel wrench is inserted. This wrench is also used to tighten and loosen the hand wheel on the compressor. The opposite end of the hand wheel wrench was of flat bar section. This end was used to insert into the slots on the hood of the windlass to tighten or loosen the windlass mechanism which controls the movement of the drive pins of the windlass to put it in gear and take it out of gear. This wrench is stowed on the inboard side of the base of the windlass.

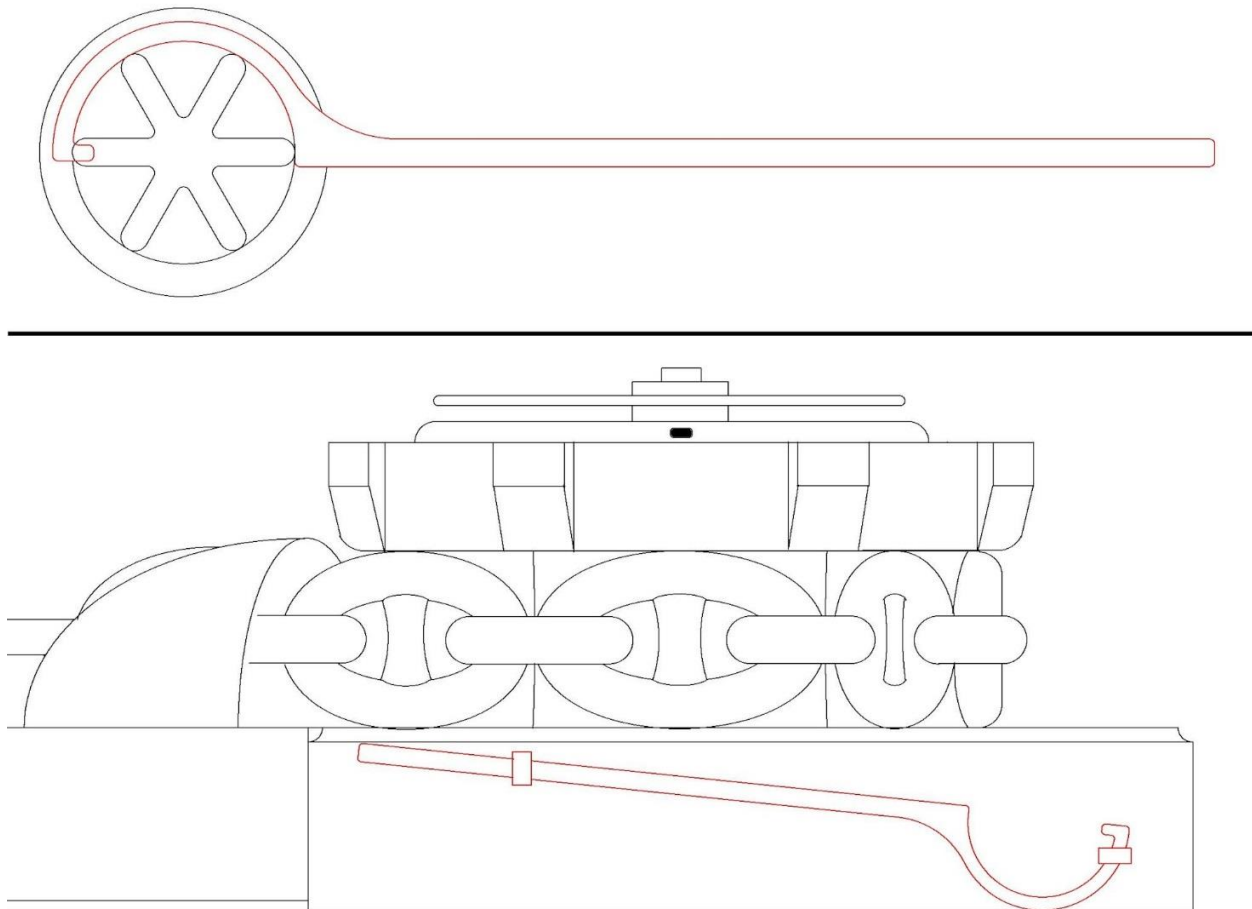


Figure 21

Conclusion

This article has sought to consolidate information about anchor handling equipment and procedures used aboard *Titanic*. Only the basic operation of the equipment was discussed. In practice there are many factors which can modify these procedures. It was considered beyond the scope of this article to discuss these alternative practices.