Titanic's Steering System Back-Up Components

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Introduction

To be able to navigate, a ship must have power to be able to move through the water and it must be able to control that motion by being able to steer the ship.   Since being able to steer the ship was so crucial, this article will examine the steering back-up components that were in place on *Titanic* in case there was a break-down in any part of the various steering components.

Normal Operation of the Steering System

In this section we will examine the basic design and operation of *Titanic's* steering system when it was operating without malfunction.

Telemotor – The first link in the chain of operation of the steering system was the telemotor component. This component is shown in Figure 1.

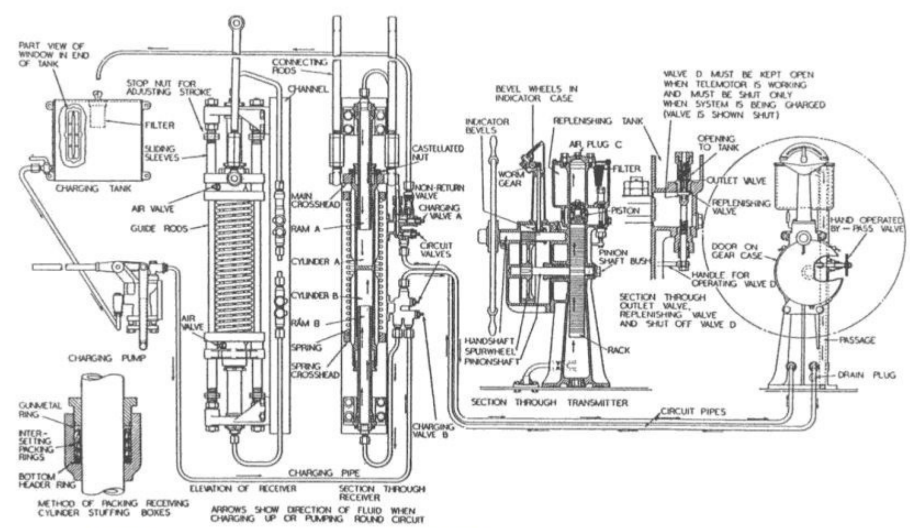

Figure 9.9 *Patent hydraulic steering Telemotor (Brown Bros & Co Ltd)*

Figure 1

Telemotor component

The telemotor transmitter is shown in Figure 2.

Figure 2

Telemotor Transmitter

The telemotor transmitter was mechanically connected to both a ship's wheel in the wheelhouse and to one on the navigating bridge. On or the other could be engaged but when engaged they were connected to the only telemotor transmitter on the ship which was in the wheelhouse. By turning the wheel, the telemotor transmitter would cause hydraulic fluid to move through pipes to a telemotor receiver in the steering flat. The receiver(s) are shown in Figure 1 and in plan view in Figure 3 (in red). The drawing shows their position on the steering flat.

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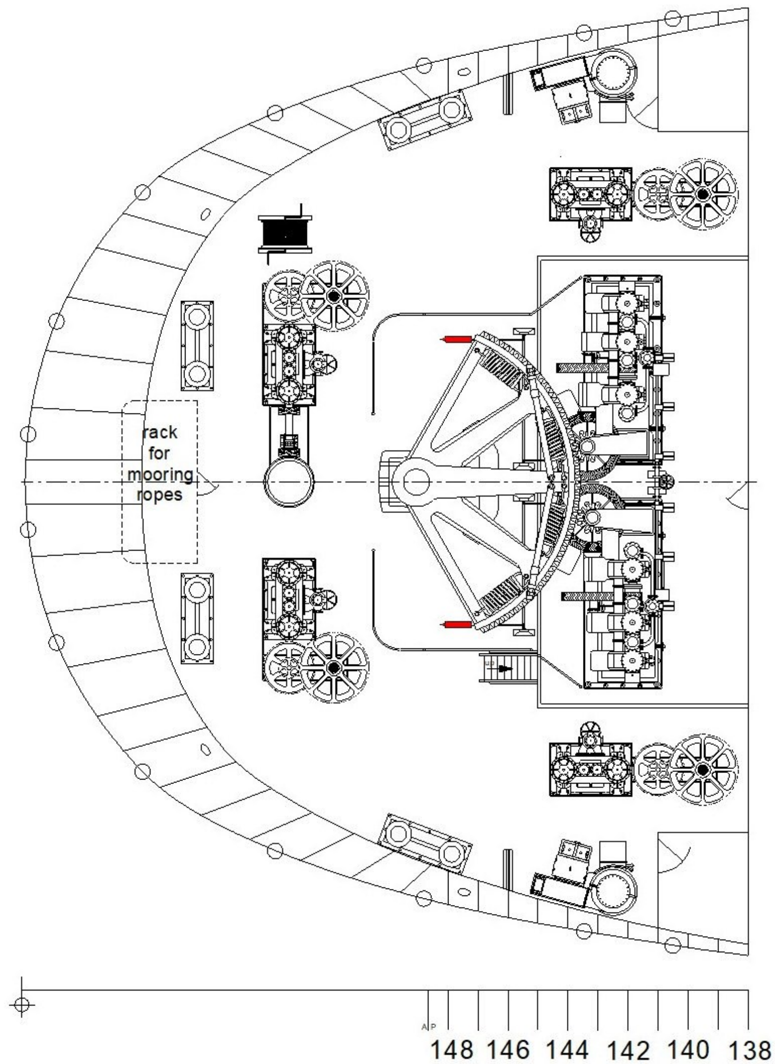

Figure 3

Telemotor receiver(s) (in red) on steering flat

This receiver had hydraulic pistons inside which were moved by the hydraulic fluid movement created by the telemotor transmitter in the wheelhouse. The movement of the pistons in the receiver moved push-rods which operated control rods for the steering engines.

Steering engines – In order to turn *Titanic's* 100-ton rudder, steam steering engines needed to be employed. Two steering engines for *Britannic* are shown in Figure 4.

Figure 4

Photo of *Britannic's* steering engines in the shop

Figure 5 shows a plan view of the steering flat with the steering engines in red.

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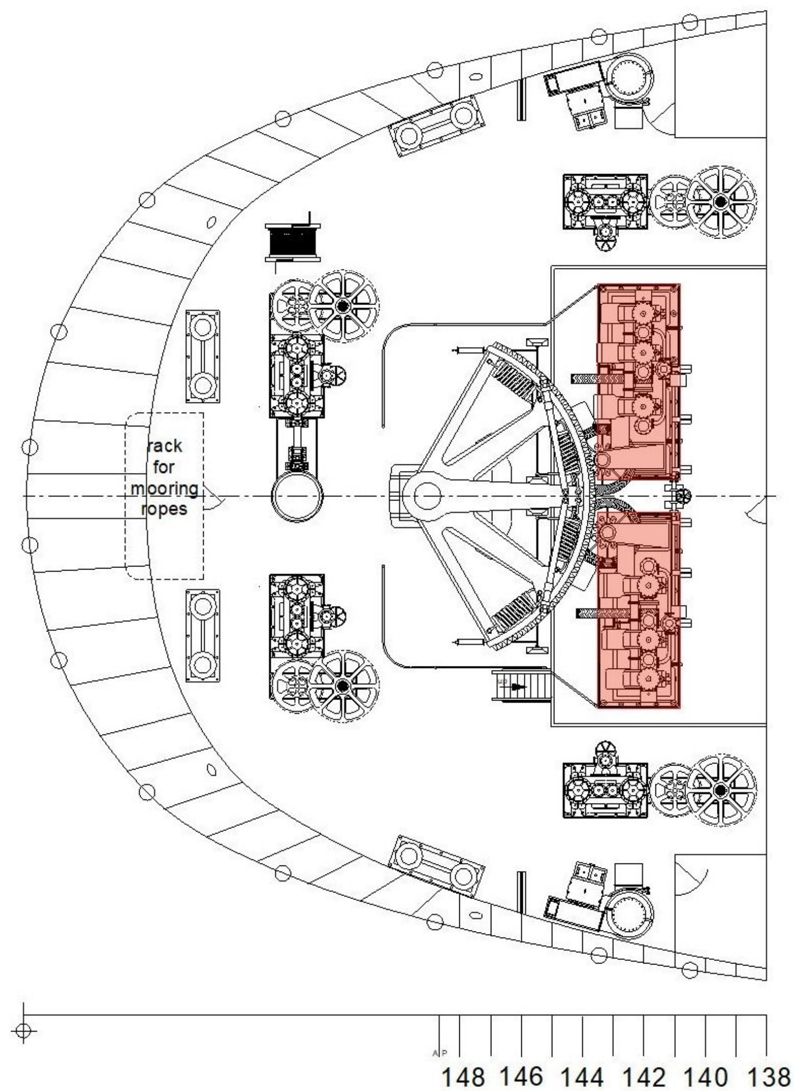

Figure 5

Plan view of steering flat with steering engines (in red)

Two working tiller arms were keyed to the rudder head in the steering flat to rotate the rudder. The tiller arms were connected to a steering quadrant via strong springs. The steering engines rotated the steering quadrant and tiller arms via gears on the quadrant and the steering engine. Figure 6 shows an annotated plan view of the steering flat. A higher resolution image of this figure is linked.

The telemotor transmitter and receiver controlled the operation of the steering engines. In turn, the steering engine caused the steering quadrant and tiller arms to rotate, which rotated the rudder. This formed the basic system for steering the ship.

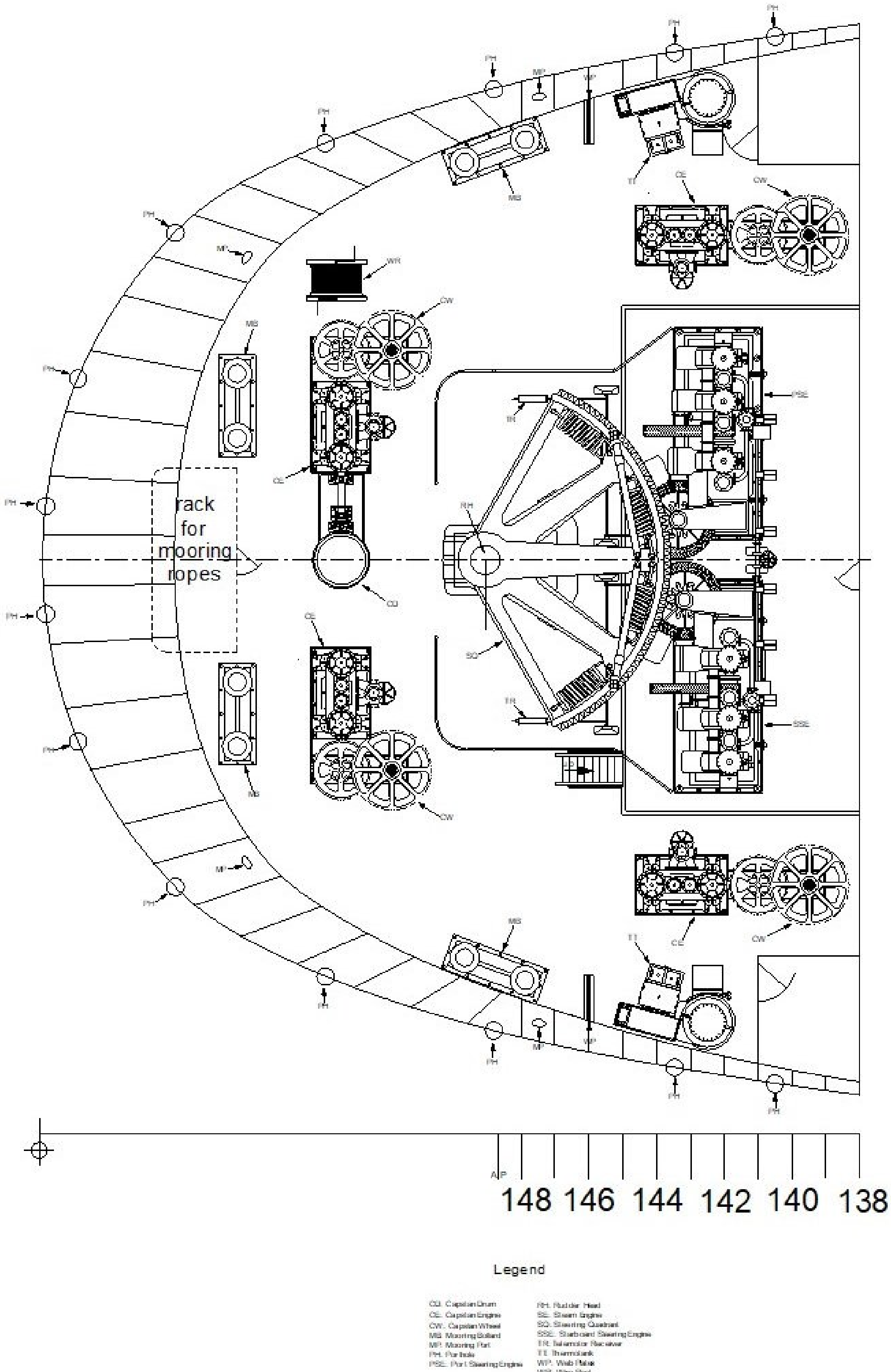

Figure 6

Annotated plan view of the steering flat

[Link to higher resolution of drawing]

Telemotor Component Back-Up

Telemotor Transmitter – If the telemotor transmitter malfunctions, the wheel on the docking bridge must be engaged to operate the steering engine. The control rods from the docking bridge wheel are engaged to the control wheel and rods on the steering engine. This enables the ship to be steered from the docking bridge. Figure 7 is an elevation showing the connection from the docking bridge wheel to the steering engine.

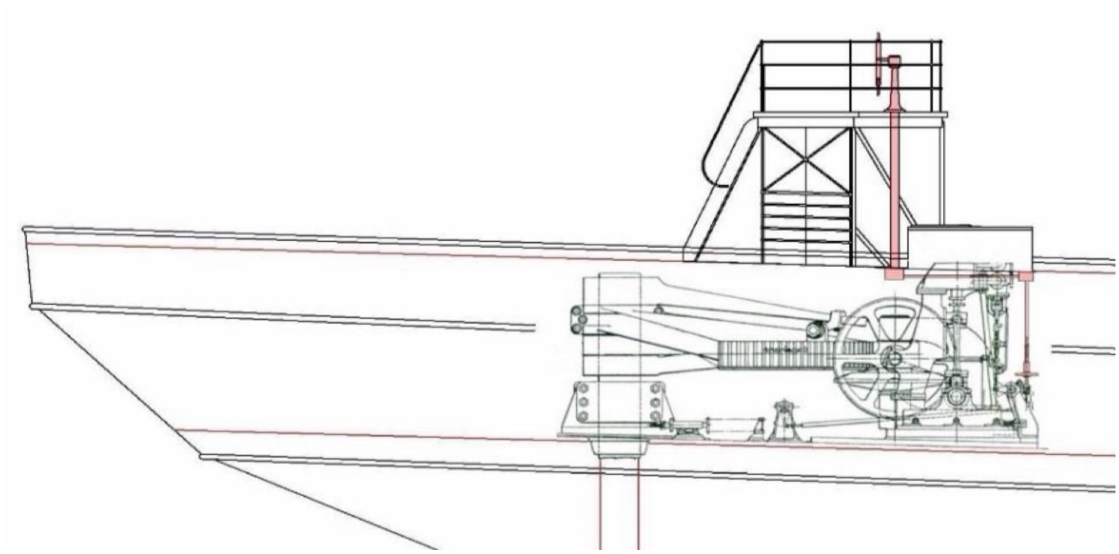

Figure 7

Elevation of connection from docking bridge wheel to steering engine (in red)

Figure 8 is a plan view of the connection from the docking bridge wheel to the steering engine.

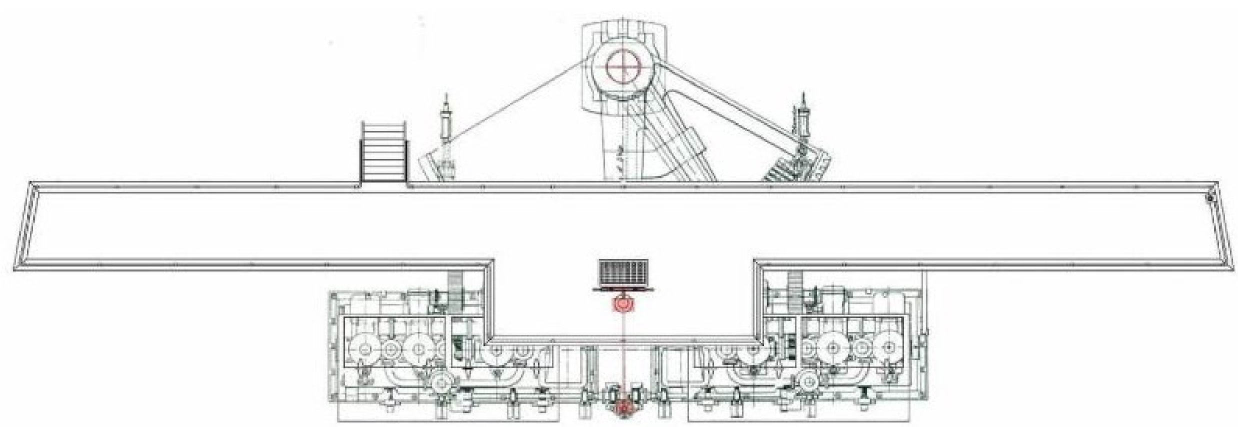

Figure 8

Plan view of connection from docking bridge wheel to steering engine (in red)

Figure 9 shows the dial face for the telegraphs on the navigating bridge and the docking bridge to send orders for the degree of rudder angle to be executed.

Figure 9

Dial face of steering order telegraphs on navigating and docking bridges

Telemotor Receiver – There are two telemotor receivers in the steering flat. The location of these two receivers is shown in Figure 3 (in red). Each receiver can control either steering engine. If either receiver malfunctions, control is transferred to the other receiver via a by-pass valve. If both receivers are disabled, control is transferred to the docking bridge wheel.

Steering Engines

There are two steering engines (port and starboard). At any one time, only one engine controls the steering quadrant. If that engine becomes disabled, the engine gearing is disengaged from the steering quadrant by moving the entire engine forward via large jacking screws. The same procedure is used to move the spare engine aft into gear with the steering quadrant.

In the unlikely event that both steering engines are disabled, the steering quadrant and tillers are rigged to be moved by block and tackle. Above the steering quadrant, a spare tiller is keyed to the rudder head. This spare tiller is also connected to the quadrant by large tie-rods. The blocks and tackle are connected to a shackle on either side of the forward end of the spare tiller.

The tackle leads to a snatch block attached to web plates and which redirects the line to a warping capstan drum located on the centerline of the steering flat. The capstan is controlled by the port, aft capstan engine. As the capstan rotates, it pulls on one side of the block and tackle and lets the other side go slack. This system is not controlled by the docking bridge wheel. It is completely controlled below on the steering flat. Orders would be sent from the navigating bridge to the docking bridge by telephone and/or steering telegraph then relayed below to the steering flat via voice tubes to an officer stationed there. With this method, the spare tiller is not isolated from rudder shocks like working tiller are by shock absorbing springs. Therefore, it is likely that if this system were in use, that the ship would be operating at a reduced speed and the movement of the rudder would probably be confined to a more limited arc. Figure 10 shows a plan view of the steering flat with the block and tackle rigged to the spare tiller (in red).

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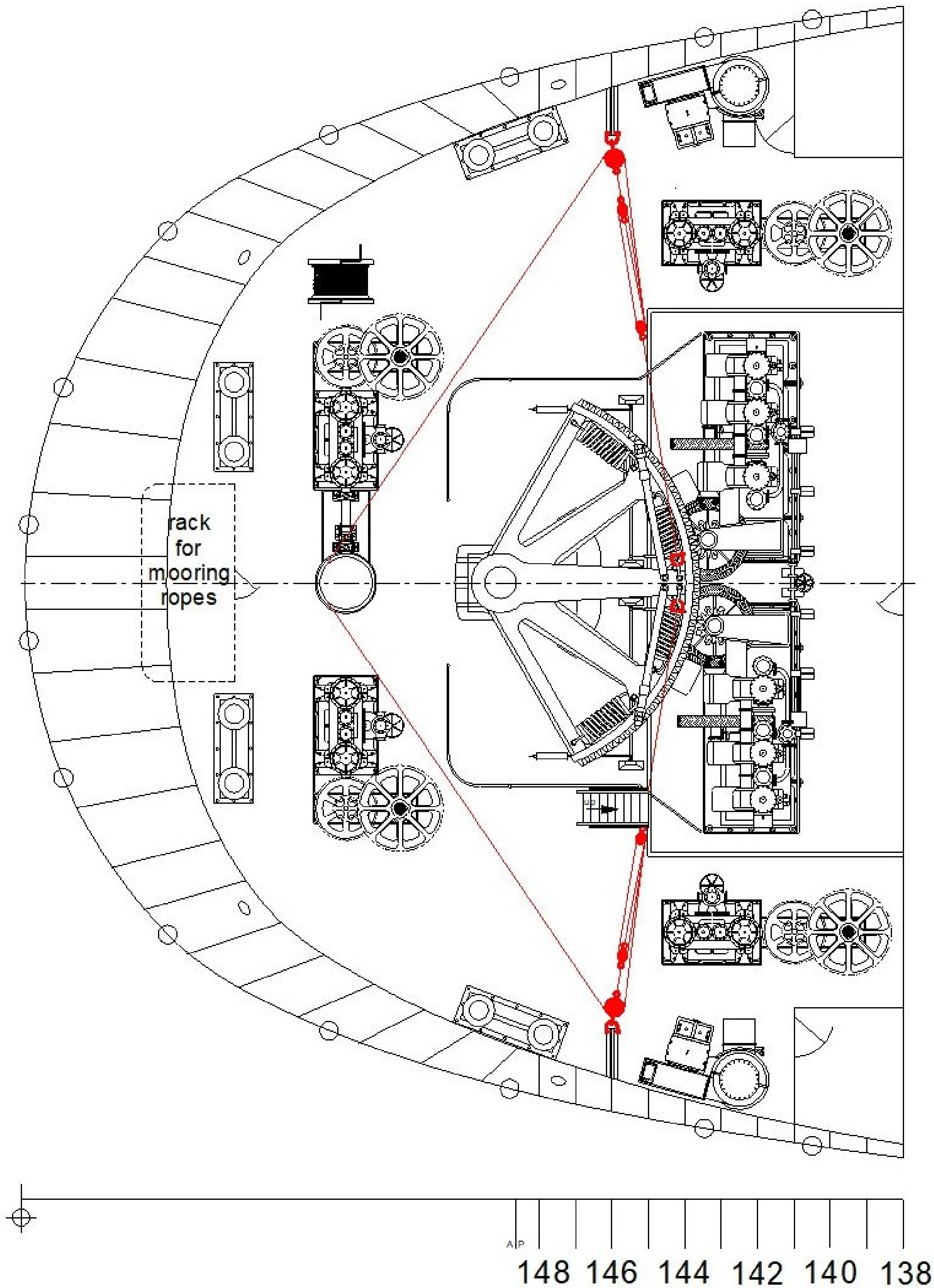

Figure 10

Block and tackle rigged to move spare tiller and quadrant

Conclusion

Because of the importance of maintaining steering control of the ship, several back-up components to the steering system have been described in this article which maintain steering control. The steering system was robust and well-engineered so malfunction of any of the components would be rare. However, at sea, even if the chances of a malfunction are small, several back-up components were provided to reduce the chances of loss of steering control to a very low order.