Operation and Control of *Titanic's* Electric Cargo Cranes

By Bob Read, D.M.D.

Introduction

The purpose of this article is to explain the operation and controls of *Titanic's* electric cargo cranes in relatively simple terms. The internal construction of the cranes will not be discussed in detail. Drawings and photos will be used to illustrate the location of the various controls.

Basic Operation

The electric cargo cranes on *Titanic* consisted of six 2-1/2 ton capacity cranes and two 1-1/2 ton capacity cranes aft on A deck. Although their capacities were different, the operation of the two sizes of cranes were identical. Within the base of the crane are two motors with separate functions. One motor was the hoist motor. This motor caused the hoisting rope to be wound on a drum which raised the cargo load. To lower the cargo load, the drum on which the rope was wound could be made to turn freely on its shaft by means of a clutch. Therefore, the hoist motor operated in one direction only. The other motor was the slewing motor. This motor caused the crane mast, operator's platform, and jib to rotate in either a clockwise or counterclockwise direction.

Jibs

The jibs were non-luffing. That means that they were held at a set elevation by two wire stays. The angle of the jibs was set so that when rotated, the hoist line would be directly over the hatch that they worked.

From the hoist drum, the wire rope hoist line ascended to a sheave in the top of the mast. This sheave redirects the hoist line to a sheave at the end of the jib which directs the hoist line downward. At the end of the hoist line was a weight and a safety hook. The purpose of the weight on the hoist line was so that when the hoist clutch was engaged, the hoist drum would rotate freely and the weight would pull the hook end of the hoist line down by gravity to the cargo handlers could attach it to a load. Figure 1 shows the basic crane structure details.

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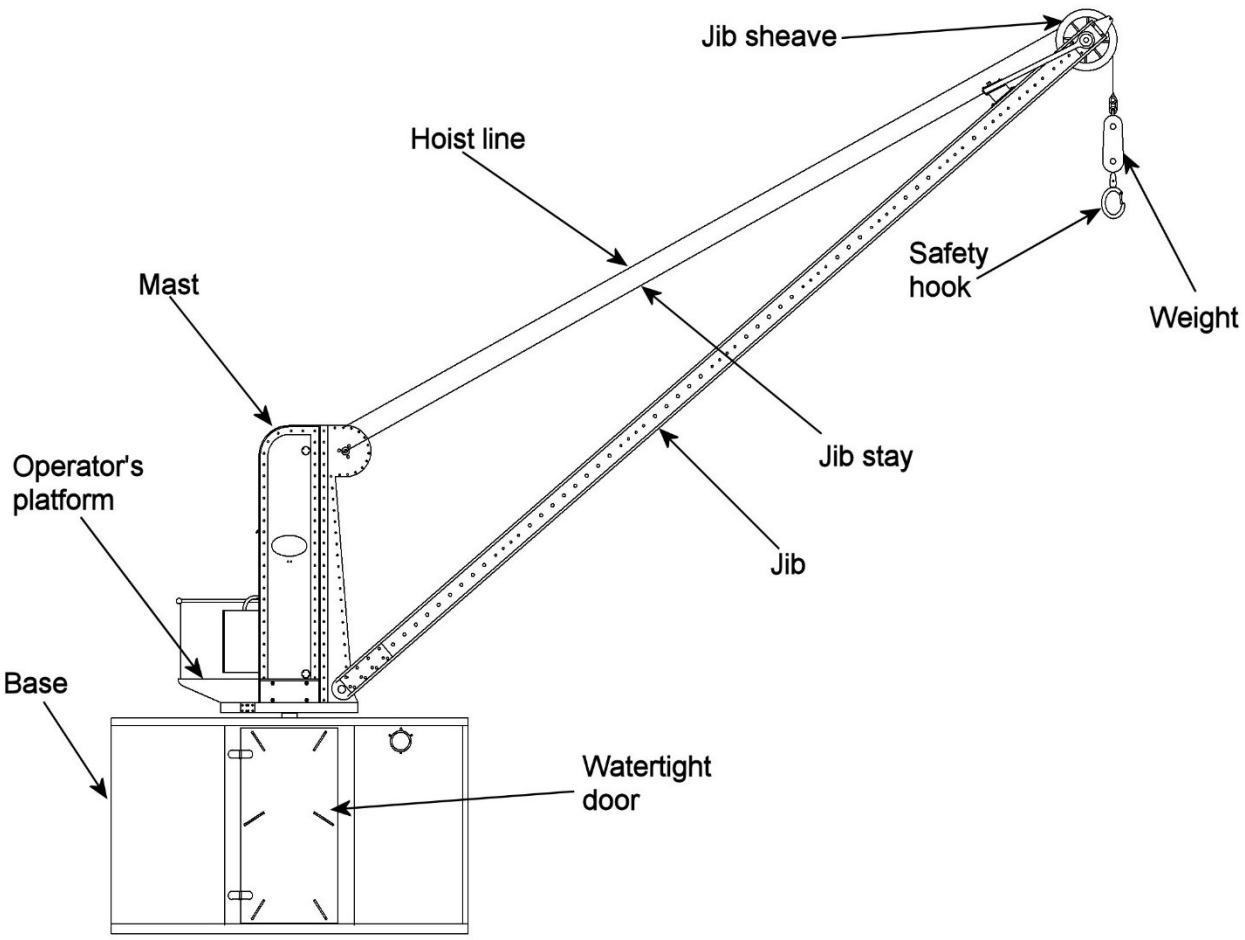

Figure 1

Exterior Crane Details

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Operator's Platform Controls

The operator's platform was always located to the left of the crane mast as the operator faced forward toward the jib. Figure 2 shows the location of the controls.

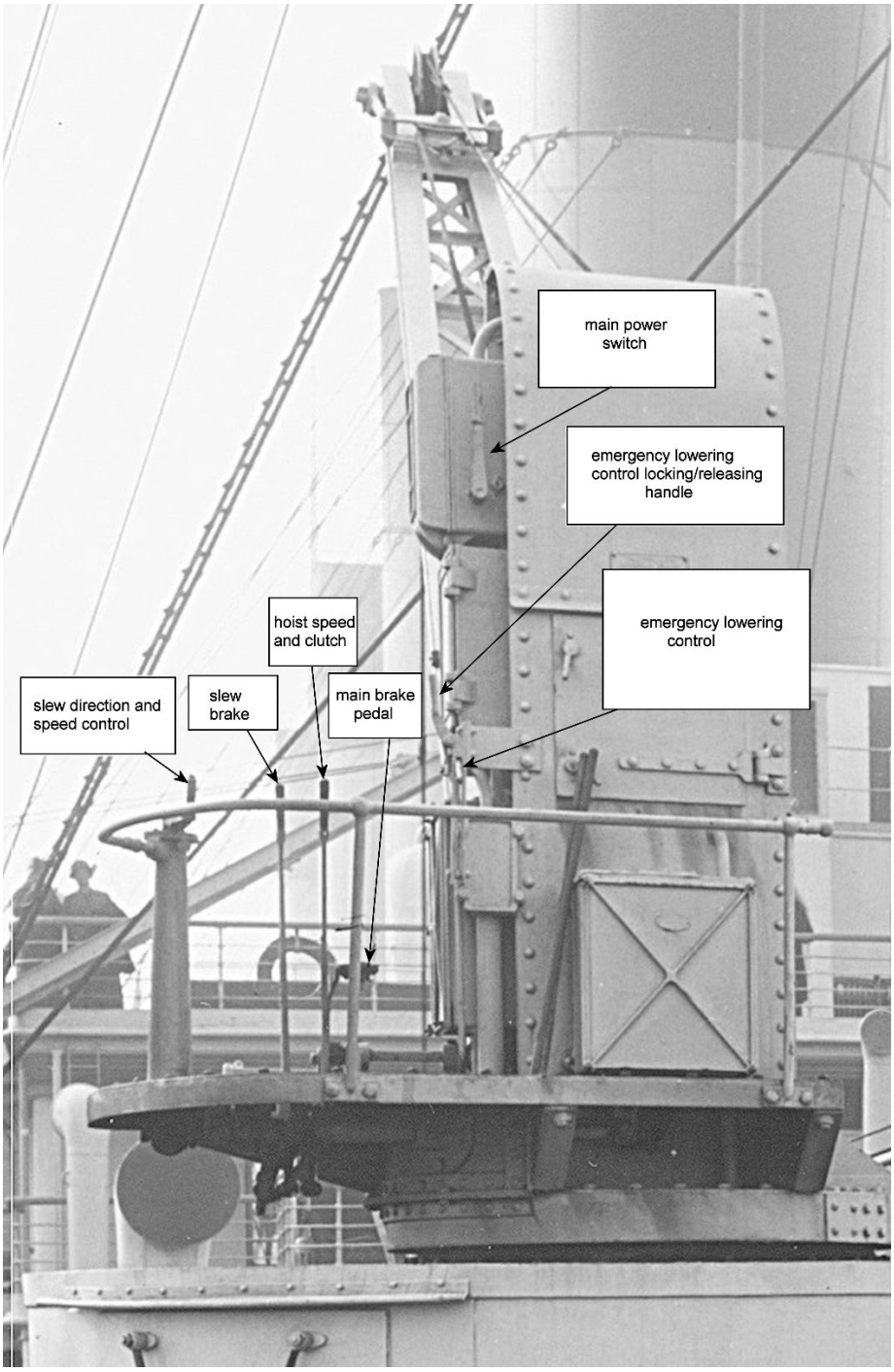

Figure 2

Operator's Platform controls

The controls were:

1. Slew motor direction/speed control – This lever was on top of the pedestal to the operator's left.
2. Slew brake control – This lever was to the operator's left as he faced the jib.
3. Hoist speed/clutch control – This lever was to the right of the slew brake.
4. Main brake control – This foot pedal was located to the right of the hoist/speed control lever.
5. Emergency lowering locking/release control – This vertical handle was located to the operator's right and was attached to the crane mast.
6. Emergency lowering control – This horizontal lever was located below the emergency lowering control locking/release handle.
7. Main power switch control – This handle was on the side of the upper fuse box on the crane mast to the operator's right.

Basic Operating Procedures

To operate the crane, the following procedures would be employed:

1. The securing plates with turnbuckles are loosened and unsecured from the crane jib. Figure 3 shows the jib crutch with the jib removed and the turnbuckles detached.

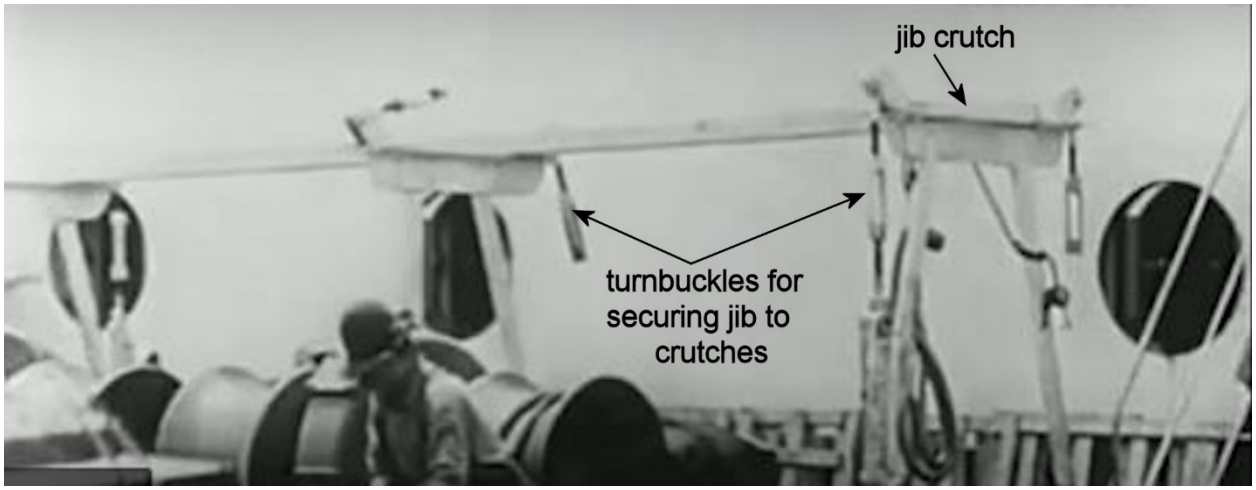

Figure 3

Jib crutch with jib removed and securing turnbuckles detached

2. The hoist hook and weight are manually detached from their position on the underside of the jib.
3. The operator mans the control platform.
4. The main power switch is turned on by raising the handle vertically.

5. The hoist speed/clutch lever is moved forward which retracts the hoist line and raises the jib just beyond its operating height. And the host speed/clutch lever is moved back and the brake is applied.
6. A secondary worker attaches the jib stays to both sides of the top of the crane mast.
7. The pressure on the main brake foot pedal is eased until the hoisting line is paid out until the jib stays are taut and bear the weight of the jib.
8. With his foot on the main brake pedal, the operator moves the slew control handle either clockwise or counterclockwise depending on where the cargo load to be picked up is located.
9. When the crane is rotated so that the jib is over the cargo load, the operator removes his hand from the slew motor speed/direction control handle and applies the slew brake by pulling it back toward him.
10. The operator then eases pressure on the main brake pedal to allow the safety hook and weight to descend.
11. The workers attach the safety hook to the cargo load.
12. The operator pushes forward on the hoist speed/clutch control lever until the cargo load clears obstacles.
13. When the load is hoisted to the proper height, the operator pulls back on the hoist speed/clutch control lever to its clutch position while applying pressure to the main brake control pedal.
14. The operator maintains pressure on the main brake control pedal and engages the slew motor control handle to rotate the cargo load over the hatch where it will be loaded. As the load nears the point where it must be to be lowered, the operator releases the slew motor control handle and pulls the slew brake control lever back toward him applying the slew brake.
15. When the worker on deck signals to lower the load, the operator eases pressure on the main brake control pedal and the cargo load is lowered down into the hold.
16. When the safety hook is detached from the cargo load in the hold, the operator is signaled that he is clear to raise the hoist line by pushing forward on the hoist speed/clutch control lever to its hoisting position.
17. The hoist speed/clutch control lever is pulled backward to its clutch position and the main brake control foot pedal is applied when the safety hook and weight has reached its maximum working height.
18. The operator maintains pressure on the main brake control pedal and the operator rotates the crane with the slew speed/direction control to begin the loading process again.
19. To stow the crane after use, the procedures described to ready the crane for use are reversed.

The Emergency Lowering Control

Most all of the control levers have identification plates riveted to them which explain their functions. These identification plates can't be seen clearly with white painted cranes. Wreck photos have allowed us to identify the various controls via the identification plates.

One of the control levers which has identification plates on it is the Emergency Lowering control lever. This lever is attached to the operator's platform side of the crane mast. It has a guide which guides its up and down motion. Just above it toward the handle end of the lever is a control handle for locking the Emergency Lowering lever in its upper disengaged position or releasing it to its lower engaged position.

There are no detailed written explanations for the Emergency Lowering control other than it was used to stop the accidental release of the hoist line due to a main brake malfunction. Then by means of a handle at the terminal end of the lever, it could be eased upward to lower the hoist line and its load safely. It appears that this Emergency Lowering control lever is entirely mechanical rather than electrical. After examination of internal equipment, it also appears that it does not act on an auxiliary brake drum on the hoist drum. There is speculation that it actuates some form of a "cable nipper" as shown in Figure 4.

Bullivant's Wire Rope Stopper.—Fig. 281 shows the arrangement of Bullivant's wire rope stopper.

The stopper depends on a parallel ruler action. The wire rope is placed between the outer case of the nipper and a sliding bar which is joined by connecting links to the other side of the case and is strongly supported by lozenge-shaped toggles. As the bar

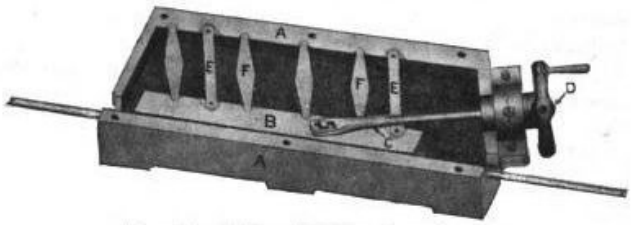

Fig. 281.—Bullivant's Wire Rope Stopper.

A. Outer casing.
B. Sliding bar.
C. Screw for moving sliding bar.
D. Wheel of nut for working screw.
E. Connecting links.
F. Toggles for supporting sliding bar.

moves forward, it is forced by the toggles and connecting links hard up against the wire. A screwed rod with an oblong slot in its head engages with a stud on the sliding bar and is worked by a nut and wheel, in which a hand bar can be inserted to get greater leverage. When it is desired to grip the wire, the wheel is turned so as to force the sliding bar against the wire, but the bar is free to move further forward owing to the oblong hole in the head of the screw. When any stress comes on the rope, it tends to take the sliding bar forward, and this makes the stopper grip tighter.

Figure 4

Example of a wire rope stopper or "cable nipper"

This would act directly on the hoist cable to stop it if there were a main brake control malfunction.

If an operator had a load suspended and his foot on the main brake control pedal and the load began to drop because of a main brake malfunction, he could quickly pull the Emergency Lowering locking/release lever to release the Emergency Lowering control lever. There is a rod connected to the Emergency Lowering control lever which it is speculated connects to a spring in the base which would pull the emergency lowering control lever down to its fully engaged position rapidly. At this fully engaged position the hoist line would be stopped. The cargo load could then be rotated to the desired position where emergency lowering would be performed. To perform the emergency lowering, the slew brake control would be applied. Then the handle at the end of the Emergency Lowering control lever would be slowly raised which would lessen the braking action on the hoisting line which would allow the cargo load to be lowered slowly and safely. After safely lowering the cargo load the Emergency Lowering control lever could be raised and locked into position. After that, repairs could be made to the malfunctioning main brake. The internal equipment used to arrest the downward movement of the cable is speculative but the operation of the Emergency Lowering control lever is not.

There is a non-emergency situation where it appears that this Emergency Lowering control lever was used. If the crane had to be unattended by its operator, even if there were no load, the Emergency Lowering control lever would be released and engaged. This would prevent the safety hook and weight from falling to the deck since the operator would not be there to apply pressure on the main brake control foot pedal. Once the operator returned to the platform, the main brake control pedal could be applied and the Emergency Lowering control lever could be raised and locked in its upper disengaged ready position.

Conclusion

This article has demonstrated the function and control of the electric cargo cranes aboard *Titanic.* Drawings, photos, and enumerated procedures have been employed to explain these structures and their functions.