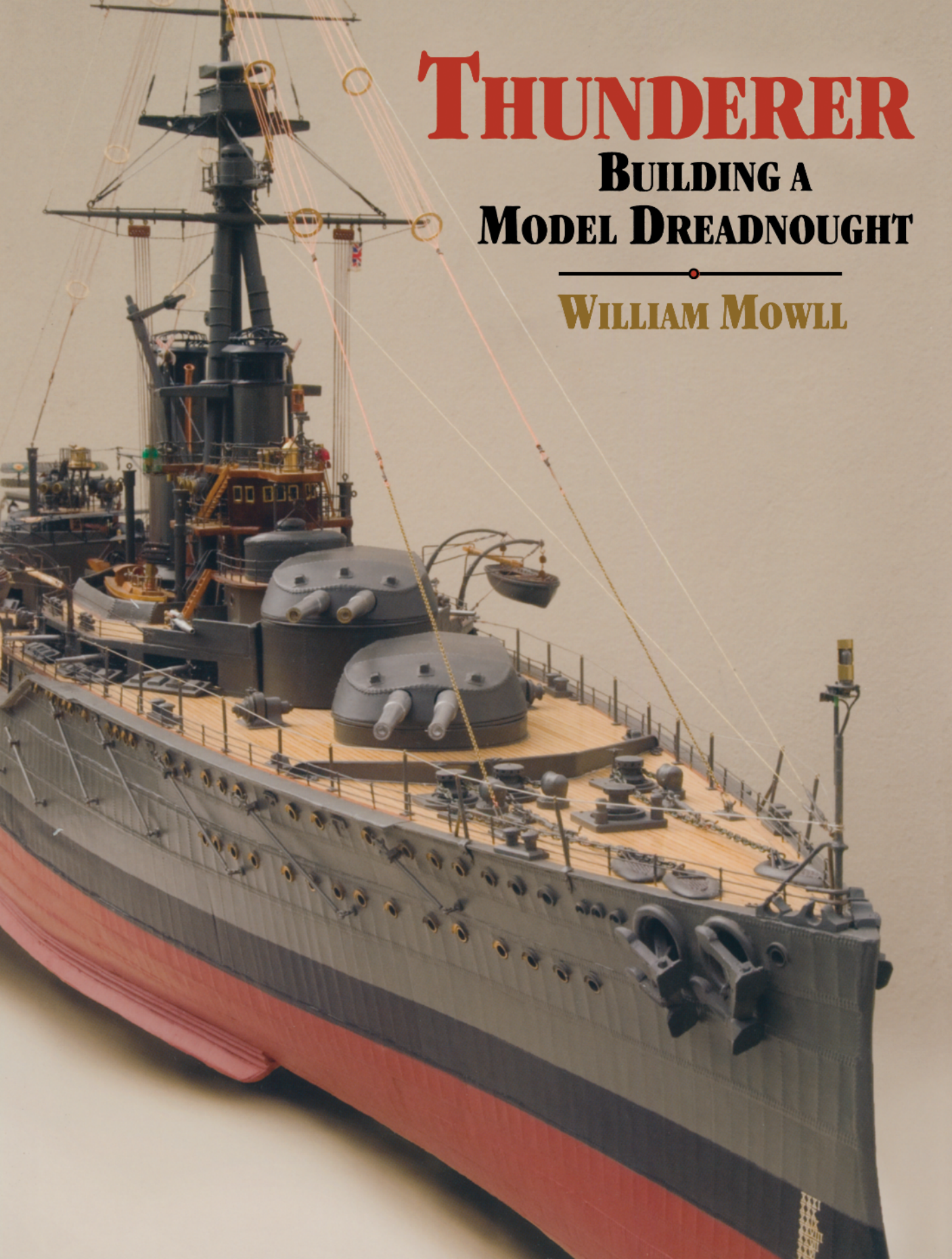

THUNDERER

BUILDING A MODEL DREADNOUGHT

WILLIAM MOWLL

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Foreword by Simon Stephens

Seaforth
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Dedicated to Patrick Hills and Charles Warner,
the grandson and great-grandson of Arnold J Hills

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To my wife Susie who, stoically and heroically, puts up with it all.

William Mowll
June 2009

Foreword

It was through the UK National Maritime Museum's educational programmes which began in 1995 that I first met Will Mowll, and read about the work on his model of the SS *Great Britain* and subsequently HMS *Warrior*, on which subjects he has published two books. He very kindly agreed to give a talk about the trials and tribulations of both building and operating large working scale model ships, and ever since that time, he has been a keen supporter and friend of the museum.

The public, regardless of age or gender, have always been fascinated by ship models. Having had the privilege of working with the National Maritime Museum's ship model collection at Greenwich for over thirty years, I am frequently asked why, and for whom, these truly remarkable objects were made. This is the most rewarding aspect of my job, dealing with a whole range of enquiries: historical, technical, advising on research issues, and answering questions from ship-modellers.

The public are also inquisitive to know more about the modelmakers themselves, who have spent so many hours creating a ship in miniature; for an outsider the motivation for this activity is often difficult to fathom. It involves entering into an individual and very private world. With modelmakers who are not working on commission, and where money is not the prime incentive, the choice of subject is likely to have a technical or historical association with a particular ship, as is the case with this book. There can also be a desire for ownership, expressed by the seventeenth-century diarist, Samuel Pepys, who made the following entry in his diary, on 11 August 1660: 'Mr Deane, the assistant [shipwright] at Woolwich came to me ... He promises me also a model of a ship, which will please me exceedingly, for I do want one of my own.'

With the addition of HMS *Thunderer* (1911) to the 'Mowll fleet', it is encouraging from a curatorial perspective that Will has put pen to paper, and recorded not only the historical and technical aspects of this dreadnought battleship, but also the human endeavour and ingenuity required to complete such a model.

As a warship, *Thunderer* had a number of notable attributes. She was the largest and last to be built on the Thames, sadly forcing the builders into liquidation, as well as being a pioneer of the Dreyer fire control system, which some would say was the world's first automatic computer, and also Captain Percy Scott's new direction firing system, earning her first place in the shooting trials of 1912.

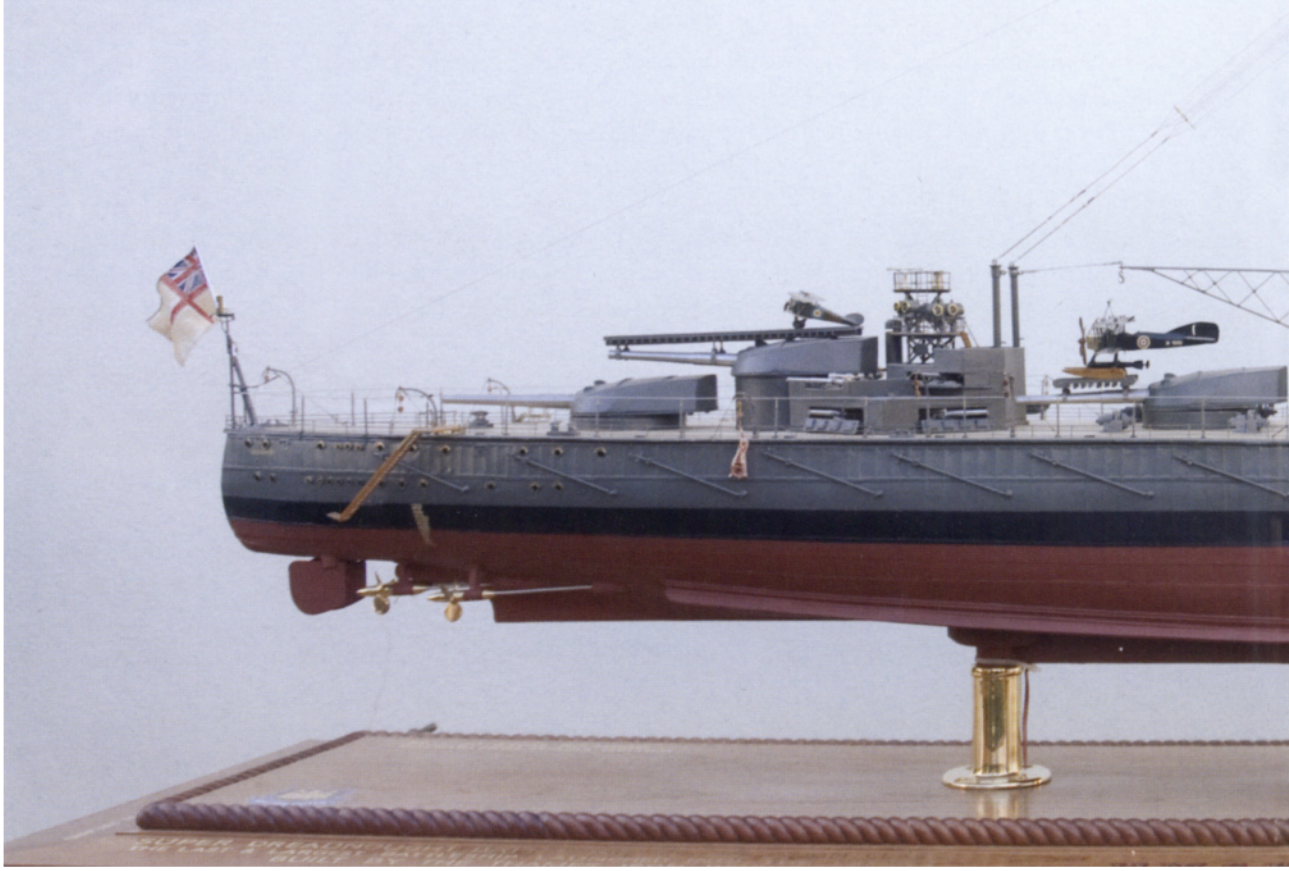
In a touching and remarkable tribute to the ship, Will has included in the deck planking on his model a sliver of original teak deck plank, liberated from a garden bench which was made from timber recovered from the dismantled ship in 1927. In the age of recycling, this keeps alive a long tradition of using original ship's timbers in the construction of a scale model.

SIMON STEPHENS
Curator, Ship Model and Boat Collections
The National Maritime Museum, Greenwich, London

HMS *Thunderer*

Orion Class: *Orion*, *Conqueror*, *Monarch*, *Thunderer*
Launched: 1911
Dimensions: Length 177.1m/581ft, beam 27m/88ft 6in, draught 7.3m/ 24ft 1in
Displacement: 22,560 tonnes/22,200tons
Main armament: 10 x 340mm/13.5in guns
Secondary armament: 16 x 100mm/4in guns & 3 x 535mm/21in torpedoes
Machinery: 18 boilers, steam turbine on 4 shafts 20,134kW/27,000shp
Speed: 21knots
Complement: 738-752 officers and men

The model: Scale 1:96 (one eighth of an inch to the foot)
Dimensions: Length 6ft 1/2in (1842mm), beam 11in (280mm),
height (keel to truck) 2ft 21/2in (673mm)



CHAPTER 1

History and Background

Introduction

The battleship era from 1860 up until the outbreak of the First World War in 1914 can be summed up in four words: from *Warrior* to *Dreadnought*. HMS *Warrior* (1860) was the first all iron battleship the world had ever seen, and she was built by the Thames Iron Works as the first warship fashioned totally from iron. She may be seen as a live exhibit in Portsmouth, restored in the most beautiful and authentic way as a living tribute to the finest mid-nineteenth-century shipbuilding in the world. HMS *Thunderer* (1911) was the last battleship built by the Thames Iron Works, and was launched from exactly the same slipway, somewhat extended, as her forerunner. During that time, a mere fifty-one years, warships had modernised from being fully-masted sailing ships which carried free-standing weaponry, to vessels whose whole design and purpose was to be an engine of war, capable of destroying an enemy so far distant that they could hardly be seen with the naked eye.

For years I have been fascinated by the emergence of the sailing navy into the era of the iron fighting ship. These new steam-powered vessels were no longer dependent on the vagaries of the weather for their theatres of operation, and no longer struggled with masting systems which interfered with their offensive capability. This period of naval development exactly coincides with the history of the Thames Iron Works.

By 2004, I had built two very large models of HMS *Warrior* at 1:48 scale, one of which is on permanent display beside the prototype at Victory Gate, Portsmouth. A book had also been published in 1997 to accompany the first model. The second model was built as a commission for West Ham United Football Club, intended to be a part of their existing museum of artefacts and memorabilia showing the beginnings of the club's history and its connection with nineteenth-century shipbuilding. A further commission followed, which would tell the end of the story of this famous yard, in the form of HMS *Thunderer*. This is how I was first introduced to this remarkable vessel, built as the last and, in many ways, the finest of London's ships, but the ship which finally and tragically bankrupted the already-ailing firm.

Thunderer is classified as a super-dreadnought and represents for the scratch-modeller a major challenge on a scale of 1:96. The long journey of my build has been a very exciting one for somebody who is new to twentieth-century warships, because every step of the way has been a small voyage of discovery. A battleship is not only a most complex structure where everything must fit together with great accuracy, but it is also a place where men must live and work together as a team which will be called upon to fight for their country. A model should be a tribute to all this, and a serious model is a reminder of the sacrifices which young men are called upon to make whenever and wherever war is declared. It should also be a salute to the designers, draughtsmen, engineers, tradesmen, craftsmen and builders, who constructed these massive structures, almost literally with their bare hands.

My hope is that the model of *Thunderer*, which has been built with my own bare hands, will give both pleasure and reflection in equal measure, and be a worthy reminder of this vessel's centenary year.

The Thames Iron Works 1846-1912: The Oldest Battleship Builders in the World

By the time Arnold Hills (1857-1927), the Chairman and Managing Director, secured the all-important order for the last battleship to be built on the Thames in 1909, the noble history of the Thames Iron Works was drawing to a close. Hills' public pleading with the First Lord of the Admiralty, Winston Churchill, to give the men of the East End of London a chance to be a part of the arms race for the defence of the realm, was finally and reluctantly acceded to, although Churchill knew that the proposed ship could be built more cheaply at one of the established shipyards in the north of England. The Thames Iron Works, a private shipyard, would also have been expected to quote more competitively than a Royal Naval dockyard in order to secure the contract. In his obituary in the *Evening News* in March 1927, it was reported that Arnold Hills quoted a price £25,000 less than that of any other firm

tendering; this added pressure to an already tricky financial situation at the Thames Iron Works.

The plain truth was that London in 1909 was no longer well-placed for obtaining the plethora of raw materials and fittings needed to manufacture and assemble a 22,500-ton super-dreadnought battleship. Coal, iron and steel all had to be delivered to the site, whereas these materials were an integral part of the supply chain connected to shipyards in the north, most notably on the rivers Tyne and Clyde.

What the East End of London did have was a skilled workforce, plenty of proven experience, and across the river from the Thames Iron Works, the former John Penn's Engineering Works at Greenwich, acquired in 1889. Work in the Thames shipyard had diversified greatly since the halcyon days of pure shipbuilding and now included the production of lorries, cars, bridges, lock-gates, and lifeboats. They were also developing, with great excitement, a reliable 60hp touring car. The car was a success, but the tyres were not.

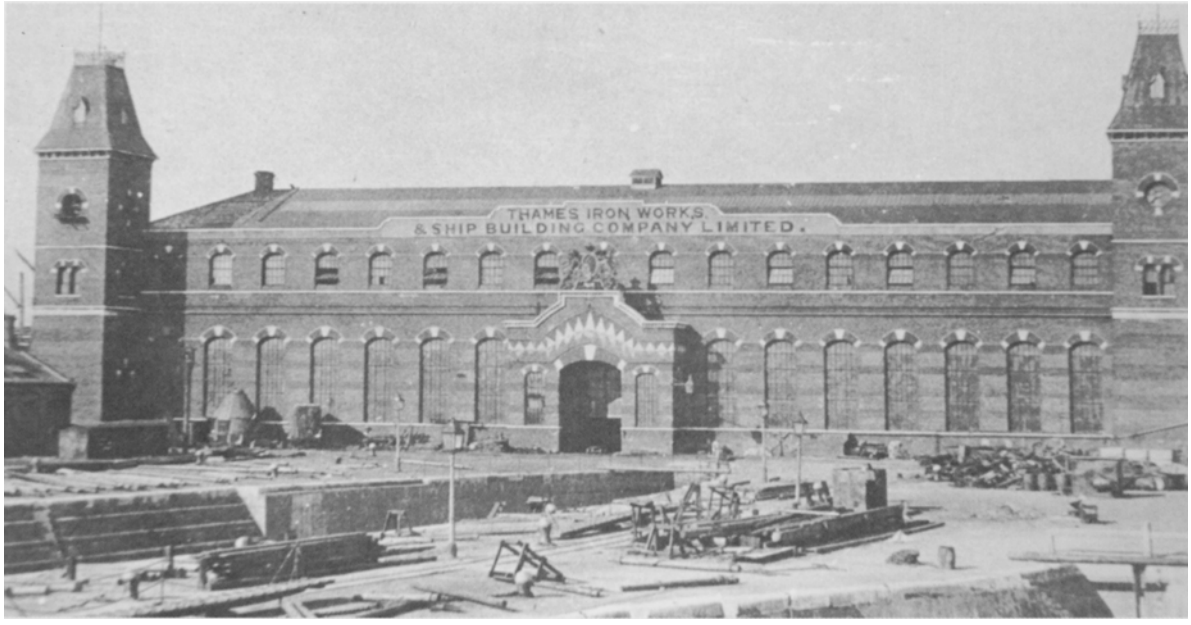
All these projects were attempts to keep full employment at the engineering works. Outwardly, all was well. A handsome new office block had been opened in 1909 on the Essex side of the River Lea, opposite the old Orchard Yard, the former site from which the works had expanded. The order books were far from empty, but a shipyard needs a ship in order to hold its head high.

The Chairman and Managing Director

Arnold Hills had joined the Thames Iron Works in 1880 at the age of twenty-three. He was the third son of Frank Hills, who had amassed a fortune from chemical manufacturing at Deptford. His two brothers had gone into their father's firm, leaving Arnold to manage the interests of the Thames Iron Works, in which his father had gained a controlling interest as the majority shareholder. With no prior knowledge of ship-building, as a very young man he was thrown into the deep end of a most complex construction industry, at the spearhead of all the new technologies of mechanical engineering.

Although he was the third son, Arnold Hills was no pushover. He was an Oxford University championship runner and the possessor of an international cap, having played for England against Scotland. A classical scholar and a modern historian, he was also a vegan and a teetotaller: a formidable young man who, tragically, was to suffer a most debilitating disease which would eventually leave him paralysed during the whole building programme of *Thunderer*. His arthritic condition had reduced him from athlete to helpless cripple, unable even to lift a finger. According to his obituary in the *Times*, despite the severe nature of his rheumatic illness, his mind remained sharp and 'as vigorous and active as ever'.

Although born into riches, Arnold Hills had a



▲The new offices of the Thames Iron Works, 1909.

▶ Arnold Hills, c. 1905. Photograph from the private collection of his grandson, Patrick Hills.

social conscience, coupled with a strong religious belief in practical matters. As a young man, for five years he lived in lodgings alongside the workforce in the East India Dock Road. His motives were sometimes misunderstood, but there is no doubt that he cared deeply about the welfare of his men, and was constantly concerned about the poverty of the area in which they lived.

Labour Relations

At the turn of the new century, labour relations in London's East End were going through difficult times. There was a general feeling of unrest regarding working conditions and pay within the shipyard, sparked off by the Gas Workers' Union in 1889 giving a new confidence to the British Trades Union movement. For Arnold Hills, the issue centred on his claim that he had the right to employ non-union members if he chose to do so. This was fiercely resisted by the shipyard's activist trade union members involved in the different sectors of shipbuilding.

To improve the situation, Arnold Hills introduced what he called a 'Good Fellowship System and Profit Sharing Scheme' so that 'every worker knows that his individual and social rights are absolutely secure': the illuminated citation which enshrined this agreement for the eight hour day is dated 13 November 1894. The scheme included bonuses on top of standard wages, and the care of his workforce. The eight hour day, when other yards were still requiring a ten or twelve hour shift and sweated labour, had implications for profitability which ultimately worked against the interests of the yard.

Work, Play and the Football Connection

Out of concern for the workers' ultimate well-being flowed a catalogue of his own enthusiasms for sport, cycling, cricket, rowing, amateur dramatics, and the formation of a brass band. Some of these extra-curricular activities might have appealed more to middle management than to riveters and machinists, but for the latter, football league was the new passion. Hills encouraged the formation of the football team, initially titled the Thames Iron Works Football Club, in 1895.

Within their first two years they had entered the FA Cup and the London League, and from this single initiative for Thames Iron Works employees flowed a whole new future, which outlasted the Thames Iron Works into the present day. West Ham United Football Club plc, known today as the Hammers, take their name from the riveting hammers on their official badge, and the tool of their trade, rather than any reference to West or East Ham, and the club has its initial roots in shipbuilding and engineering of the highest skill and order, of which they may be justly proud.

Initially, it was the connection between fitness at

▲ The citation for the eight hour day.

▲ The Thames Iron Works football club 1896.

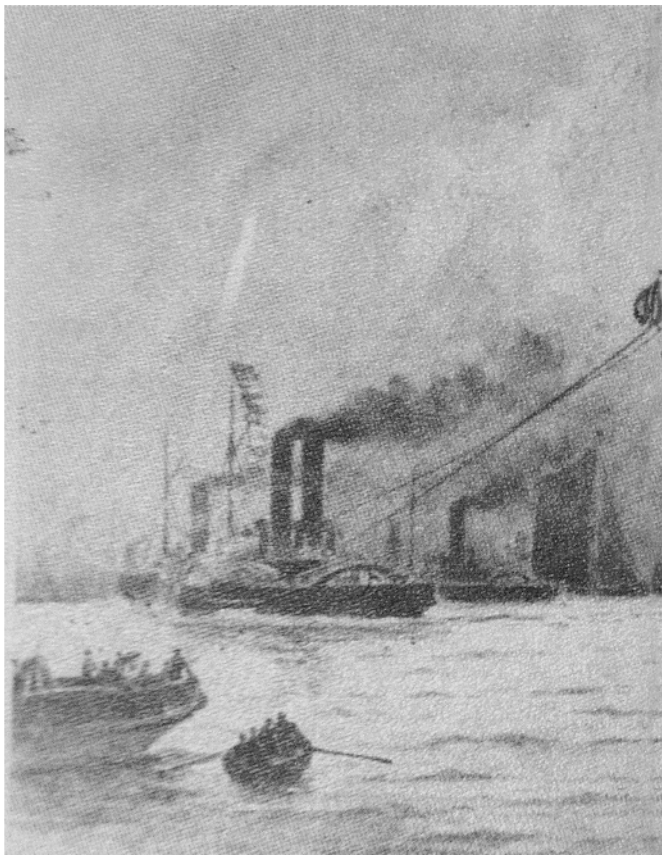
work and play which resulted in the formation of the football club, with Hills as prime mover of this initiative. His Achilles heel in this venture was that he did not approve of anyone outside the works being involved with the team. He deeply resented hiring professionals in order to attract larger numbers of supporters, and dissociated himself from the Club when this started to happen. He did, however, maintain a major shareholding in the team out of a basic loyalty to the men, and had in the past always responded to their needs for subsidising the Club. Following the fundamental disagreement about using professional footballers whom he referred to as 'mercenaries', the Club reorganised and changed its name from the Thames Iron Works FC to West Ham United FC in 1900. By 1904 the Club had moved to their present ground in Green Street from the old Memorial Ground at Hermit Road in Canning Town. Interestingly, even today, 'Come on, you Irons!' is still a shout of encouragement you can hear from older supporters in the club stands, and harks back to the days of the shipyard.

▼ The Bobby Moore Stand at West Ham United FC plc.

A New Battleship for the Thames

The Orion Class Battleship *Thunderer*

The Admiralty requirement was for four battleships to be built. Their names were *Orion*, *Conqueror*, *Monarch*, and *Thunderer*, all to be launched and completed by 1912. All of them were eventually to serve at the Battle of Jutland in 1916, as the Second Battle Squadron (Second Division). In the First Division of the Second Battle Squadron were the four very latest vessels, all classed as improved super-dreadnoughts, namely *King George V*, *Ajax*, *Centurion*, and *Erin*, completed in 1913. These battleships were not designed primarily to be used in the front line of battle. This was the province and territory of the newly-conceived battlecruisers, which were less heavily-protected by armour plating, and designed to move at a faster pace, typically 6 knots above the design speed for an equivalent battleship. *Thunderer*'s top speed as a battleship was 21 knots, whereas her equivalent the *Princess Royal* (1910), a Lion Class battlecruiser, could achieve 27 knots.



Pre-Dreadnoughts

The last ships of any size built by the Thames Iron Works were the pre-dreadnoughts HMS *Duncan* and HMS *Cornwallis*, both launched in 1901 at 13,745 tons. HMS *Albion* was finally completed in that same year at a deep-loaded displacement of 14,320 tons. There had been no further orders for battleships for an agonising eight years.

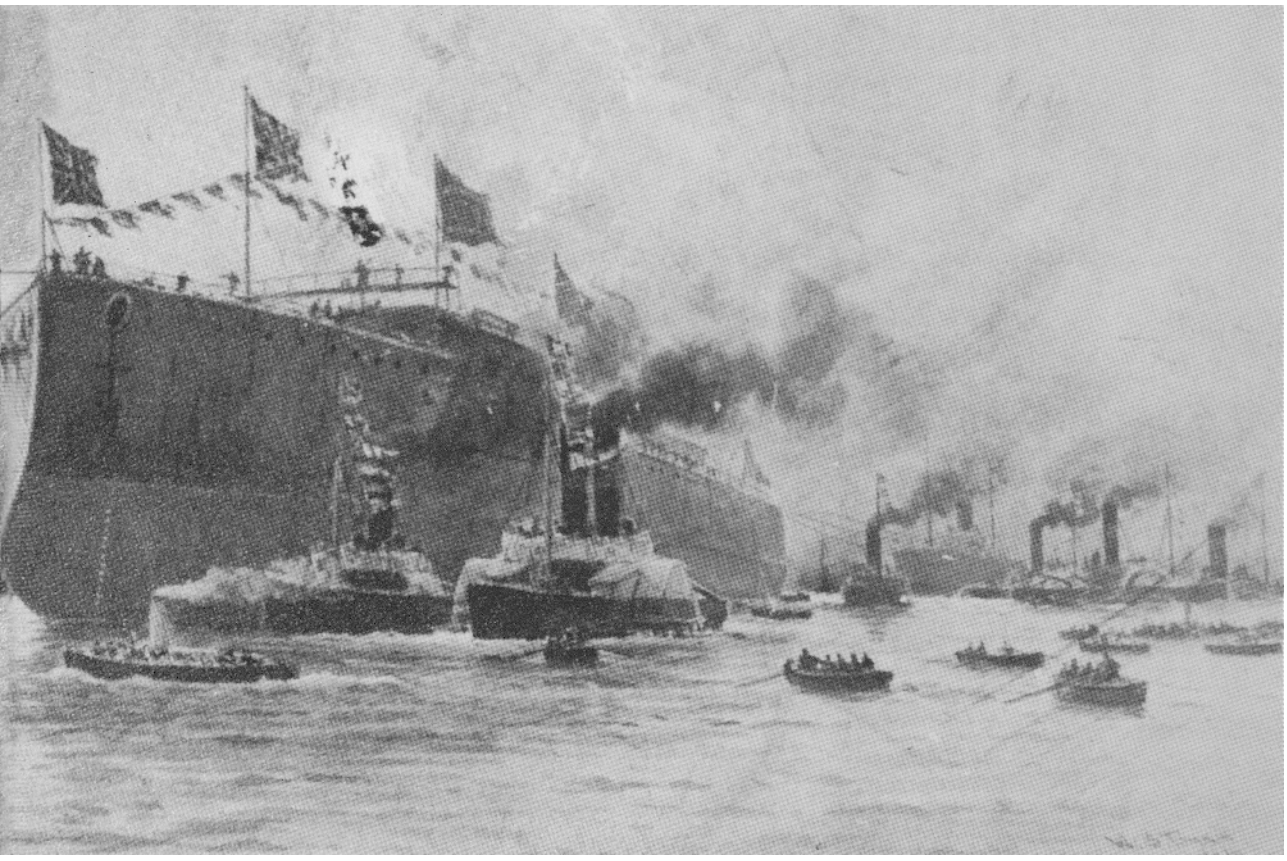
The proposed HMS *Thunderer* at 22,500 tons would be a third heavier than any one of her predecessors launched into the Thames, and 110ft longer than any previously-built battleship from this shipyard. The Thames Iron Works would also be responsible for making the Parsons turbine engines of 27,000 IHP. The Thames Iron Works agreed a price of £1.9m, which was to prove insufficient, but this was the gamble the directors took to keep the works alive. It would be a breathtaking challenge.

The Great Leviathan

Fifty-three years before the launch of *Thunderer*, Brunel's last great passenger ship PS & SS *Great Eastern* (1858) was a mighty 689ft long, but the displacement tonnage was almost exactly the same as the newly proposed super-dreadnought. The *Great Eastern* was launched sideways into the river from Scott-Russell's yard at Millwall or, more accurately, pushed and pulled into the water with enormous and famous exertions of hydraulic rams and checking chains.

The number one slipway at the Thames Iron Works had been greatly extended for the launch of *Thunderer*, but this was exactly the same slip which had been used for launching her famous elder sister, HMS *Warrior*, fifty-one years previously. HMS *Thunderer* would eventually slide gently into the river Thames at Bow Creek, at the mouth of the River Lea, with great dignity. She was launched by Lady Randall Davidson, wife of the Lord Archbishop of Canterbury. At the same time, the ship was photographed, with much waving of top hats by onlookers, and recorded in early black-and-white motion picture which still survives.

▼ The launch of HMS *Thunderer*.



THE SHIPBUILDING DEPARTMENT
OF THE THAMES IRON WORKS 1909

On the 7th October, 1909, we received an enquiry from the British Admiralty to submit a tender for the construction and completion of an Armoured Battleship for H.M. Navy, and on the 5th November we sent in our tender. On the 17th December we received a wire from the Admiralty conditionally accepting the same, providing we agreed to carry out various suggestions in connection with the construction, docking, etc., etc. of the vessel. We found no difficulty in this, as the suggestions were all quite practical, with the result that on the 23rd January 1910, our Managing Director instructed us to run up the Union Jack at the head of the slip, and this may be called the commencement of H.M.S. "Thunderer."

Clement Mackrow, N.A., 'Departmental Notes, Shipbuilding Department'
Thames Iron Works Gazette, Vol No XIII, February 1911, No 49, p57.

The Importance of Ship Models

The ability to be able to mimic and reflect the original build of a vessel launched many years ago is a prime motivator for a model shipwright. In the United Kingdom we are lucky enough to have a wealth of Admiralty Board models, half-models, block models, and wonderful miniature replicas of all kinds of ships built over the last four hundred years. Some of these were built for decoration purposes only, and some as working examples of what the purchaser was about to buy in full size; others were detailed constructional models, used for measuring plating lines and making other three-dimensional assessments. Before any of these scaled models were created, plans had first to be drawn. Personally speaking, plans are in themselves intrinsically exciting, because they demonstrate how it was in the past, and how it will be in the future. The thrill of being able to turn a set of scale drawings or ship's plans into a three-dimensional object has been an abiding motivation which has stayed with me throughout my experience of constructing model ships over the past forty years. There is still magic for me involved with turning lines on a piece of paper into an object which will entertain and instruct even the most casual onlooker.

At the same time as studying the plans, the builder will be forced to puzzle and probe every aspect of the vessel's design; this constant investigation is a separate journey from the model-building programme, and will take the serious enquirer to places never imagined at the outset, and in the case of this particular model, to the other side of the world. So there is the bonus of learning ever more, as well as the prize of the completed model at the end.

Plans for the Orion Class of super-dreadnoughts, and in particular for HMS *Thunderer* (1911), are available from the National Maritime Museum. They are produced in several scales, and are classed as builder's plans rather than modelmaker's plans. They are facsimiles of the dockyard plans: in other words, these are the plans which were used for building the prototype, and the dates of various inspections are stamped upon them, as the ship came to completion. In common with all ship's plans, they were liable to alteration and modification, which particularly applied to the early years of any vessel, as usage and experiment demanded.

THE IMPORTANCE OF MODELMAKING

But not for some weeks [from late January 1910] could we really commence work, as the drawings and specifications had to be received from the Admiralty to enable us to begin the laying off on the mould loft and getting the model made, from which the hull-plating, etc., is measured for ordering. In many yards, the hull-plating is ordered from the sheer draught, but we are still conservative enough to believe that the more accurate and economical way is to measure the plates from a small scale model.

Clement Mackrow, N.A., 'Departmental Notes, Shipbuilding Department'
Thames Iron Works Gazette, Vol No XIII, February 1911, No 49, p57.

From such a block model, as Thomas and Patterson point out in *Dreadnoughts in Camera* (1998), a complete presentation of the shell plating, frames, strakes, keelsons and side stringers were all drawn and calculated.