

The mystery of Titanic's central propeller

by Mark Chirnside

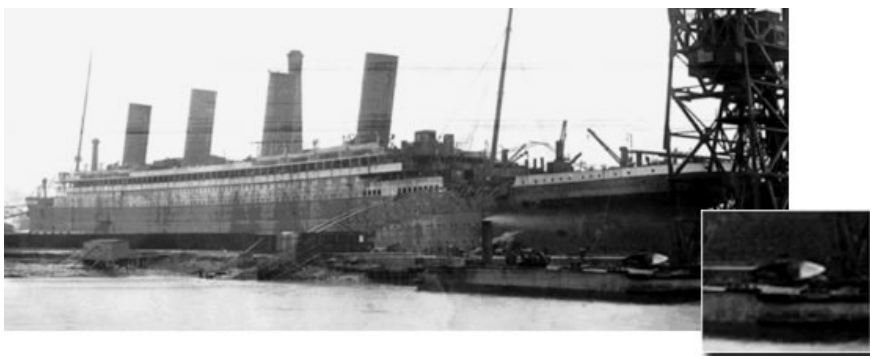
Voyage

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Given the vast amount of information that is available about *Titanic's* history – from her conception to her disastrous end – it is sometimes asked if there is anything new to be learned. In spite of the information available, the answer to this question is certainly a resounding "yes." Time does not stand still. There will *always* be something new to learn; more myths to be exposed; and more popular misconceptions to be addressed.

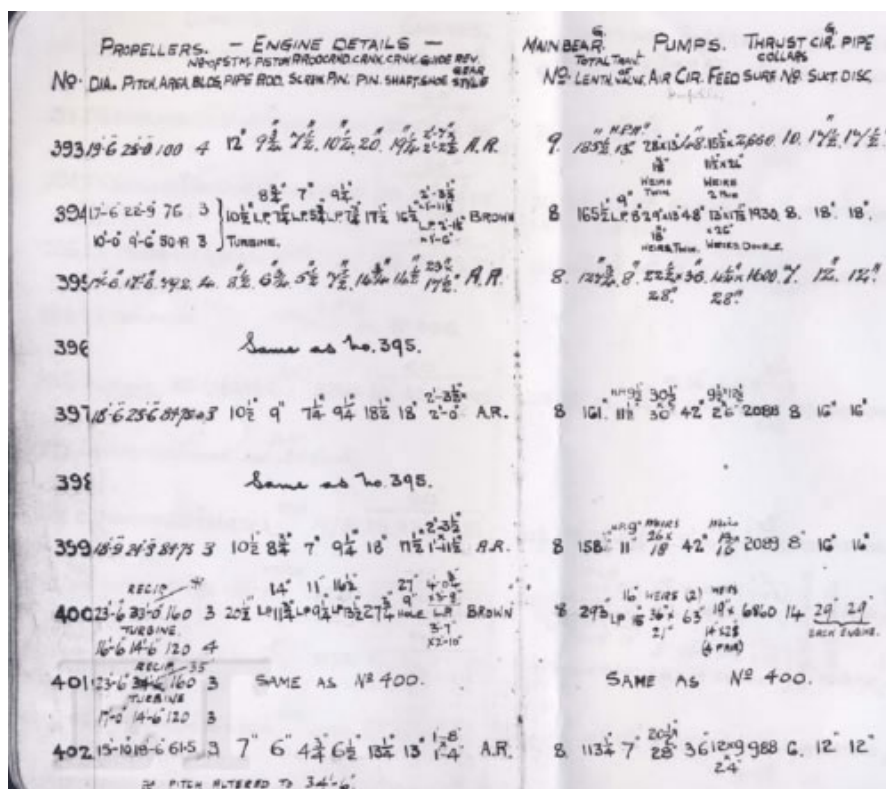
When *Olympic* entered service in 1911, her propellers were photographed and these well-known photos show her turbine-driven central propeller as a four-bladed casting. In *Britannic's* case, not only is a four-bladed propeller visible in period photos, but this propeller is also visible today on the wreck. However, at present, no known photos appear to exist showing *Titanic's* propellers in place and, given that the central propeller is not visible on the wreck, this raises an intriguing question.

Although a number of adjustments were made to *Olympic's* propeller specifications – such as altering the pitch at which the blades were angled and the diameter of the propellers themselves – and those of her sisters, our focus here is directed at the number of blades each propeller had. There is no reason to question that the port and starboard propellers, driven by the reciprocating engines, were three-bladed on every one of the sisters throughout their lives.



Titanic Titanic: The Ship Magnificent, Volume 1. *Tempus Publishing*; 2008)

There is, however, a good reason to take a closer look at the central propellers – in particular, *Titanic's*. An original engineering notebook, apparently hitherto unpublished, kept by Harland & Wolff, gives some very interesting data for *Titanic's* propeller specifications (see page 124). To judge from the entries for yard numbers 400 and 401, *Olympic* and *Titanic* respectively, the records for the ships were written prior to *Olympic's* 1913 refit. It seems *Olympic's* entry was written in 1911 and amended in January 1912, and that *Titanic's* was written no later than January 1912 and amended sometime in January or February 1912. The technical specifications are interesting enough, yet the number of blades on *Titanic's* central propeller is even more so, because the figure of "3" blades is recorded very plainly. There is no alteration whatsoever: no "4" crossed out and replaced by a "3." There is merely the figure "3." At present, there seems to be no other primary source to contradict it – no document which gives the number of blades for this propeller. That being the case, *Titanic* may well have been fitted with a three-bladed central propeller.



Lapland Laurentic Median Memphian (396), Minnewaska Mercian Megantic
 Olympic Titanic
 Leopoldville Olympic Titanic Olympic's Titanic's Titanic's Olympic's Laurentic Megantic Northern
 Ireland [Reference no. D/2805/SHIP/8A-E]

If what has been documented in this Harland & Wolff document is true, it is likely to upset the apparently universal assumption that *Titanic's* central propeller was four-bladed, and render numerous illustrations and models of the ship inaccurate. This highlights the vital importance of primary sources, for so much misinformation can be spread as a matter of "common knowledge" when, in fact, it is an assumption. It remains necessary to go right back to the beginning to assess whether researchers really know what we think we know. How many differences between the two sisters have remained unnoticed, merely because it was assumed that they were identical in a certain respect?

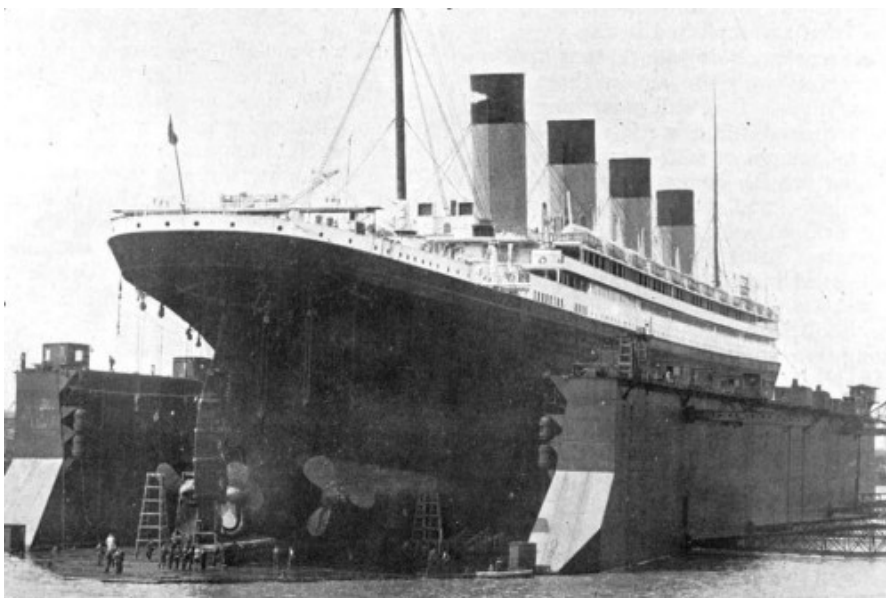
Another point is equally interesting, at least to the technical researcher. *Titanic's* wing propellers are

recorded as being essentially identical to *Olympic's* as they were in 1911-12, with three blades and a diameter of 23 feet, 6 inches. There is, however, an important difference. When *Olympic* entered service, the pitch of her wing propellers was set at 33 feet. By January 1912, however, the pitch had been increased to 34 feet, 6 inches – Harland & Wolff having taken the opportunity to alter the pitch of both wing propellers during repairs in November 1911 following the *Hawke* collision. Similarly, *Titanic's* wing propeller pitches had been assumed to be 34 feet, 6 inches, but this particular source has a pitch of 34 feet, 6 inches crossed out and replaced with a pitch of 35 feet. This seems to indicate that the proposed pitch of

Titanic's Olympic, quite naturally they appear to have done the same for *Titanic*. It was in this knowledge that they estimated *Titanic*

Similarly, the process worked in reverse the following year. As *Titanic* was improved compared to *Olympic* when she entered service in 1912, so *Olympic* was im-proved when she underwent her extensive refit in 1912-13. Leaving aside the changes to the ship's watertight subdivision and internal systems, aspects of her accommodation were improved as *Titanic's Olympic* returned to service for spring 1913, her original four-bladed propeller had been replaced with a three-bladed one. This was documented on page 49 in the "Andrews notebook" that was made available in the late 1990's. The change does not appear to have been a success, since it had certainly been replaced by a four-bladed version by 1919, but its original installation on *Olympic* highlights the very real possibility that *Titanic* had been fitted with a three-bladed central propeller in February 1912.

Why would Harland & Wolff have fitted a three-bladed central propeller to *Titanic*, given that *Olympic* retained her original four-bladed one at that time? The answer most probably lies in their attempts to find the most efficient propeller design, in order to maximise performance. No doubt, if *Titanic's* performance had proved satisfactory then they would have altered *Olympic* when the opportunity arose. As it was, *Titanic* was not in service long enough to assess her performance properly, and *Olympic* was altered during the 1912-13 refit with a three-bladed central propeller, only for a four-bladed propeller to be fitted later on.



In the summer of 1924, after recording an impressive average speed Olympic Leviathan's Olympic Leviathan's

In terms of efficiency:

*A single-blade propeller would be the most efficient – if vibration could be tolerated. So, to get an acceptable level of balance with much less vibration, a two-bladed propeller, practically speaking, is the most efficient. As blades are added, efficiency decreases, but so does the vibration level. Most propellers are made with three blades as a compromise for vibration, convenient size, efficiency, and cost. The efficiency difference between a two- and a three-bladed propeller is considered less significant than the vibrational difference. Nearly all racing propellers are presently either three- or four-bladed.*⁶

		<i>Olympic</i>		<i>Titanic</i>		<i>Britannic</i>	
		Wing propellers	Centre propeller	Wing propellers	Centre propeller	Wing propellers	Centre propeller
June 1911	Diameter Pitch Blades Area (Sq. ft.)	23 ft 6 in 33 ft 3 160	16 ft 6 in 14 ft 6 in 4 120				
November 1911	Pitch	34 ft 6 in					
January 1912	Diameter Pitch Blades Area (Sq. ft.)			23 ft 6 in 35 ft 3 160	17 ft 14 ft 6 in 3 120		
March 1913	Diameter Pitch Blades Area (Sq. ft.)	22 ft 9 in 36 ft 3 165	17 ft 14 ft 3 125				
September 1914	Diameter Pitch Blades Area (Sq. ft.)					23 ft 9 in 35 ft 3 160	16 ft 6 in 14 ft 6 in 4 120
1919-20	Diameter Pitch Blades		16 ft 6 in 14 ft 4				
Post-1925	Pitch Blades Area (Sq. ft.)	36 ft 9 in 3 160	14 ft 6 in 4 120				

Olympic Britannic Engineering Olympic
 Olympic's Olympic's Olympic's
 Britannic Olympic Olympic
 Majestic RMS Olympic: Titanic's Sister, *Tempus Publishing, 2004*)

It may have been the case that *Olympic's* three-bladed central propeller paid the price for increased efficiency at the expense of increased vibration, and so the shipbuilders subsequently reverted to a

four-bladed one. *Britannic* certainly had a four-bladed one. Her propellers were fitted after the shipbuilders had some 18 months' experience of operating *Olympic* and her three-bladed one, so it certainly seems the arrangement did not live up to expectations. All this, of course, would not have been known when *Titanic* was being completed in February 1912, or when *Olympic* returned to the shipbuilder at the end of 1912.

There are no known photos of *Titanic*'s propellers in place (as is so often the case, many photos claiming to be *Titanic* are actually *Olympic*). The photographic record is therefore of no assistance to us.

As an aside, there is one interesting image of *Titanic* being outfitted during mid- to late January 1912. It appears to show a four-bladed propeller beside the Thompson dry dock, resting by itself on the floating crane platform. Why it was there at the time, or for what ship it may have been originally intended, is the subject of speculation. By contrast, it is not speculative to state that there is a primary source, apparently giving an accurate set of propeller specifications for *Titanic*, which identifies her central propeller as a three-bladed one.

It might be the case that another document will surface in the future, contradicting this source, and recording that *Titanic* was indeed equipped with a four-bladed central propeller – just as historians have believed all along. However, given the fact that a three-bladed propeller has also been documented, it seems the only way to state for certain what *Titanic*'s central propeller was will be to hope that a method can be found to examine it in place on the wreck. Until then, or until a verifiable photo is discovered, then it will be another of *Titanic*'s enduring mysteries.



Olympic Olympic's stern can also be dated by examining the number of rows of rivets around the arch at the top of the central propeller aperture; there were originally four rows of rivets, yet after the new stern frame was installed over the winter of 1925-26, these were increased to five rows. (Author's collection)

ACKNOWLEDGEMENTS

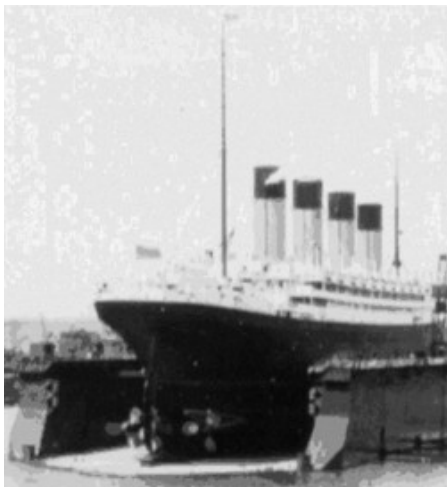
Many thanks are due (in alphabetical order) to Scott Andrews, Bruce Beveridge, Steve Hall and Sam Halpern for all their insights; Jennifer Irwin for her considerable assistance; and the Deputy Keeper of the Records, Public Record Office of Northern Ireland, courtesy of Harland & Wolff.

ENDNOTES

Propeller pitch is "the distance that a propeller would move in one revolution if it were moving through a soft solid medium not allowing for any slip." In other words, "it is the ideal travel distance for one revolution of the propeller." Slippage is inevitable for a propeller moving through water rather than a soft, solid medium. As an example of slippage, if a propeller has a pitch of 33 feet, then with a typical slip of

around 12 percent, it will actually move around 29 feet through the water. (See Halpern, Sam. "Speed and Revolutions," September 18, 2007, accessed October 1, 2007.)

Oceanic's propellers had a diameter of 22 feet, 3 inches when she entered service in 1899, according to a newspaper report which appeared in *The New York Times* on September 10, 1899. However, even if another liner had propellers of a larger diameter, *Olympic* and *Titanic's* wing propellers were certainly among the largest in terms of their diameter, if not *the* largest. While *Olympic* and *Titanic's* wing propellers, with a diameter of 23 feet, 6 inches in 1911-12, were considerably larger than those of most other liners, the same cannot be said of their central propellers. *Lapland*, Harland & Wolff's yard number 393, had propellers with a diameter of 19 feet, 6 inches; *Laurentic*, yard number 394, had wing propellers with a diameter of 17 feet, 6 inches and a central turbine-driven propeller with a diameter of 10 feet. Examination of other smaller liners constructed at the time shows that the central propellers for *Olympic* and *Titanic* were by no means exceptionally large. In fact, they were about average in terms of their diameter, if compared with the propellers fitted to smaller liners at the time.



In Southampton's floating dry dock once again, some time after the 1928-29 refit, Olympic's propellers are visible in this unique view. Although the angle and distance can make it hard to discern, it almost seems as though the decrease in diameter and increase in pitch are visible on the wing propellers compared to 1911 photos. There is some "spotting" on the photo. (Author's collection)

³*Titanic: The Official Story*. Random House; 1997. This book included a number of original documents relating to *Titanic*. The *Guide* included an appendix giving "particulars of ships built by Harland & Wolff." wing propeller pitches are mistakenly given as 33 feet, while *Olympic's* boiler and propeller particulars are her configuration following the 1912-13 refit. No figures are given for the number of blades. It has been assumed that *Titanic's* wing propeller pitches were increased to 34 feet, 6 inches, but in fact they appear to have been altered further to 35 feet. More relevant to the central propeller is the fact that this document lists exactly the same diameter and pitch measurements that are listed in the Harland & Wolff engineering notebook for *Titanic*.

⁴The fact that the pitch of the wing propellers had been entered in the book, then crossed out and altered, would seem to enhance the credibility of the figure of three blades for *Titanic's* central propeller. After all, if it was entered incorrectly then it would be a simple matter to cross out the "3" and then replace it with a "4."

⁵Although called the "Andrews notebook," the document itself does not appear to be written in the same

hand as the notes that Andrews made on *Olympic's*

⁶Mercury Marine. "Mercury Propellers: Props Fundamentals."2007. (accessed October 27, 2007.)

⁷In 1911, prior to *Olympic's* propellers being fitted, photos show *Olympic* (at her fitting-out berth and, subsequently, in the Thompson dry dock) and all three of her propellers on top of a tram. At least one other photo shows the blades of the wing propellers lying beside the Thompson dry dock. Unlike the central propeller, which was a solid casting, the wing propeller blades were fixed to the propeller boss. Harland & Wolff appears to have followed a logical procedure of moving all three propellers to the ship prior to installation, and then fitting them within a short space of time. This would appear to be the most efficient and practical method of installing them. Assuming that this was the case for *Titanic* as well, this raises some key questions about the photo. No tram is visible, nor the wing propeller bosses or their blades. It does not seem to be waiting to be installed. Was it even a propeller for *Titanic*? It is not possible to tell. Even if it was intended for *Titanic*, then it seems it had been *removed*

Mark Chirnside is a well known researcher and author in the Titanic community. To his credit he has written several books dealing with such ships as the RMS *Olympic*, RMS *Majestic*, and RMS *Aquitania*, as well as a book dealing with the three 'Olympic' class ships: *Olympic*, *Titanic*, and *Britannic*. He also has authored a number of articles on various related subjects. He maintains a website at www.markchirnside.co.uk.

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