A history of north east shipbuilding: being an attempt to describe and analyse the development of shipbuilding in the North East of England from earliest times to the end of 1967

Dougan, D. J.

D. DOUGAN (St. Cuth.)

M.A.

ABSTRACT OF AN M.A. SUBMISSION

"A HISTORY OF NORTH EAST SHIPBUILDING"

PRESENTED BY D.J. DOUGAN FOR AN M.A. DEGREE, DECEMBER 1968

At the end of the 19th century, the United Kingdom produced four out of every five ships built in the whole world, and the North East coast of England, stretching from Blyth in the North to Whitby in the South, was responsible for two out of those five ships. A Government enquiry said that the United Kingdom performance was an industrial achievement almost without parallel. Clearly the contribution by the North East was a substantial one.

Together with the river Clyde, the North East of England has been the major shipbuilding area in the country and until recently one of the main areas in the whole world.

Yet this supremacy did not start to emerge until about half way through the 19th century when iron began to usurp wood and steam began to usurp sail. These two technical changes turned a craft into an industry and no area was as successful in adapting to the new era as the North East coast. Its natural resources of coal and iron were exploited by a group of brilliant entrepreneurs who literally fashioned the industry.

They were responsible not only for organising production; they also stimulated technical innovations. The turbine engine was developed in the region; so was the oil tanker. There are many other examples.

British - and North East - supremacy lasted for 100 years. By the 1950's competition from other countries and an inability to expand meant that British - and North East - shipbuilding had to yield its place as a world leader. Today Japan is almost as dominant as the United Kingdom was at the end of the 19th century.

This story of the rise and fall of a great industry is not yet finished, however. In 1968 there were strong indications that the industry was going through a period of rejuvenation and reinvigoration, ready to challenge foreign competition more strongly than it had done in the 1950's and early 1960's.

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NORTH EAST SHIPBUILDING

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DAVID DOUGAN, B.A. (DUNELM)

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SUBMITTED AS AN M.A. THESIS TO
DURHAM UNIVERSITY

NOVEMBER, 1968

Tutor: Professor Edward Allen

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AN ECONOMIC HISTORY OF SHIPBUILDING IN THE NORTH EAST OF ENGLAND

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INTRODUCTION

Justification of the Study

There are at least two major reasons why it is important to study the history of shipbuilding on the north east coast;* for its contribution to national and world output; and for the light it throws upon Britain's general economic performance.

At one time, the United Kingdom was responsible for 80 per cent of world shipbuilding output and for many years after this outstanding period it was still by far the most important shipbuilding country in the world. In fact this dominance lasted from about 1850 to 1956. Much of this success was due to the contribution made by yards in the north east. Over a considerable period they were responsible for about 50 per cent of national output; today their share is about 40-45 per cent of national output. This preponderant contribution stems from technical innovations and a high degree of managerial organisation and initiative.

For this reason alone the economic history of north east shipbuilding is of great interest. But, equally important, this study bears on the more general question of Britain's total economic performance over the period. According to the London and Cambridge Economic Bulletin, the U.K. share of the total world export of manufactures fell from 33.2% in 1899 to 13.7% in 1965. Over the same period, the U.K. share of world shipbuilding launchings fell from 66.7% to 8.8% and the north east share from 36.0% to 3.7%.

* Stretching from the river Blyth in the north, to Whitby in the south.

The comparison in the above paragraph is, of course, not an exact one. In the case of total exports, the volume has gone up from 53 (index, 1958 = 100) in 1900 to 123 in 1964 and the value of U.K. exports has gone up from £291 m. in 1900 to £4,254 m. by 1964, a fourteen-fold increase. But with British shipbuilding output there has been an actual decrease of about 40% in production. Nevertheless, both generally and in shipbuilding alone, Britain has not been able to match standards being set in other countries, and a study of north east shipbuilding may help to illuminate the reasons.

BRIEF OUTLINE OF SHIPBUILDING ACTIVITY

Increasingly, shipbuilding is becoming a technical, scientific and mechanised operation. And, increasingly, ships themselves are becoming part of the computerised world of advanced technology. So a wide range of skills is required, from heavy mechanical on the one hand to electrical and electronic on the other.

Shipbuilding can conveniently be divided into two parts: the building and launching of the hull (and this is the essence of the industry); and fitting out with lighting, plumbing, furniture, instrumentation and, in the case of naval ships, armaments.

About two thirds of the total building time consists of assembly and 70% of the costs arise from bought-in materials. The shipbuilder's task consists of programming this assembly work accurately as well as working out the often complicated details of design and performance and then ensuring that the ship is built to these specifications.

Over the years, new skills have come in and others have disappeared. And at different times, certain sections of the workforce are more important than others. At the moment, with the keen competition to gain new orders, the sales team is the most important. Without their success in winning contracts at the right price and ensuring delivery at the right time, shipyards could not survive. The skills of the workforce would have no chance to flourish. In wartime orders flow in and the main responsibility falls on the production departments.

An interesting example is provided by the Furness Shipbuilding Company, which announced in March 1968 that it was to close the yard it hadoperated at Haverton Hill, near Middlesbrough, for 50 years. Production techniques were among the most efficient in the country, following a £5 m. investment in new plant and machinery. Relations between management and men were said to be excellent. Yet the management could not operate the yard at a profit for a number of reasons, particularly because the company was unable to join one of the groups that were emerging in the industry which would have enabled it to share in cost reductions through bulk purchases. In 1967-8 the company tendered for over 100 contracts. In every case it was told that its prices were too high. Since it had made losses of £8.5 m. between 1962-7, the management decided that it could no longer continue, despite a willing labour force and modern production capacity. In October 1968, it was announced that the yard was to join the Swan Hunter & Tyne Shipbuilders Co.

CHARACTERISTICS OF THE INDUSTRY

(1) Output is extremely unstable. There is seldom a steady trend line for a couple of years, never mind longer, so that the industry continually appears to be shifting gear from expansion to contraction or vice versa. This noticeable fluctuation, perhaps more marked in shipbuilding than in any other industry, leads to difficult management problems.

(2) Production is extremely varied. Many yards are equipped to build virtually any vessel that may be ordered. Others maintain at least a very wide range of specialisation. This characteristic is the opposite of "conveyor belt" production. Almost every ship is a "one off" although there were exceptions at the turn of the century, and the Sunderland firm of Austin and Pickersgill is at the moment trying to standardise on the S.D. 14 general cargo vessel.

(3) In contrast to Japan, which has a more specialised output, British shipbuilding must remain labour-intensive. This is still the case despite a gradual fall in employment and a growing investment in new plant and machinery. In "one off" production, a highly skilled and highly paid labour force plays a central part.

(4) The dominance of the labour force has been matched by other characteristics to produce difficulties in labour control. The industry has a high trade union loyalty yet at the same time a highly fragmented union structure. This has led to continual friction between management and men and often between the men themselves.

(5) On the employers' side, the industry has been marked by a high degree of family connections. Even today, two thirds of north east shipbuilding firms have strong family associations on the boards of directors.

(6) A final characteristic that should be mentioned at this stage is the relative absence of attempts at vertical integration. We shall see that in the course of 100 years only four serious efforts were made to integrate production from the raw material stage to operating the product and thereby manipulating the market. Until recently, there was an equal - perhaps even greater - absence of attempts at horizontal combination. It seems strange that such few attempts should have been made remembering the competitive nature of shipbuilding which has been completely open to the economic forces of the world and remembering, too, the highly fluctuating nature of output. One would have thought that vertical or horizontal combination would have had an appeal in an effort to reduce these fluctuations.

ARRANGEMENT OF THIS THESIS

The first chapter deals with the shipbuilding history of the area up to 1840, when the advent of iron building and steam propulsion began to turn a long-established craft into an industry requiring more organisation, more capital, more workers and more scientific knowledge. Thereafter, each of the next six chapters covers a 20-30 year period. The final chapter includes statistics of production, employment, costs and profits and includes an analysis of some of the main trends.

CHAPTER ONE

FROM THE EARLIEST YEARS UP TO 1840

As might be expected for a coastal region of an island that prided itself on its naval strength, shipbuilding - or more properly, boatbuilding - was an activity of long standing. The earliest record is dated 1294.* In that year a galley was built at the mouth of the Lort Burn on the river Tyne for Edward I, one of 20 ordered by the King at this time from distant ports.

Records go back almost as far at Sunderland. John Spearman, under-sheriff for Durham, writing in 1697, quotes from histories of the 14th century:** "Thomas Menvill occupied a certain place called Hendon, for the building of ships, for which he paid to the Bishop an annual rent of 2s. 0d." And Bishop Hatfield's Survey, published by the Surtees Society in 1857, indicates that Menvill was given permission to 'ply' ships at Hendon. So it looks as if he had two deeds, one to build ships and one to ply and moor them.

For centuries afterwards, shipbuilding disappears from the records. But we know that in 1588-9, Queen Elizabeth sent a commission to Sunderland to discover why no customs dues were being paid.*** The commission found that there was no customs house in operation. Almost certainly there would have been one had shipbuilding been a regular activity.

* "Newcastle upon Tyne, its Growth & Achievements" by S. Middlebrook, Newcastle 1950. P.32.

** "Where Ships are Born" by J.W. Smith & T.S. Holden, Sunderland, 1946. P.3.

*** Ibid. P.7.

But a century later, the records are stuffed with shipbuilding references. A record from the year 1648 refers to John Forster, who lived in Low Street, as a shipwright. And fourteen years later there is the first mention of the Goodchilds who built ships over a period of 149 years. They had lime kilns at Pallion and built 70-80 ton vessels to carry the lime. Later they acquired a Sunderland bank which failed in 1816 and five years later they went out of business.

The reason for the shipbuilding boom was simple. With the emasculation of the forests, coal was being increasingly employed as the great natural fuel of the country and much of the coal was to be found in the North. By the end of the 17th century, great fleets of coal-carrying ships were sailing from the Tyne for ports as far away as Danzig or the Channel Islands.* But Newcastle's chief markets were London and East Anglia, or abroad, Northern France, North West Germany and the Low Countries.

The home trade ships were mostly owned by shippers at Ipswich and King's Lynn while most of the foreign trade, certainly at the beginning of the 17th century, was carried in Dutch or French ships. But as the century progressed, more and more British ships were used. In 1625 the number of British coastal vessels was between 300 and 400. ** By the start of the 18th century the number had jumped to over 1,000. ***

Most of this shipping consisted of colliers and indeed the Stuart Kings regarded the north east coal trade as the nursery of the Navy. It was the increasingly-felt need for a strong navy as well as the development of trade that stimulated the growth of shipbuilding in all ports. The chief centres were: Newcastle, Whitby, Ipswich, Yarmouth, Bristol and London.

The ships were small wooden vessels. In 1750, for example, the Tyne launched its largest vessel up to that time, which could carry just 30 keels of coal. This was the "Russell", launched from Headlam's yard. **** Thirteen years later, the launch of the "Solebay", a frigate of 28 guns built by Airey, attracted "a great concourse of spectators."

* Middlebrook , P. 88-9.

** Ibid

*** Ibid

**** Ibid

But despite the upsurge of local output, the Dutch were the predominant shipbuilding nation in the 17th century. * English-built ships were too dear, carried too little cargo and were too difficult to manoeuvre. Dutch ships, on the other hand, were about two thirds and sometimes only a half of the price of English vessels. In 1669, a small ship built in Holland cost £800 against £13,00 for its English equivalent. A larger ship could be built for £1,400 in Holland, compared with £2,400 in this country.

The high price of English shipbuilding was caused at least in part by the need to import the raw materials. For contrary to popular belief, home-grown oak was not used widely in ships, certainly not as much as foreign timbers. And foreign sailcloth and even rope were used to a considerable extent.

Dutch supremacy spilled over into the 18th century when it was challenged most forcefully by Britain's 13 American colonies. ** The eastern seaboard provided ample supplies of timber and the American colonists seemed to have developed a greater skill than their counterparts in this country. But the secession of the 13 colonies in 1776 wiped out any advantage. British shipbuilders were spurred to fill the gap that had been created. During the American War new yards were set up in remote creeks in Scotland and Wales - and for the first time naval contracts were given to firms in Newcastle and Sunderland. ***

But London remained by far the largest centre of construction in this country. In 1702 a sixth of all British ps were reg. at London & the Thames ~~and~~ produced a third of the tonnage. **** By the end of the century a fifth were registered there and the river produced two fifths of the tonnage. At the same time Newcastle and Sunderland were becoming significantly more important. In 1702 Newcastle was not among the top four building ports. By 1800 it was third after London and Liverpool, with Sunderland fifth.

* "Dutch and English Merchant Shipping in 17th Century" by Violet Barbour, from Essays in Economic History edited by E.M. Carus-Wilton, published London, 1954.

** "Economic History of England, the 18th Century" by T.S. Ashton, published London, 1955. P.140-1.

*** Ibid.

**** Ibid.

Daniel Defoe, in his "Tour Through England and Wales", published in 1727, wrote warmly (and too briefly) about the area's shipbuilding: *

"From hence (Durham) the road to Newcastle gives a view of the inexhausted store of coals and coal pits, from whence not London only, but all the south part of England, is continually supplied... Newcastle is a spacious, extended, infinitely populous place; it is seated upon the river Tyne, which is here a noble, large and deep river and ships of any reasonable burthen may come safely up to the very town... They build ships here to peffection, I mean as to strength and firmness and to bear the sea; and as the coal trade occasions a demand for such strong ships, a great many are built here. This gives an addition to the merchant's business in requiring a supply of all sorts of naval stores to fit out those ships. "

The same could have been said of Whitby, which by the end of the 18th century was one of the most important shipbuilding centres in the country. By 1776 there were 251 ships registered as belonging to Whitby, compared with 113 in 1700. One observer wrote: "The progress of the inhabitants of Whitby in the art of shipbuilding has eminently conduced to the increase of their shipping." **

Ships - or more accurately, boats - had been built at Whitby from time immemorial but it was not until 1730 that the harbour was improved to take bigger ships and that regular yards were formed. The earliest recorded yard was begun by Jarvis Coates, who died in 1739.***

Mr. Jarvis Coates, junior, started his own yard about 1749, followed 11 years later by William Simpson.**** Both yards passed into other hands. Coates' Yard was taken over by Messrs. Fishburn and Broderick, while Simpson's business passed to William Hustler and then Messrs. Longborne.

* "A Tour through England & Wales" by Daniel Defoe, published 1727. P.659-661.

** "A History of Whitby", Vol. II, by Rev. George Young, published Whitby 1817. P.548.

*** "The Ancient Port of Whitby & Its Shipping" by Richard Weatherill, Whitby 1908.

**** Ibid.

Whitby shipbuilding was given great encouragement by the four vessels chosen by Captain Cook for his voyages of discovery. * Three of them were built by Fishburn and the other by G. & N. Longborne.

The biggest, the "Resolution", was only 462 tons and manned by a crew of 118. There was a great outcry at the time because country-built vessels were generally considered by LLoyds to be far inferior to those built on the Thames. But Cook stood by his original choice and wrote to a friend: "You must have heard of the clamour raised against the "Resolution" before I left England. I can assure you I have never set foot on a finer ship." **

By 1816 Whitby owners possessed 280 vessels of 46,341 aggregate tons, and there were 2,674 registered seamen in the town. There had, in fact, been "astonishing" progress since the beginning of the 19th century. *** Mr. Coulson from Scarborough hadopened a yard, so had the Dock Company and Jonathan Lacey and Jasper Wake. None of them survived very long. Lacey went out of business after three years and Wake after five. But a commentator could still write: "The skill of our shipbuilders and carpenters has long been generally acknowledged and has brought much business to the town and produced a great influx of property, especially during the first American War and the last French one. No ships are better adapted for transports... In strength, beauty and symmetry, our vessels are equalled by few and I may venture to say excelled by none." **** This was a view, as we have seen, that was not shared by Lloyds.

During the American War of Independence, Whitby produced an annual average of 20 or 21 ships. From 1792-1806 the average went up to 24 or 25. In 1802, in fact, 39 were built. But from 1807 - 1816 the average declined to no more than 14. *****

* "The Old Seaport of Whitby" by Robert Gaskin, published Whitby, 1909.

** From "Forty Famous Ships" by H.B. Culver & G. Grant, published New York 1938.

*** Rev. George Young , P.550-2.

**** Ibid.

**** Ibid.

South and North Shields, on the lower reaches of the Tyne, also developed rapidly as shipbuilding centres in the late 18th century. * In 1740 only four ships of an estimated 800 tons were registered at S. Shields. By 1809 there were 500 ships totalling 100,000 tons registered in the town. There were 12 shipbuilding yards and an even larger number of docks.**

The first South Shields shipbuilder was Robert Wallis, who started a yard in the town in the 1720's. *** The early years were even more difficult for him than for other pioneers. For in shipbuilding, as in everything else connected with the river Tyne, Newcastle's freemen claimed and enforced a monopoly. **** The Corporation thus did everything in its power to hinder the construction of Wallis's first ship and he had to fight two legal actions, as well as ward off physical intimidation, before he succeeded in breaking Newcastle's power. From then onwards he built up a considerable business and by the time he died in 1781, "at an advanced age, he had acquired a handsome fortune by his assiduity and care and was very much respected." *****

Towards the end of the eighteenth century, numerous other shipbuilders followed Wallis's example and set up in business in the town. Some of them were unable to survive the post-Napoleonic wars' depression and others faded out of the industry even earlier. But the arrival of new techniques and new materials helped to rejuvenate some of the old firms and bring in new ones. In 1830 Thomas Dunn Marshall began building ships in part of the old Wallis's yard and there, as we shall see, he built the first iron ship to be launched on the Tyne. His business prospered and between 1842 and 1852, when he retired, his firm built ten wooden and 99 iron vessels. His sons who succeeded him moved the shipbuilding department to Willington Quay.

* "The History of South Shields" by George Hodgson, published Newcastle 1924. P.212.

** Middlebrook.

*** George Hodgson, P. 212.

**** Ibid.

***** Ibid.

Some of the Shields' shipbuilders seem to have migrated to the town from Whitby. This was true, for example, of Lockwood Broderick. He began building ships at South Shields in 1772 but his business did not prosper and in turn it was taken over unsuccessfully by a number of other builders.

In Sunderland there were great developments too. The most important yard in the 18th century was that started by Thomas Havelock, the father of Sir Henry Havelock, of Indian Mutiny fame. * In 1792 the yard built "Themis", of 574 tons, a big ship for that period. Three years later the firm moved from the river mouth to Southwick andlaid the keel of what was to be one of the finest ships of her day - the famous "Lord Duncan", of 952 tons, launched on 2nd March 1798. The Durham historian, Surtees, wrote:

"Thousands of spectators covered the borders of the river, many of whom were engulfed to the middle by the rising of the water on receiving this ponderous body." **

It was at this time that the Wear's oldest surviving shipbuilding firm began business.*** Philip Laing, a farmer and shipowner, migrated to Sunderland from the Fifeshire village of Pittenween in 1792. He was then 22 years old. The following year he began shipbuilding with his brother John, who had a small business on the North Sands.

Like so many other Sunderland shipbuilders, the brothers made several moves in their early years. In 1804 they acquired a dock near Wearmouth Bridge and later they left the town to open a dock and shipyard in South Shields. But within a short time they returned to Sunderland and began building at Southwick on a site later occupied by Robert Thompson & Son. In 1818 the firm moved to Deptford on the south side of the river and it has stayed there ever since. It was also in that year that the brothers dissolved their partnership, when John left the firm.

* "Where Ships Are Born" by Smith & Holden. P.9-12.

** Quoted in the above.

*** Ibid.

Another North East shipbuilding firm that can trace its history even further back - over 200 years* - is the Smith's Dock Company Ltd., now part of the Swan Hunter Group. Its origins are traceable to William Rowe who started building ships on the Tyne in 1756. By the end of the 18th century he was the biggest builder on the river. But in 1810 he was bought out by Thomas Smith who took his two sons Thomas andWilliam into partnership with him to form the firm William Smith & Company, Shipbuilders. Less than four years later the company acquired Laing's Dock at North Shields as an additional repairing establishment.

Meanwhile the firm embarked upon East Indiamen which at that time were almost the monopoly of London builders (it was 1815 before Laing's built the first East Indiaman on the Wear). The first vessel to be launched was the "Duke of Roxburgh" of 417 tons burthen. This was followed by"George Green", which was not launched until Boxing Day, 1829 - a surprisingly long interval of inactivity.

The American War of Independence nurtured shipbuilding on the Tees.** In the late 1770's Mark Pye of Stockton was building frigates for the Admiralty and by 1783 three shipyards at Stockton were in constant employment, mostly for the Admiralty. Despite the quick demise of another yard which opened at Portrack, the boom continued after the war. Between 1782 and 1790 Mark Pye and a rival Thomas Haw built 24 ships, of which the "Aurora", 97ft. long, appears to have been the biggest.

The Napoleonic Wars kept the boom going.*** Between 1790 and 1805 Thomas Haw built 40 vessels, of which the biggest was the "Highland Lass", of 556 tons. But in the next 12 years, from 1805 to 1817, he built only 16 ships, ten of which were under 100 tons.

* "History of Smith's Dock" from Company's own magazine of April 1924.

** "The Local Records of Stockton & Its Neighbours" by Thomas Richmond.

*** Ibid.

The Napoleonic Wars were good for the Wear, too.* In 1801, one estimate says, there were nine shipbuilding firms in Sunderland and this had risen to 15 by 1815. A House of Commons' Report in 1806 gives the following output figures for the river:-

	No. of Ships.	Average Tonnage	Largest Tonnage
1790	19	144	312
1791	6	202	356
1804	51	163	349
1805	36	163	337

The demand led many people to go into the industry, build a ship or two and then leave after the war, well satisfied with their profit. It was this continual fluctuation that made estimates difficult. For Surtees claimed there were 17 yards at the beginning of the century and 24 in March 1814. ** He also provided an output table:-

Under Construction	No. of Ships	Total Tonnage
Dec. 1810	37	8,410
Nov. 1811	32	8,020
Nov. 1812	37	8,437

He added: "But though thus vigorous and enterprising in the prosecution of their business, the shipbuilders of the Wear do not appear generally to have been possessed of much scientific knowledge respecting it."

In 1804, according to William Fordyce, a ship of 12 or 14 keels was kept on the stocks 18 months or two years but her construction was far from excellent. "The form, in general, was exceedingly rude," he wrote, "the proportion of breadth of beam to the length of the ship being not more than 1 to 3½, subjecting them to the scornful designation of tubs. One vessel of 129 tons, built in 1805, was 66ft. long and 22ft. broad, or exactly one third. The degree of perfection in construction would seem to have been regulated according to price. Hence it came to be derisively said that the Sunderland shipbuilders could either build a ship or make one." (i.e. do a good job or only an adequate one).

* "Where Ships are Born"

** "The History of Durham" by William Fordyce, Vol. II, published 1857.

As late as 1835, when Lloyd's Register was founded, Sunderland was not allowed exemption from the general rule that "no ship built north of Yarmouth should have a classification of more than 10 years."* At the same time, Lloyd's Register recognised that Sunderland was "the most important shipbuilding centre in the country nearly equalling, as regards number and tonnage of ships built, all the other ports together." In 1840 the river launched 251 ships, the highest number it has ever achieved, although tonnage has, of course, increased enormously since then.

It was about this time that North East shipbuilding really began to emerge from the shadows of Continental or London-based competition. With the arrival of steam and a little later of iron shipbuilding, there began a growing sophistication and a growing application of scientific principles that were to make north east shipping among the best in the world.

The world's first steamboat, the tug "Charlotte Dundas", had been built by William Symington in 1802 and fitted with James Watt's double-acting engine. Five years later Robert Fulton in America took the next step when he built the paddle steamer "Clermont" to make regular runs on the Hudson River between Albany and New York. The first steamboat service on a British river was Henry Bell's "Comet" built on the Clyde in 1812. Within two years the Tyne had built its first steamboat, the "Tyne Steam Packet", later renamed "Perserverance", which began conveying passengers between South Shields and Newcastle in May 1814."** This was owned by Joseph Price of Gateshead who thus made a significant contribution to the development of the river and to the opening up of the hinterland. We must remember that at this time and, indeed, for another 40 or 50 years, road communications between Newcastle and the coast were primitive in the extreme. When John Wigham Richardson took over a shipyard at Walker as late as 1860 there was only one rough road through fields to Newcastle***The riverside railway had still to come and so, even in 1860, had a regular river steam service.

Joseph Price had another very novel idea. In 1818 he tried to introduce the towing system and spent "upwards of £2,000" but without success. In 1838 he issued a public statement to try to gain Government compensation for the loss.

* Fordyce
** "The Making of the Tyne" by R.W. Johnson, Newcastle 1895.
*** "Launching Ways" published by Swan, Hunter & Wigham Richardson & Company Ltd., in 1953. P.22

"In July 1818," he wrote in the statement, "I conceived good might be done by towing vessels to sea.... The tide was against us the first three miles. Everything answered as well as I could wish and the vessel was towed two miles over the bar in two hours ten minutes - a distance of 13 miles, the wind against us all the way. This was the first time a sailing vessel was ever towed by a steam boat.

"The public did not at first appreciate my endeavours for expediting the sailing of ships in adverse winds. On the contrary, I was told I had ruined the port....

"After a considerable interval, the other owners of steam boats saw the advantage of the towing system.... Previously no vessel larger than 240 tons register ever attempted to come up to Newcastle; after the introduction of the towing system, vessels of 400 register were brought up and vessels that previously averaged only 8 voyages in the year between Tyne and Thames were enabled to average 13 voyages, thereby keeping the coal market in the Metropolis and elsewhere supplied and preventing those great fluctuations in prices which in former times had such a serious effect in increasing the misery of the poor.

"In 1821, the towing system was adopted between Hull and Gainsborough; then at Sunderland; in 1826 in Liverpool; afterwards at Montreal... It was soon after generally followed in all quarters of the globe."*

But without benefit to Joseph Price, who thus became one more pioneer to suffer for his advanced ideas.

Meanwhile engineering and shipbuilding were coming together for the first time. In 1820 Robert and William Hawthorn formed a partnership to run an engine works at Forth Banks, Newcastle, and in their first year built three pairs of engines for steam packets running on the Tyne.**

* Quoted in "The Making of the Tyne" by R.W. Johnson, published Newcastle 1895. P. 252-3.

** "A History of R.& W. Hawthorn, Leslie & Company", by J. Bulman, at one time managing director of the St. Peter's Works (private edition).

Their father, also called Robert, was considered the most famous enginewright on Tyneside at the turn of the century. In 1790, when he was only 20 years old, he had been made chief engineer at Walbottle Colliery. A neighbour in the row of single storey cottages where he lived in Walbottle was Robert Stephenson, whose son George, was to become the famous locomotive engineer. All three were good friends and in 1796 when Hawthorn installed the pumping engine for the new pit at Newburn, he put George Stephenson, then only 17, in charge of it.*

Six years later, Hawthorn erected a winding engine at Willington Quay to draw to the top of the ballast hill the wagons filled with ballast from the collier brigs. Again it was on Hawthorn's recommendation that George Stephenson was put in charge of the machinery. Despite this help, Stephenson wrote in a letter that Hawthorn was "exacting, tyrannical and domineering", but this was a view that he modified in later life.

Of Hawthorn's 11 children, only Robert and William lived beyond their teens. The eldest son Robert was apprenticed as a millwright and enginewright to his father at Walbottle Colliery. In 1817 on the completion of his apprenticeship, Robert Hawthorn junior set up on his own in a shed at Forth Banks as an enginewright with the intention of making and repairing machinery for collieries. In his first year he employed four workmen and they remained with him throughout their lives.**

In 1820 he was joined in partnership by his brother and the firm's labour force reached 34. In that year the firm made its first venture into the marine field, supplying a 7 h.p. engine for the "Indefatigable" and then 12 h.p. engines for the "Northumberland" and the "Lemington Packet".

In 1822 the brothers introduced steam power into the works to drive machines. This replaced the labourers who had turned a handwheel with a rope drive to the machine and lathe countershafts. Two years later they built a 50 h.p. engine for a glass works. What the price was we do not know, but a set of steam boat engines at this time cost about £1,500. ***

* "A History of R. & W. Hawthorn, Leslie & Company".

** Ibid.

*** Ibid.

The Hawthorn Brothers were quickly followed by Hawks, Crawshay and Company at Gateshead and then in 1830 by T.D. Marshall of South Shields, who within a few years built up a very important business in steam tugs. As we shall see, he was the first to build an iron vessel on the Tyne. The stimulus in fact that the locomotive engine gave to Tyneside engineering raised the district to national importance.* For years, Newcastle engineers, led by the Hawthorns and George Stephenson, who started in business in 1823, remained the sole producers of locomotive-engines in the world. In 1824, the "Rapid", a Tyne-built boat, made the first steam-propelled journey between Newcastle and London, taking 56 hours. Three years later, the "Hylton Jolliffe" with two engines of 100 h.p. began a regular run between the Tyne and the Thames during the summer.

Surprisingly, it was the Tees rather than the Wear that was quicker to follow the Tyne's lead. On the 13th November 1823 the Steam Vessel Company was established at Stockton and just over a year later, on 18th December 1824, the river's first steam vessel, the "Albion", was launched.**

Sunderland's first steam ship, the "Experiment" was not built until 1845.*** It was constructed by Thomas Rowntree, not an outstanding shipbuilder, who confessed that steam was something of an afterthought. The engines were supplied by Marshall of South Shields and the auxiliary screw propeller by Robert Thompson and Company of Sunderland. The ship was schooner-rigged, of 296 tons and capable of steaming at four knots. It was used for transporting both passengers and coal between London and the north east.

* "The Making of the Tyne" by R.W. Johnson, published Newcastle 1895. P.250.

** Local Records of Stockton.

*** "Where Ships Are Born" by Smith & Holden. P.35.

But if Sunderland lagged in engineering, it certainly led the way in shipbuilding. The North Sands, for example, was thronged with yards in the 1820's and 1830's so that William Brockie in his history of the town could write: "The banks of the river were studded with small wood shipbuilding yards as far as the tide flowed, exciting the wonder of strangers, when they passed at time of low water, as to how the builders could possibly manage to get their vessels launched." *

It was at this time that Sunderland became widely known as a shipbuilding centre and it was then, too, that many of today's yards began - Austin, Bartram, Pickersgill, Doxford.

Peter Austin started a business mainly for repairing on North Sands in 1826.** George Bartram, who had begun his shipwright's apprenticeship at the age of 11, went into partnership with John Lister in 1838. They laid the keel of their first ship, "Crown", on 14th January and launched her on 7th July, for William Thompson, a baker of Monkwearmouth. The partners made a profit on that first ship of £77 after paying wages for carpenters, sawyers, joiners, blacksmiths and painters. The six months' work therefore brought the partners about 30s. a week each. Four days after the launching of the "Crown", they laid the keel for their second ship.

William Pickersgill also probably started in 1838 in partnership with a man called Miller and in 1840 William Doxford started at Coxgreen, what was destined to become Sunderland's biggest yard by the end of the 19th century.***Robert Thompson started building ships in 1819 but the firm did not really get under way until he was joined by his three sons in 1846.

In his youth Robert Thompson had used his mother's kitchen floor to sketch out ships and to try his hand at draughtsmanship. He became an apprentice shipwright at 17 and by the age of 22 he had built several small craft on a berth near to one of the engineering wonders of the time, the great cast iron bridge which had just been built across the Wear. ****

Robert Thompson created the family shipbuilding firm with his three sons in 1837 but it was not able to withstand the depression of the early 1840's and it was 1846 before it made a proper start.

* Quoted in "Where Ships Are Born" (Smith & Holden) P.8.
** Ibid, P.24.
*** Ibid. **** Ibid.

Tees shipbuilding also grew rapidly in the 1830's. On 5th March 1833 the new yard of Laing's launched Middlesbrough's first ship, a 300-ton vessel named the "Middlesbrough".* Four years later, on 3rd February 1837, another new shipyard belonging to Spence launched Thornaby's first ship, the 340-ton "Coundon" and in the same year shipbuilding began at Hartlepool.***

The firm was Richardson and Parkin, which in its first year built the "Castle Eden", of 258 tons, the "Richmond Lass" of 281 tons and "Victoria" of 182 tons.

New firms were springing up all the time. Many of them sank back again, leaving hardly a trace. But others, through luck or energy or expertise, survived and flourished. And the north flourished with them.

"A long-established local craft was thus in the process of rejuvenation and reinvigoration. Much of the stimulus came from the latest developments in engineering, many of which were happening within the region. Throughout the years, in fact, there was a close connection between shipbuilding and engineering and many firms tended to embrace both branches. It was not essential, however, for a shipbuilding firm to supply engines or for engine makers to have a shipbuilding capability. Many firms prospered as independent units and a recent investigation of the industry recommended that shipbuilding and engine making should be considered as separate activities.***

The introduction of engines and the arrival of iron took the industry away from a haphazard craft, in which even the biggest operator of the time, William Rowe, was ready to sell out to the Smith family, towards a more formalised industry, requiring greater capital, more organisation, a wide range of skills.

With this change in the nature of the activity, Britain and especially the north east, began to emerge as the world leader. Why ? The main reason is that the entrepreneurs in the north east were more prepared to accept change, to understand and implement technical innovation. Time and again we shall see this point illustrated. Steam power had been accepted within 12 years of its first marine application. Iron was to be adopted within a similarly short period.

* Local Records of Stockton.

** Ibid.

*** The Geddes Report, 1966, Cmnd 2937, P.160.

The region had few advantages up to 1840, apart from its long association with boatbuilding of an inferior nature. The advances being made in other fields, especially railways, acted as a spur and a sufficient number of industrial leaders began to emerge. Looking back from today, progress may seen natural. That was not the case in 1840. There was no knowing then that the region was to make such remarkable strides.

CHAPTER TWO

1840 - 1860

GROWING STRONG

By mid-century, the north east was beginning to emerge as a notable industrial area. This was partly due to natural resources such as large deposits of coal, iron ore and chalk; and partly to the inventiveness and energy of a nucleus of leaders who were born in or migrated to the area.

In engineering, the work of George and Robert Stephenson, of the Hawthorn brothers and of William Armstrong was outstanding. Starting a small crane-making factory in Newcastle in 1847, Armstrong built up a very large business in only a dozen years and was to continue to expand it throughout the century so that by 1900 he was employing 25,000 people. *

His success was based primarily on two main inventions: a new type of hydraulic crane and a rifled breech-loading gun. The success of the first-mentioned led him to set up a factory at Elswick, a suburb of Newcastle but at that time consisting simply of green fields. His hydraulic invention could be applied not only to cranes but also to capstans, coal hoists, dock gates, sheer legs and winding engines.

In 1855, eight years after setting up his factory, Armstrong invented a rifled breech-loading gun which was much lighter and more accurate than contemporary artillery. The Government adopted the gun as standard Army equipment and because the Woolwich Arsenal had neither the plant nor the facilities for turning out the new gun, production started on the Tyne. A new industry came to Tyneside which within a few years was to become one of the main armament centres in the country. **

Between 1856-1863 a million pounds worth of orders was placed with the firm by the Government. After 1863 Armstrong also manufactured the gun for foreign countries. As we shall see later, armament manufacture subsequently led his firm into naval shipbuilding and then merchant shipbuilding. By 1900 when he died, his firm employed 25,000 people. It thus played an important part in the region's growth.

* J.D. Scott -"Vickers, A History". London 1963.

** R.W. Johnson - "The Making of the Tyne". Newcastle 1895.

Speaking of the region's shipbuilding performance generally, one writer has said: "The growth of output, striking as it was....was no more perhaps than might have been expected in a firmly established shipbuilding centre faced with an expanding market."*

Such a comment seems to beg a number of questions. First, an expanding market provides only an opportunity. It does not provide the means of securing domination. That can only come from personal initiative, as illustrated by the career of Armstrong and others. Secondly, the fact that the north east was a long-established shipbuilding centre does not explain its success. Indeed as we have seen, its performance in the past had been inferior to Holland or the American colonies, and, within this country, to ports in the south, especially the Thames. Again success was due to the imagination and energy of a handful of people. True, they were helped by the proximity of natural resources but this advantage was counterbalanced by the absence of population. As we shall see below there were more jobs than people to fill them and the extra numbers had to be attracted to the area.

Thus the area grew under the stimulus of individual leadership confronting an expanding market and having natural resources to exploit. It is quite wrong, however, to suggest, as Mr. Parkinson does, that the process was inevitable. That is too easy a view, looking back with the comfort of hindsight. In fact, the north east had to ensure that it had a product to sell - and this is where the work of the Stephensons in railways, the Hawthorns in engine-making, Armstrong in armaments was of vital importance - and then had to establish a commercial organisation - the factories, the skilled workforce - to exploit the economic potential.

The growing demand for iron, for both railways and ships, led to a big expansion of the local iron industry to be fed eventually by Cleveland iron ore, the biggest and best deposits in the country at that time. The Consett Iron Works were established in 1841 originally to work local ores but within a few years it was supplied from Cleveland. "What had once been a barren moor without population for miles around speedily became an immense hive of industry,"** wrote one historian. Four years later, Henry Bolckow and Henry Vaughan started the Witton Park Iron Works near Bishop Auckland and in the same year the Weardale Iron and Coal Company began operations at Stanhope. ***

* J.R. Parkinson - "The Economics of Shipbuilding", Cambridge 1960, page 8.

** Middlebrook, P.185.

*** Ibid,

The annual output of the top eight north east industries in 1863 was estimated as: *

Coal	-	£6,650,471
Metal Products	-	£3,707,941
Shipbuilding	-	£2,275,828
Engines and machinery	-	£1,928,600
Chemicals	-	£1,583,220
Glass & clay products	-	£1,066,650
Textiles	-	£ 972,400
Leather	-	£ 135,659

The same source estimated the tonnage and value of shipping registered at various ports as follows:-

	No. of Ships	Gross Tonnage	Value
Tyne	1,673	385,268	£2,700,000
Wear	947	226,203	£1,830,000
Tees	327	69,293	£ 569,000
	2,947	724,864	£5,099,000

The gross tonnage of shipping registered at north east ports at 724,864 compared with 1,406,904 registered at the Mersey, 1,059,356 at the Thames and 358,097 at the Clyde.

The industrial expansion brought about a dramatic increase in the population. Indeed throughout the whole of the 19th century, the rate of increase in the north east was always greater than for the country as a whole. **

Between 1851 and 1861 the north east increased its population by a quarter, while the average increase for England and Wales was just over ten per cent.

This was the decade in fact when the region emerged from green fields and nowhere was growth more noticeable than on Tees-side. Middlesbrough's population jumped by 137% between 1851-61*** West Hartlepool increased by 206% and Stockton by 107%. This growth was due partly to the very high birth rate, which between 1851-61 resulted in a net regional increase of 141,000, but it was also due to the high level of immigration. The net increase in migration in the decade was 40,000 and in the next decade was to be 75,000.

* "Industrial Resources of Tyne, Wear & Tees". N'cle. 1863. Publisher's Preface.

** Professor J.W. House - "N.E. England - Population Movement", published Newcastle 1959.

*** Ibid.

Newcastle was the "most cosmopolitan of the north east towns".* In 1851 a tenth of its population had been born in Ireland and another tenth in Scotland. By and large, the Irish provided the unskilled labour and the Scots the skilled men looking for greater opportunities. Mr. John Price, general manager of Palmer's shipyard, said in the 1880's, "The principal part of our labour is performed by the Irish."** On the other hand, as we shall see, many Scotsmen provided the "brains" behind north east yards either as owners, foremen or the most skilled workers.

Sunderland had 4,000 Irishmen and 2,300 Scotsmen living in the town by 1851 - most of them coming to take part in the fast-expanding, although highly fluctuating, shipbuilding industry.*** Output on the river Wear at Sunderland for 1835, the earliest year for which there are even rough figures, was 26,000 tons. *** *

By 1840, only 5 years later, output had soared to 64,000 tons. Then it started to drop again, falling to 20,000 tons three years later. This rapid rise and decline of output became one of the key characteristics of the industry, producing enormous difficulties in production, management and labour control. By 1850, however, output on the Wear had reached a plateau of 50,000 tons, below which it fell only on the rarest occasions.

Most of the shipbuilders in the area were only on a small scale. In fact in 1851 only eight firms employed more than 100 men and none more than 250. Thirteen firms employed between 10 and 19 men and ten firms between 50 and 74.*****

A great deal of Wear shipbuilding was done on a speculative basis. In December 1849 only 24 of the 90 vessels under construction on the Wear had been sold. In January 1866 only half those under construction were to an order, while on the Tyne only 44 out of the 58 being built had been sold. ******

* J.W. House - Ibid

** Royal Commission on "Depression of Trade & Industry", 1886.

*** Census Report, 1851. Pages 804-5.

**** "Where Ships are Born"

***** Census Report 1851, Northern Counties. Page 798.

****** Newcastle Courant, 12th January 1866.

IRON SHIPBUILDING BEGINS

The most important development in shipbuilding in these twenty years was the advent of iron ships.

An iron barge had been made in this country as early as 1787 and another was built for the Severn in 1789.* In 1822 the Horsely Company had built the "Aaron Manby", which was sent to London in sections, reconstructed in one of the docks and sailed to Havre and Paris.**

A few years later Mr. Houston of Johnstone, near Paisley, found that a light boat drawn by two horses had sufficient power to convey passengers on a canal at 8 - 9 m.p.h. This seemed like a gleam of hope to canal proprietors at a time when the railway trials at Rainhill were filling them with foreboding. ***

Iron and steam first came together under the influence of William Fairbairn. He was asked by the Governor and Council of the Forth and Clyde Canal Company to carry out experiments into canal traction. Fairbairn recommended the use of iron vessels propelled by steam power rather than by horses.

Acting upon this recommendation, four iron vessels were made at Manchester. One of them called the "Manchester", 84 ft. long and 14 ft. beam, with recessed paddles in the stern, was used for several years as a coastal vessel carrying passengers and goods between Dundas, Grangemouth and Dundee.****

The first iron ship built in the north east was the "Star".*≠ This was a small passenger steamer built by Mr. T.D. Marshall of South Shields in 1839 for plying between Newcastle and North Shields. Two years later he built the 214-ton "Bedlington" propelled by twin screw propellers.

* "Treatise on Iron Shipbuilding" by William Fairbairn, published London 1865.

** Ibid. *** Ibid. **** Ibid.

*≠ See "Sixty Years of Merchant Shipping on the N.E. Coast" by Dr. G.B. Hunter and Mr. E.W. De Rusett, read to N.E. Coast Institution of Engineers & Shipbuilders on 5th August, 1909.

The arrival of the Aberdeen-built "John Garrow" in the Tyne in 1840 is often regarded as the initial inspiration for iron shipbuilding on that river. For almost immediately Messrs. Coutts & Company of Walker began building iron vessels. The first one, "Prince Albert", was used for passenger service on the Thames and was launched on 23rd September 1842 from a site now occupied by the Swan Hunter Group.* It should be remembered, however, that the head of the firm, John H. Coutts, was the former draughtsman for the Aberdeen firm of Vernon, Bourne & Company which had built the "John Garrow" in 1835.** So iron ships were nothing new to Coutts, although seeing the ship he had designed seven years previously might have rekindled his interest. In any case, he was three years behind Marshall.

But the advantages of iron were on the whole accepted very slowly. Opponents ignored the facts that iron vessels were lighter, needed thinner walls, thus allowing more space for cargo and could be built with greater strength and to greater size. Instead, they pointed to the disadvantages - the difficulties with compass readings and the fouling of ships' bottoms.***

Opposition was particularly strong from the wooden shipbuilders of the Thames who no doubt appreciated their precarious position if iron shipbuilding should ever take hold.****They were far away from supplies of raw material, certainly in relation to the shipyards in Scotland and the North. Glasgow in particular led the way through Robert Napier but Laird & Company and Vernons, both of Liverpool, were also among the pioneers.

Following "Prince Albert", several iron vessels were built in the north east over the next ten years, chiefly by Coutts at Walker, by Coutts & Parkinson at Willington Quay and by T.D. Marshall at Shields.3≠

* "Sixty Years of Merchant Shipbuilding on N.E. Coast"

** A letter from W.O.T. of Walker to the Courant of 25th July, 1863.

*** "Treatise on Iron Shipbuilding" by William Fairbairn, published London, 1865.

**** Ibid.

3≠ "The Making of the Tyne".

John Coutts, who came from Aberdeen and set up the first exclusively iron shipbuilding yard on the Tyne in 1840 could not find a sound economic base for his technical innovations. His firm was closed in 1848.* But Coutts had great faith in the future of iron ships and on 25th March 1849 he went into partnership with John Parkinson at Willington Quay.**

Three years later they built the biggest iron vessel in existence, "Thomas Hamlin" of 1,350 tons. The following year they launched the iron East Indiaman "W.S. Lindsay" in splendid style by giving dinner to 400 guests. This was not so much a sign of affluence, however, as a way of advertising iron ships and of promoting emigration to Australia.

In any case the success of the yard was short-lived. Parkinson retired in 1853 and after continuing for a couple of years on his own account, Coutts also gave up the struggle. Despite his apparent failure Coutts was an extraordinarily far-sighted pioneer. He not only built the Tyne's third iron ship, "Prince Albert", but also the "Q.E.D.". ***

The "Q.E.D." was a small sailing vessel of 271 tons built by Coutts in 1844. She was subsequently fitted with auxiliary engines made by Messrs. Hawthorn and was the first ship to be built with double bottoms in which to carry water ballast. The practice at the time was to use chalk or sand to act as ballast when empty cargo vessels were returning home after discharging, and the banks of the Tyne and other trading rivers were lined with heaps of the ballast. By having double bottoms, the "Q.E.D." could take in water to act as ballast.****

The development of iron shipbuilding was given a strong stimulus in the early 1850's when a partner in a Newcastle colliery company decided to build an iron screw collier, the first in the country. The vessel was called the "John Bowes", after one of the partners in the coal company and the innovation was made by Charles Mark Palmer, who was at the time just 30 years old. ≠

* "A History of Wallsend" by William Richardson, Published Newcastle 1923. P.299.

** Ibid. *** "The Making of the Tyne".

**** Ibid. ≠ Ibid.

The northern coalfield in Durham and Northumberland had enjoyed a monopoly of the London coal market since the 16th century because the coal seams were never far from the sea and therefore never far from cheap transport.

As Raymond Smith says in his book "Sea Coal for London" *:- "The metropolis during the middle ages looked to the northern coalfield for its supply, not because there were no sources other than the Tyne - coal was mined in Wales, on the Trent, in Durham and in Scotland - but because at Newcastle there were abundant outcropping seams of coal suitable for industry and domestic use, with access to navigable water and facilities for coastal shipping... In early days the charge for Newcastle coal in London was rarely less than three or four times the price on the Tyne - even so, transport by water was very much cheaper than it was by land.**

By 1800 there could be between 1,000 and 1,400 colliers and coastal vessels in the Thames at any one time -"an outward and visible sign of the importance and opulence of the trade". ***

The predominance of Newcastle was challenged first by other northern ports, such as Sunderland and Stockton and then half way through the 19th century by coalfields in the Midlands and Yorkshire which delivered their coal by means of the new railway.

Railways began to deliver coal to London in 1845. In that year they delivered 8,377 tons out of a total import of 3,472,000 tons. Railway shipments progressed very quickly and by 1867 they exceeded those by sea. In 1875 eight million tons was brought into London, five million by rail and three million by sea.****

Meanwhile, between 1835 - 1844 inclusive, an average of 2.5m. tons of coal a year was delivered to London by sea, of which 2.3m. came from the three northern ports of Newcastle, Sunderland and Stockton.***** The total coasting trade in coals to all ports as late as 1844 was 7.4m. tons, of which 4.3 m. tons came from the three northern ports.

*	Published in London 1961.
**	" " , pages 5-6.
***	Smith, op. cit. p. 142
****	See Scott, J.R. "Epitome of the Progress of Trade in Coal", 1869.
*****	Clerk & Registrar of London Coal Market in official statement, 4th Jan. 1845. See also Parliamentary Paper, 25th May 1845.

The cost of these shipments varied but an average figure was 5s.6d a ton or, taking the distance as 270 miles, a farthing a mile.

With the development of the railway system, the northern coalfield, with an annual output of over £6 m.,* by far the largest industry in the north east, was in danger of large-scale retraction.

Many of the Midlands' railway companies transported coal at 1d a ton mile or less** The Stockton & Darlington Railway Company charged 5/8ths of a penny per ton mile to transport coal from the Durham coalfield to the Tees***The railways were becoming extremely competitive in price with the sailing colliers. They were, from the outset, much quicker and more regular in their service, thus helping to reduce the fluctuations in the London market. A scheme was even proposed for a Newcastle and London Coal Railway with initial capital of £5 m.≠ The sponsors anticipated they could transport the coal for 4s. a ton. This seems an extremely optimistic figure, for even at 5/8ths of a penny per ton mile (one of the cheapest charges by any railway company at that time) the true cost would have been over 14s. a ton.*****

The embryonic company based its calculations on the London-Birmingham railway which charged £566 per mile per annum for coaching and carriage costs. But since the Newcastle company was not to carry passengers, it set its own costs (without any explanation) at only a third of this figure, i.e. £189 per mile per annum. +

Thus total annual expenditure under this heading was reduced from £152,820 to £50,940 making total annual costs for the 270-mile long railway system £397,350 instead of £499,230.

But if these were their total costs and if 4s. a ton was the target, it is clear they would be able to move less than two million tons a year. The prospectus clearly states that three million tons was the target, together with a ten per cent return on the £5 m. capital employed.

* See publisher's preface to "Industrial Resources of Tyne, Wear & Tees" edited by W.G. Armstrong, Newcastle 1863.

** See "Ships & Railways" an anonymous publication printed in London in 1846 - in Newcastle Central Library's Local Tracts D.72.

*** Ibid. ≠ Ibid. ***** Ibid. + Ibid.

Costs would increase more or less directly with the extra load, giving a cost figure of between £5m. and £6m. A ten per cent return would bring the total income requirement to over £1m. This would be the equivalent of 6s per ton per trip or 3/10ths of 1d per mile.

It would seem that the proponents of the scheme put too much faith in their belief that long distances would produce a marked reduction in costs. The prospectus said: "The carriage of heavy goods at extremely low rates will yield remunerative profits provided they be conveyed in large quantities at a moderate speed and for long distances." *

One must also doubt the seriousness of the project from the sponsors' statement that coal consumption in London was 4m. tons a year and rising. In fact, as we have seen, it was 2.5m. tons and falling.

In any case, railway transport from the north east could not compete with railway transport from the Midlands, Yorkshire or Wales. A better and cheaper form of sea transport was clearly essential. In 1852 this is what Charles Palmer instituted when his own shipbuilding company (formed at Jarrow in 1851 with his brother) launched the "John Bowes". The effect of this innovation in producing a steam powered iron collier can be seen in the following table:- **

PRIOR TO 1852

Average collier shipment to London	264 tons
Average no. of journeys/ship/year	7 - 8
Total annual shipment/vessel	2,112 tons
Cost of sailing ship	£1,000
No. of tons transported/£ investment in first year	2.1

"JOHN BOWES"

Average shipment to London	650 tons
Maximum No. of journeys/year	73
Total annual shipment possible	47,450 tons
Cost of ship	£10,000
No. of tons transported/£ invested in first year	4.7

* "Ships & Railways".

** Based on figures given in a lecture to British Association meeting in Newcastle in 1863 by C.M. Palmer.

The industry's cost curves were thus pulled down dramatically by the "John Bowes". They were pulled down even further by the "James Dixon", named after another partner in the Marley Hill Coal Company, in which Palmer was a partner.* The "James Dixon" could transport 1,200 tons of coal. It needed only 64 hours to complete a round trip to London of 540 miles and a further 14 hours for charging and discharging. Her maximum capacity therefore was 120 voyages a year with a total carrying capacity of 144,000 tons. Her cost is not known but considering she was twice the deadweight of the "John Bowes" let us make the generous assumption that her cost was double, i.e. £20,000. The theoretical numbers of tons that could be transported per £ invested in the first year would be 7.2.

Her greatest performance up to 1863 in fact was 57 voyages between Newcastle and London in one year carrying 62,842 tons of coal, equivalent to 30 sailing colliers each doing a customary 7-8 voyages a year. **

Thus Palmer's gamble in using steam power instead of sail and iron instead of wood was successful despite the much higher initial capital charge. "I was confident of the result and persisted in the development of the system", he said in later years.***His view is confirmed by the number of cargoes and the tons of coal imported into London by screw colliers:- ****

	Cargoes	Total Tonnage	Average Tonnage
1852	17	9,483	558
1856	413	238,597	577
1862	1,427	929,825	651

The great success of the "John Bowes" led one writer to observe: "No single event ever had a greater influence on the progress of the Tyne than the building of the "John Bowes"*****That still seems a fair comment today for the other two inventions that spring to mind - the development of the oil tanker and the creation of the turbine - may have had greater national and international significance but they did not affect the progress of the Tyne itself in the way that iron colliers did.

* See his lecture on iron shipbuilding to the British Association meeting in Newcastle in 1863.

** Ibid. *** Ibid. **** Ibid.

***** R.W. Johnson, op. cit.

John Bowes and partners saw their business at Marley Hill grow from a "very trifling" level to an annual million and a quarter tons within 25 years.* They also took over 14 other valuable colliers and transacted an enormous business as coal exporters. In fact they Tyne's coal trade as a whole never wavered throughout the century, expanding from 4 million tons in 1859 to 12 million on 1894.**

The "John Bowes" herself had an eventful career. In 1889 she was sold to a Norwegian firm which changed her name to "Spec". Eleven years later she was taken over by Swedish owners who changed her name to "Transit". In 1908 she was sold for £2,000 to a Spanish owner who rechristened her "Carolina" and in the next 25 years she changed ownership twice again, always with a change of name. With the changes came new work. She had a period as a general cargo ship and another laying cables from Dover to Ostend. Finally, 81 years after she had been launched, she sank in a storm off Bilbao in 1833, the same year as Palmer's shipyard itself collapsed.

The success of the "John Bowes" and the "James Dixon" gave an important filip to iron shipbuilding. In the next ten years Palmer Brothers themselves built 25 vessels of 12,210 gross tons.

By 1855 there were eight Tyne yards capable of building in iron.*** Seven years later 4,000 Tyneside men were working in iron shipbuilding.**** On the Wear, William Pile, the river's biggest shipbuilder, moved over from wood to iron very quickly, faster than any other builder on the river. ≠ In 1860 he was still working in wood. By 1863 he was employing 2,000 men in iron shipbuilding. The output of iron ships at the beginning of the 1860's was as below:++

	1862 (tons)	1863 (tons)
Tyne	32,175	51,236
Wear	15,608	25,000
Tees	9,660	15,060

* "The Making of the Tyne". ** Ibid.
*** "Industrial Resources of Tyne, Wear and Tees."
**** Ibid. ≠ "Where Ships Are Born".
++ Industrial Resources of Tyne, Wear & Tees.

As shown above, the screw collier first made its appearance in 1852. By 1853 there were 13 of them, by 1854, 36. *

Gradually they wrested back the supremacy for sea-borne trade. Throughout the century rail-borne tonnage continued to increase but because of the rising demand in London, the coastal trade was able to regain its dominance as the following table shows:-

COAL CARRIED TO LONDON
SOURCE: JONES, H.R. "THE GEOGRAPHY OF LONDON RIVER, 1931, p. 169-76)

	Railborne Tons	% total	Seaborne Tons	% Total	TOTAL **
1880	6,200,780	62.5	3,714,708	37.4	9,919,567
1898	6,954,206	48.6	7,337,062	51.3	14,305,076
1905	7,137,473	45.6	8,494,234	54.3	15,650,388

From then until the present day, with the exception of wartime, coastal transport has been much more important than the railways for the shipment of coal.

Palmer's contribution through his willingness to risk capital in the experiment of an iron screw collier was thus twofold: to give a decisive filip to iron shipbuilding at a time when its adoption was still regarded with scepticism; and to assure the future of the northern coalfields. We must remember than when the "John Bowes" was launched, there was nothing new in having an iron ship. Nor was there anything new in screw ships. "But screw-propelled iron vessels were a novelty and a luxury suitable only for passenger and mail services." ***

Unlike Armstrong, Palmer did not provide original ideas. He provided capital, a willingness to take risks and a profound ability to plan and to organise. His decision to set up his own yard to develop the potential of the screw collier is an example of all three of these qualities. So was his adoption of rolled armour plates for warships, as we shall see later in this chapter.

* Allen, E.E. "On the Comparative Cost of Transit by Steam & Sailing Colliers" (Inst. Civil Eng. Proc. Vol. 12, 1854-5, pp. 318-73)

** Includes canal-borne tonnage which was always less than 0.2% of total.

*** Ellen Wilkinson in "The Town That was Murdered", London 1939 P.60.

But nothing typifies his business sense more than his decision to form an integrated organisation, controlling every part of the process from the discovery of the iron ore to the delivery of the ship. He bought the mineral rights in an area north of Whitby where iron ore had been found and set up the Grinkle Park Mining Company.* He invested £30,000 in the development of a small harbour near the iron ore supplies.**In 1858 Palmer had four blast furnaces built at Jarrow and, once a regular ore supply was established, he had rolling mills added.***

He matched this vertical integration with attempts at horizontal combination. He played an important part in the establishment of the National Line, which developed a large trade between England and the United States.θ He helped to promote the Union Line and he became Chairman of the Tyne Shipping Company.≠ The orders from these companies naturally helped to keep his Jarrow yard busy. In 1861 he secured a contract from the Italian Government to construct and work a line of steamers to carry mails between Italy and Alexandria.+ A year later Palmer founded the Bede Metal Company to supply the copper needed in ship building.

In all this he was a typical Victorian man of enterprise, seeking new ways of making money, new ways of expanding his business, revelling in the details of organisation whether on the selling side or the production side. He was not a successful financier and as we shall see later he only avoided bankruptcy by resigning from his own company. But he enjoyed and mastered the problems of production and organisation.

NEW FIRMS EMERGE

Another yard, just across the river from Palmer, began operations in the same year as the Jarrow enterprise. This belonged to Mr. Charles Mitchell, who had been born in Aberdeen. From the start he went in for iron ship-building. In the following year, his example was followed by a fellow Scot, Andrew Leslie, who established a firm at Hebburn, next door to Palmer's works at Jarrow. The story of Andrew Leslie seems typical of those days and is therefore worth recalling in some detail.

* "The Town That Was Murdered". P.64.
** Ibid. *** Ibid. θ Ibid. ≠ Ibid. + Ibid.

Leslie was born in 1818 at Garth in the Shetland Islands, but was brought up in Aberdeen.* He began his apprenticeship as a boilermaker and blacksmith. The business seems to have been a small one.

But clearly Leslie had ambitions and he decided to seek his fortune on Tyneside as a shipbuilder. He travelled by paddle steamer from Leith and landed at Hebburn Quay. Hebburn was then an isolated village. The combined populations of Jarrow, Monkton, Hebburn and Heworth were only 3,800.

"Green fields with grazing cattle, a wooded dene, gave - apart from the adjacent pits and ballast hill - a very rural scene and it would appear from this distance of time a most unlikely spot to level off and arrange as a shipyard. However, he thought otherwise." **

With £198 capital Leslie obtained a lease from Mr. Cuthbert Ellison for nine acres of land and started to dig out a building berth.*** By 1854 he was ready to launch his first ship, "Clarendon". This was 200 ft. long with 29 ft. beam and 1,000 tons gross. She was rigged as a three-masted barquetine with auxiliary engines of 20 h.p. Altogether she was a remarkable achievement as the first vessel from a new yard. ****

But in the same year Leslie launched three other vessels, one of 1,200 gross tons and two of 230 tons. And in his first ten years he built 53 vessels with a gross tonnage of 22,240. θ

One of his difficulties in launching these early ships was the presence of a shoal in the middle of the Tyne opposite his berth. Vessels frequently became stranded in it. Despite the Tyne Improvement Act of 1850, it was the middle 1860's before anything was done to improve the river.

* "A History of R. & W. Hawthorn, Leslie & Co." by J. Bulman, formerly managing director of St. Peter's Works (private edition).

** Ibid. *** Ibid. **** Ibid. θ Ibid.

Another difficulty was the scarcity of local labour and he was forced to import skilled men from his home town, a movement that gave Hebburn the name of "Little Aberdeen".* With labourers coming in from Ireland at the same time, the result was often hooliganism and violence. When the men arrived, however, there was a shortage of accommodation. In 1856 Leslie had to have houses built for them.** Most consisted of only one room but they did have gas lighting supplied from the gas-producing plant in the shipyard. Altogether he housed about 300 people. From 1859 Andrew Leslie himself owned a house on the opposite bank of the river which gave him an uninterrupted view of his own yard. He was ferried across each morning and evening.***

Some of his early ships Leslie built as a speculative enterprise hoping to sell them before the launch. Usually he had little difficulty, for his firm quickly built up a good reputation. It was well regarded in Liverpool, for example, and achieved a close connection with shipowners there.θ Between 1861 and 1892 it built 41 ships for Lampart and Holt and from 1864 - 1930 31 ships for Alfred Holt & Co. Other Liverpool owners, such as A. Booth & Co., and J.D. Milburn & Co., also bought from the company.

He was a keen exporter too. Of the first 17 vessels built in his yard, 11 were for Russian owners. In all, the company was to build over 60 vessels for Russia, ten of them for the Volounteer Fleet. ≠

Not all yards were so lucky. The iron pioneer, John Coutts, soon joined the large band of shipbuilders who went out of business in the depression of the early 1840's - about 40 Sunderland builders also failed at this time. +

Coutts' yard was not used again until 1860, when it was taken over by 23 years-old John Wignam Richardson. == He was a man of "remarkably diverse talents and inclinations". He was widely travelled and was a gifted writer. He designed several houses and was a student of military science. He also had a penchant for Latin verses, examples of which, inscribed in stone, can still be seen in the Neptune works.

* "A History of R. & W. Hawthorn, Leslie."
** Ibid. *** Ibid. θ Ibid. ≠ Ibid.
\+ "Where Ships Are Born".
== "Launching Ways".

After studying at London and Tubingen universities he joined R. & W. Hawthorn as a marine-engine draughtsman in 1858. Two years later he set up on his own. He took on as manager another gifted young man, Charles John Denham Christie, who had been all round the world in a sailing ship by the time he was 18.

Things were difficult at first because of the cloud of recession hanging over the industry. But slowly the business was stabilised, thanks to Wigham Richardson's tireless quest for new orders.

Sunderland's first iron ship was launched in the same year as Andrew Leslie began operations, but there is some doubt about the exact date. One history says the first iron ship built on the river was the 77-ton "Loftus", built by George Clark and launched on 27th February 1852.* "One wonders", the authors wrote, "why George Clark, an engineer, was connected with the building of a ship and why this launch .... was the only one with which he was associated." The Sunderland Herald** agrees that "Loftus" was the first iron ship built on the Wear but gives the weight as 120 tons and 23rd February as the launch date.

Two other sources*** say the "Amity" was the first iron ship and that she was launched in February 1852. Whichever was the real pioneer, wood and sail continued to play an important part in Sunderland shipbuilding. Wood did not finally die out until 1880 and sail until 1893.

The same, of course, was true on the Tees. Iron shipbuilding began there shortly after it was taken up on the Wear. The first iron ship was the "Advance", built by the Stockton Iron Shipbuilding Company at South Shore and launched on 26th January 1854.**** The company's business did not prove very successful and passed into the hands of Richardson, Duck & Company who launched from their yard in ten years no fewer than 50 screw steamers, a paddle steamer, 10 sailing ships and 29 barges, a total of 55,493 gross tons and 7,045 h.p.

* "Where Ships are Born" by J.W. Smith & T.S. Holden. R36.

** Edition of 27th February 1852, p. 5, col. 3.

*** Sunderland Year Book 1908, p. 51, and "Concerning Ships" published by Sir James Laing & Sons.

**** "Local Records of Stockton and Its Neighbours" by Thomas Richmond.

The first iron ship launched at Middlesbrough was the "De Brus".* It was built by Rake, Kimber & Co., and launched on 1st March 1858. It was fitted with a 40 h.p. engine made by R. & W. Hawthorn, but this was only as an auxiliary for she was properly rigged as a schooner. The "De Brus" was 146 ft. long, 20 ft. in the beam and was designed to carry 350 tons of cargo. **

Rake, Kimber & Co., who had laid out a site on waste ground where the Transporter Bridge now stands, had been established almost two years by this time.***Their first two vessels had been built under sub-contract to Richardson, Duck & Company. These in fact had been iron ships but they were not launched into the Tees. ≠ They were shallow draught iron paddle steamers of about 150 tons each, intended for use on the river Volga. The ships were built in sections and shipped to Russia for final assembly. In May 1858 a fourth ship was launched from the yard but after fitting out and trials there were no more orders, the workers were paid off and the yard closed. θ The slump did not last long, but Rake, Kimber and Company were unable to weather it. A year later, Richardson, Duck took over the yard. They brought in as manager a young man from Newcastle, Raylton Dixon, who eventually formed his own company.

Richardson, Duck were rapidly establishing a reputation as the major shipbuilders on the Tees, but no firm at this time could match the meteoric rise of Palmer's since the highly-successful experiment with the "John Bowes".

"To the success of this experiment", Palmer himself declared, "may be attributable in great measure, the present important development of iron shipbuilding in this district and the fact that we continue to supply so largely the London market with coals." +

He estimated that the total tonnage of iron ships launched from the Tyne, Wear and Tees in 1862 was over 57,000 tons and that more than 8,000 men were employed in iron shipbuilding, exclusive of engine building.==About 38,000 tons of iron was used in that year.

* "Middlesbrough's First Iron Ship" by Peter Barton (Evening Gazette, 6th March 1958)

** Ibid. *** Ibid. ≠ Ibid. θ Ibid.

\+ "Industrial Resources of Tyne, Wear & Tees."

== Ibid.

His own firm obtained the greater part of its ironstone from its own mines at Port Mulgrave, 10 miles north of Whitby, a harbour development that had cost his company £30,000. *

By the early 1860's his firm was employing 3,500 men, consuming 18,000 tons of iron and launching more than 22,000 tons of shipping a year. The current joke was that Palmer's built colliers by the mile and cut them off into the required lengths. **

And even later, another commentator wrote: *** "One cannot reflect on the state of English shipbuilding without perceiving that some great alteration is necessary in order to place it in a proper position. The price of new ships is too much reduced to allow room for profit, when labour and timber are so expensive as in this country; and I believe it is generally acknowledged that our shipbuilders mainly depend for subsistence on repairs alone.... Where can we see any prospect of improvement while timber alone is employed ?

".... But let iron become the material with which our ships are henceforth to be built and the whole question assumes a widely different and highly cheering prospect. Without being in any degree dependent on foreign countries, we should find an inexhaustible supply of more suitable and less perishable materials for the whole of our national and mercantile marine in our own country..... All nations yield the palm to England in the production and working of iron and it will be long before we can be deprived of our superiority in this respect."

The Navy was no quicker to take up the new material. The Admiralty had begun to experiment with iron vessels in 1838. Targets were prepared at Woolwich for experiments with a 32-pound smooth bore gun at a range of 30 yards. But, according to Fairbairn; "The result was condemnatory of the use of iron and the Admiralty then fell back on the old wooden walls." θ

* "The Town That Was Murdered" by Ellen Wilkinson, 1939.p.64.
** Ibid. p.63.
*** "Iron Shipbuilding" by John Grantham, London 1868.
θ "Treatise on Iron Shipbuilding".

No progress at all was made until 1855, when, during the Crimean War, the French Emperor ordered thick iron plates for casing the sides of vessels.* The success of the ironclads forced the Admiralty to think of a reply and in order to secure the contract Charles Palmer promised delivery in three months.** He not only kept his promise but incorporated a new technique, rolled iron. The idea was put to him by the manager of the Parkgate Ironworks at Rotherham and its success led to the creation of the British armour plate industry. ***

The "Terror", produced by Palmers, was the first iron ship built for war purposes in the north east. She had a displacement of 2,000 tons, mounted sixteen 300-lb. guns and was propelled by engines of 200 h.p. The hull was built of iron in the ordinary way but the sides sloped to 25 degrees and were protected from shot by iron armour plates four inches thick and backed by six inches of teak, all of which was bolted to the main structure. The war was over, however, before the "Terror" was ready.

This meant that Palmer's enterprise in using rolled plates could not be tested in action. The Admiralty therefore were prepared to give him only half the credit to which he thought he was due, for while complimenting him on the speed of delivery, their Lordships refused to accept the validity of his rolled plates' experiments. He had to pay for most of the research and development work out of his own pocket to prove his theory. "The commercial men of this country have set the Admiralty a signal example of industry and enterprise," he said.**** It was 1862 before his company built naval vessels again but from then on they formed an important part of the business.

The effect of Palmer's success on the town of Jarrow was dramatic. In 1851 the population was 3,500. Ten years later it had doubled. From 1851-8 houses were quickly run up to add to the colliery rows. By 1860 there were 1,005 occupied tenemented houses in Jarrow; in 1850 there had been 300. θ

In 1858 the launch of the Atlantic steamer "Hudson" was reported in these words by a Newcastle Chronicle reporter: "There is a prevailing blackness about the neighbourhood. The houses are black, the ships are black, the sky is black and if you go there for an hour or two, reader, you will be black."

* "The Town That Was Murdered" ** Ibid. *** Ibid. p.63.
**** Palmer's paper to the British Association, 1863, "Resources of the Tyne, Wear and Tees."
θ "The Town That Was Murdered". p.72.

Some saw this as a heroic story. "And so the formerly almost deserted village rapidly assumed an importance and interest in the commercial world equal to what it had long enjoyed in the ecclesiastical. Henceforth, when men think of Jarrow-upon-Tyne, the achievements of Mr. Palmer, as well as the writings of the Venerable Bede, will rise up before their minds. A new spirit was infused into the place by the Palmer Brothers. By a wave of their magic wand they effected transformations, one after another, the marvellous character of which was sometimes so great as almost to make one question their reality. Workmen hastened to the place in hundreds; tradesmen followed in large numbers; prosperity abounded on every hand; and, ere many years had come and gone, the previously unimportant hamlet became such a noted town for shipbuilding that commissions poured in from all parts of the world. The sound of the forge, the whiz of machinery, the whistle of steam engines, and the ceaseless strokes of the riveters' hammers, fell like a new voice upon the ear of Tyneside and proclaimed that one of her greatest sons had brought her fresh glory, power and good." *

Not everyone saw Palmer in such fulsome terms. "The first twenty years of Palmer's shipyard were the peak years of almost unhampered exploitation of the workers of Britain by their employers... Hours were long and wages terribly low. The grim pictures drawn from Government reports by Marx and Engels of the England of this period show a whole working class exploited to the limit, its strength sucked by long hours and by wages which kept most workers at a level of deadly malnutrition... Enormous profits were made. In the steel and shipbuilding trades... dividends of 50 per cent were boasted of on Tyneside.... But from a health point of view things got steadily worse in the town for the workers these profits came from." **

Whether one believes Palmer was on the side of the angels or the devils, his influence in the development of the north east was tremendous. It stretched far beyond his own company or Jarrow. For the development of the steam-powered collier led quickly to the tramp ship, the all-purpose, go-anywhere cargo vessel that became the backbone of the north east output.

* "Tyneside Celebrities" by Wm. Lawson, published Newcastle 1873.

** "The Town That Was Murdered", p.81.

It is easy, too, the look back on those days with the enlightened, sophisticated attitude of a later generation but ceaseless energy, constant growth and a greedy search for profits were essential to get the new firm off the ground. One cannot win economic battles, any more than one can win military ones, with an altruistic spirit.

When seen in the context of the times, Palmer was fulfilling the normal Victorian conventions. It was his very success that made his enemies pick him out. Yet his motives were not entirely selfish. He built houses for his workers, he built a hospital and other amenities. The fact that he expected his men to work long hours for as little reward as he could get away with was not unusual. In this sense he was a typical Victorian entrepreneur - although far more successful than most.

Just as iron was slow to supplant wood, so steam overtook sail only over a period of years. The sixties and early seventies were the golden days of the lean, fast tea clippers. * They could cross the Atlantic in 12-14 days and reach China in three months. As late as 1860 there were 6,876 sailing ships in the United Kingdom, compared with 447 steamers, most of which were under 2,000 tons. And in 1858 only seven of the Tyne's 44 shipbuilders were listed as capable of building iron ships (See [illegible]).

The competition between iron and wood and between sail and steam helped business, however. Owners might argue about what sort of ship they wanted but they continued to place orders and in growing numbers. The growth of international trade and the Free Trade legislation were the main reasons. It was just at this time of rapid development that the Americans cut themselves off from the rest of the world. The economic crisis of 1857, followed by the Civil War, led the Americans to sell much of their fleet and to look inward, upon their own continent. ** They thus missed the full flood of technical developments that swept the British shipbuilders on to world domination.

* "Cambridge Economic History of Europe", Vol. VI, published 1965.

** Ibid.

GROWTH OF SUNDERLAND

Sunderland was growing remarkably fast. An historian of the time wrote: "From the entrance of the harbour up to Hylton Ferry, the banks of the Wear, on both sides, are crowded with shipbuilding yards and docks, presenting, in a most striking point of view, an exemplification of the enterprise and industry which have so effectively conduced to the prosperity of the port. Scarcely an opening on the shore of the river, or a nook or crevice in the limestone rocks which overhang it, can be found in which a ship of large or small dimensions is not in course of erection. Sunderland is emphatically the first shipbuilding port in the world." *

There were 72 shipbuilding yards on the river at this time. Some of the old names remain to us. ** Messrs. Potts had a yard near to French's wharf. Further west on the sameside of the river were Messrs. Hutchinson, and at the head of Low Street, Messrs. Adamson built large vessels of the heavy, old-fashioned East Indiamen type. On the other side of the river, William Pile's yard was famous for clippers.

Like so many others, Pile's business depended heavily on the personality and drive of the owner. When Pile died, his yard died too. William Pile, who was the most famous Wearside shipbuilder of his day, was born in 1823. He received little formal education but walked the banks of the river night after night watching ships being built. *** In 1848 he took over the family yard at North Sands, Monkwearmouth, and in 1853 became sole owner when his brother John went to Hartlepool. Ten years later he purchased the Bridge Graving Dock to make one of the finest dry docks on the river. By this time he was the biggest builder on the Wear, with 8 building berths and a labour force of 2,000.

Pile built over 100 ships in wood and the same number in iron. He built for Dicky Green's famous Blackwall fleet of crack ships. In 1851 he launched the "Chowringhee" which was the first Sunderland vessel to have a length more than five times its breadth. Her length was 170 ft., and her breadth 31 ft.

* "A History of Durham" by Wm. Fordyce, Vol. II, published 1857.

** An anonymous undated note on shipbuilding in the Wear found in 1863. B.A. Papers (Newcastle Library, No. L.338).

*** "Where Ships Are Born".

William Pile died in 1873 at the age of 50. Although a wonderful ship designer, he was no businessman. He had built up no reserves so that his stock had to be sold to meet his creditors. The yard closed. One writer wrote of him:

"He had contributed in a great measure towards the establishment of Sunderland as the largest shipbuilding town in the world and one can only imagine the heights he would have reached had he been given another 20 years in ship designing." *

Not far away from Pile's yard, Messrs. Hall had their yard and dock. Higher up the river were several smaller builders. Mr. Cairncross on the Raven's Wheel, Mr. Rowntree, a familiar figure in his short blue jacket and glazed hat, and Mr. Fraser.

Other well-known builders of the time included Philip Laing, of whom one writer said: "It was an experience to see the awakening effect of the old gentleman's presence as he was seen by his workmen on the scaffolding, making his way through the little wicket and past the timber which then occupied a large space in shipyards." ** There was also John Watson who was "intolerant of drunkenness and hard swearing" and John Hutchinson. In 1851 Sunderland had a population of 63,897, of whom 30,377 were males.*** Of these, 99 were anchorsmiths, 479 were blacksmiths, 82 were boat-builders, 784 were joiners, 235 were painters, 216 were ropemakers, 118 were sailcloth makers, 248 were otherwise engaged in fitting ships and over 2,000 were shipwrights. There were also 146 shipowners. Twelve years later another estimate said there were 3,000 shipwrights on the Wear.

In 1843 Philip Laing, who had set up as a shipbuilder 50 years earlier, handed over the business to his only son James, then 20 years old. θ James' first ship was the "Agincourt" built for Duncan Dunbar, for whom he built a ship every year for the next 12 years. The "La Hogue" that he built for Dunbar in 1855 was the biggest vessel built in the North of England up to that time. Two years earlier he had built the yard's first iron ship "Amity", probably the first iron ship built on the river.

* "Where Ships Are Born". p.20. ** Ibid. pp.11-12.

*** "A History of Durham".

θ "Where Ships Are Born".

At about the same time, in 1854, George Bartram dissolved his 16-years long partnership with John Lister and instead continued the firm with the help of his son Robert.* Three years earlier Pickersgill and Miller dissolved their partnership and William Pickersgill junior joined his father to continue in business on their own account.

In 1846 Robert Thompson finally succeeded in getting a shipbuilding business going. He had twice tried unsuccessfully. But in 1846 he and his three sons started again. There was no formal agreement between them except that Robert should receive 30s. a week, Robert junior 27s., and Joseph and John 24s. each. **

The first vessel, the brig "Pearl", built in 11 weeks, with the aid of four employees, showed a profit of £300. Soon the yard was employing 60 men and boys. In 1847 the firm built seven ships. Robert senior died in 1860 and Joseph and John took over since Robert junior had already left the firm. A year later John left, leaving Joseph in full control. ***

Another important firm, Simpson and Short, started about the same time as Thompson's. The founders were George Short, who had been a foreman shipwright with John Watson of Pallion from 1840, and Joseph Simpson, another shipwright. ****

On 4th January 1850 they delivered their first ship "Isabella and Dorothy" built for Edward Oliver of North Shields. She was a schooner of about 300 tons.

The partnership did not last long and George Short moved to Claxheugh where he laid down two ships in his first year, the barques "Defiance" and "Kate". This new yard was called Mowbray Quay. George Short died in 1863 at the age of 49. His second son John Young Short joined the firm in 1865 at the age of 21 and eventually became its guiding hand.

Further south, on the Tees, there was nothing like the same eruption of activity. In fact one estimate lists only four builders in 1864, the same number as in the 1790's., although different firms. ⊖ The firms were: M. Pearce & Co., and Richardson, Duck & Co., both of Stockton, and Backhouse & Dixon, and Candlish, Fox & Co., both of Middlesbrough.

* "Where Ships Are Born". ** Ibid. *** Ibid. **** Ibid. p27-29.

⊖ "The River Tees", the Tees Conservancy Commission's handbook 1953-4.

Marine engineering was also fairly weak on the Tees and probably strongest at Newcastle, following the initiative of the Hawthorn brothers. Their business had expanded enormously since 1831 when they had started to build locomotives. In the following year they had won the order for seven out of twelve locomotives contracted by the Darlington & Stockton Railway.* These engines cost £550 each, were rated at 8 h.p., and weighed just over four tons.

Between 1835 and 1845 the firms of Stephenson and Hawthorn supplied almost all the locomotives then being built in this country. Hawthorns increased their labour force from 180 to 820. **

MARINE ENGINEERING

In 1840 the first ocean-going vessel with an auxiliary screw propeller, the three-masted topsail schooner, "Archimedes", entered the Tyne for the first time.*** She attracted much attention and it was not long before Tyneside shipbuilders wanted to copy her. John Coutts again was the first, just as he was the first to copy the "John Garrow". He built the "Q.E.D." in 1844. She was an iron sailing ship of 271 tons and 120 ft. long. Her auxiliary engines and screw propeller were made by Hawthorns.

It was the launching of the "John Bowes", however, in 1852 that provided the biggest stimulus for local marine engineers. Hawthorns decided to make marine work a more prominent part of their business.ϴ Between 1852 and 1870 they made 185 "pairs" of marine engines, mostly for screw colliers, 51 of them for Palmers. The aggregate h.p. was 17,000. ≠

The maximum boiler pressure at this time was about 15 lbs. per sq. inch. Horse power seldom exceeded 70. During the early 1850's geared engines were superseded by the direct engine with horizontal cylinders driving the shaft direct. Then in the middle 1850's the inverted engine came into vogue and soon ousted all other types. Jet condensing was the usual practice until about 1870 but Hawthorns used surface condensing as early as 1859.

In 1860 Hawthorns began to build up their close connection with Andrew Leslie and Co., at Hebburn. The two firms were to amalgamate eventually. Between 1860 and 1870 the marine engineers supplied 31 sets of machinery for vessels built in the Hebburn yard.

* "A History of R. & W. Hawthorn, Leslie."
** Ibid. *** Ibid. ϴ Ibid. ≠ Ibid.

By 1863 Hawthorns employed 984 men.* Their main work was millwork and general machinery, waterworks, mill, colliery, marine and locomotive engines and boilers. By this year they had completed 797 locos, 121 mining engines, 9 pairs and 2 single water works engines, 171 general engines, 80 pairs and 20 single marine engines and innumerable boilers. The aggregate h.p. of these engines, excluding locos, was 15,000.

Stephenson was then employing 1,500 men and had completed 1,510 locos, 115 marine engines, 1206 marine boilers, 263 stationary engines and 38 wrought iron bridges. The total h.p., again excluding locos, was 35,000. **

Marine engineering started on the Wear with George Clark of Southwick, now part of Richardsons Westgarth.*** George Clark began in business in 1848 as a general engineer but with the coming of steam and iron, he turned to marine engineering. In 1854 he built the first marine engine tried out on the Wear, which was fitted into the steamer "Alfred" built by Laings. ****

LABOUR RELATIONS

From the earliest days, the unions were well represented in shipbuilding, certainly as far as the skilled crafts were concerned. One observer of the local scene wrote in 1851: "The Tyne shipwrights are pretty well known as close unionists." *****As early as 1824 there is a record of 400 shipwrights from South Shields going on strike for 17 weeks over a dispute about the number of apprentices to be allowed to enter the industry. And in 1851 over 1,000 shipwrights on the Tyne struck when their employers refused to accept the seven-year apprenticeship period laid down by the men as the minimum period in which they felt the youngsters could gain sufficient skill. In the end the employers agreed.

* "History of R. & W. Hawthorn, Leslie." ** Ibid.

*** "Where Ships are Born".

**** Up to 1862 the N.E.'s top seven marine engineering firms had built a total of 286 pairs of marine engines and 293 single engines.

***** Sunderland Herald, 7th February 1851.

These two strikes were not perverse examples of obduracy on the part of the men. They illustrated the pride felt by the men in their craft. For the men themselves trained the apprentices and they felt that if too many youngsters were allowed to enter or if the training period was reduced, they would not be able to give them sufficient instruction. An employer himself testified to the men's high sense of craftsmanship in those days:

"They took the same pride and pleasure in their day's work as many shipyard workers of the present day do in football and racing." * But even in those early days, strong differences of opinion began to emerge.

In October 1851 shipwrights in the region went on strike to limit "boring" work to their own members. ** Employers had refused to meet this request, arguing that the men's attitude was unreasonable and presumptuous. It was for employers to decide whether they would employ more men to carry out the tasks under dispute although they agreed that preference would be given to older hands. The strike lasted 21 weeks and the employers were successful. ***

The early 1850's saw a rising demand. Output on the Wear was up by 5,000 g.r. tons in 1852 and by 12,000 in 1853. Wages rose too.

In February 1853 the shipwrights in Sunderland who were then earnings 4s. a day made a claim for a 25% increase.**** A settlement was achieved at 4s. 6d. The week before shipwrights on the Tees had received a similar increase. *****

These basic rates were soon subject to wages drift. Within months all shipbuilders had to follow the lead of a minority in offering 5s. a day as demand for ships and therefore for labour continued to rise.

* Dr. G.B. Hunter in a paper to N.E. Coast Institution of Engineers.

**** Newcastle Courant, 18th February 1853.

***** Sunderland Herald, 25th February 1853.

** "Labour Relations in Engineering & Shipbuilding on N.E. Coast in Second Half of 19th Century" by J.F. Clarke (M.A. Thesis, Newcastle University 1966). p.93-98.

*** Ibid.

In January 1853, shipbuilders and shipwrights on the Wear met at the Lyceum ballroom, Bishopwearmouth "to consider whether a better understanding between masters and men could not be established."* This meeting, chaired by James Laing, resulted in one of the first industrial consultative boards in the country. A joint committee was set up to which would be referred "any question of dispute, either between an individual master and his men or the whole body of builders and shipwrights... with a view to their amicable settlement."

On the 11th and 18th February 1853, the committee met to decide the machinery.** When a dispute arose, a court of enquiry would be formed consisting of nine members from each side. Each shipyard was to elect a delegate. Then a meeting of all the delegates would elect 14 representatives, nine of whom would sit on the court with five as deputies. If the court failed to agree, then the question would be referred to an independent chairman for final arbitration.

The Court's first task was to consider a request by shipwrights for uniform conditions along the river regarding caulking.θ Within a short time it successfully dealt with two other technical matters and it began to look as if it would serve a most useful function.

However, from the inception, it had been accepted that wage problems - the most difficult problems - were to be outside its sphere of influence. This ruling greatly blunted its effectiveness and within two years the Court fell into inactivity.≁

The Crimean War, with its demand for ships, produced a boom. On the Wear, output rose from 44,000 g.r. tons in 1849 to 68,479 g.r. tons by 1853. It stayed well above 60,000 tons until 1857. Consequently by February 1854 shipwrights' wages reached 6s. a day - an increase of 20% or of 50% within the previous 13 months. But in some yards, wages drifted up to 8s., 12s., or even £1 a day, so urgent was the demand. +

* Sunderland Herald, 4th February 1853.

** J.F. Clarke's thesis. p.101. θ Ibid. ≁ Ibid. + Ibid.

Within six months demand had eased. In October 1854 Wearside employers posted a notice indicating that shipwrights' wages would come down to 5s. a day.* The men requested use of the joint consultative machinery. The employers refused, pointing out, correctly, that wages were outside its sphere of competence. The wage reduction was not commonly applied. Six yards continued to pay 6s. a day. But elsewhere 800 men went on strike.** Again the men asked for conciliation. Again the employers refused. Mr. Knott, vice chairman of the Arbitration Board, felt the machinery had reached the end of its useful life. He wrote to the shipwrights: "The Arbitration Court may be considered at an end from the discourtesy we met with last night..." (from the employers).

Wage reduction notices were also posted on the Tyne and there was a strike of shipwrights there. By mid-December there were indications that demand was beginning to rise again. Employers were forced to accept 6s. a day, the notices were taken down and the strike was over.***

Throughout 1855 demand remained buoyant and by 1856 the 300 shipwrights on the Wear who were employed in building gunboats were able to raise their wages to 8s. a day. But the end of the Crimean War, with the sudden curtailment of naval building, saw a slump. Over the country as a whole, wooden shipbuilding dropped from 215,000 tons in 1855 to 178,000 in 1856 and iron shipbuilding dropped from 108,200 tons to 66,400 tons.● On the Wear, demand held up for a few more months so that the 1856 figure was 63,049 tons, the third highest in the river's history. It dropped sharply over each of the next three years.

Again, the Wear employers posted notices of a 1s. a day reduction in shipwrights' wages, although seven yards continued to pay 6s a day.≠ Again shipwrights in other yards resisted the reduction. By mid-1857, the drop in demand was making a firm impact. About 1,000 shipyard workers were unemployed in Sunderland. In these circumstances the men had to agree to a reduction to 5s. a day. Similar settlements were reached on the Tyne and Blyth but only after strikes involving 3,000 men.+

* J.F. Clarke's thesis. ** Ibid. *** Ibid.

● Abstract of Historical Statistics, p. 223.

≠ J.F. Clarke. p.105-106. + Ibid.

The year 1858 was "judged by shipsellers as the worst in memory."* Palmer's shipyard, which had employed up to 900 at peak times was employing only 600. On the Tyne it was estimated that only a third of the shipyard men were in regular employment.**

A remarkable piece of self-correction in supply and demand then took place. During 1859 600 shipwrights left Sunderland for the Government dockyards in the south.*** Another 400 left from other north east ports. This immediately corrected the balance of labour and within a short time the men were asking for another 1s. a day.

The decade ended on a very low note, with Sunderland launching only 37,000 tons, its lowest figure since 1844 but within a couple of years demand was to pick up more strongly than ever.

Despite the slump at the very end of the fifties shipbuilding was assuming an increasingly important role in the economy of the north east. The Census figures for 1861 showed that 9,400 were employed in shipbuilding. Charles Palmer estimated that 8,000 of them were iron shipbuilders. The total does not represent the full significance of the industry, however. We have to add those engaged in ancillary trades and in marine engineering. Historically, these two other activities have each employed as many people as shipbuilding itself. With regard to ancillary trades, these would not all be concentrated in the region as all the shipbuilding or marine engineering workers would be. There would be some "leakage", as it were, from the regional economy.

Nevertheless, we can in approximate terms, treble the shipbuilding figures to find the full employment effect, giving 28,200. With regard to wages and the financial impact on the area, this is even more difficult to compute since, as we have seen, wages fluctuated sometimes from month to month and of course there were also differentials between different trades.

If we take the average wage as ranging from four to five shillings a day then shipbuilding pumped into the regional economy between £5,640 and £7,050 a day in wages. If we then assume a six-day working week, a fortnight's annual holiday and various bank holidays, this gives an annual figure of between £1,692,000 and £2,115,000.

* * Newcastle Courant, 18th March 1858.

** J.R.T. Hughes, "Fluctuations in Trade & Industry (1850-1960)", 1960.

*** J.F. Clarke.

Since the estimated value of the output of the industry in the region in 1863 was £2,270,000, wages were thus by far the greatest cost factor and through the years they have remained so for this is essentially a labour-intensive industry.

RIVER IMPROVEMENTS

One great difficulty faced by all builders was the state of the rivers. For example, the Tees was largely in the state nature had created. It was 1838 before the Tees Navigation Company was established and 1852 before the Tees Conservancy Commission.* Within a few years the latter had constructed a breakwater, provided a deep water entrance, and dredged and deepened the waterway from the bar to Stockton Bridge to allow ships of the biggest class to use the river at almost any state of the tide.

The same was true of the Tyne. Even as late as the 1840's it was possible to ford the river below Newcastle. Small schooners and brigs often lay aground at the quay and women could gather coal in the bed of the river. In winter, the ice was often so hard that an ox could be roasted in mid-stream.**

According to Mr. James Guthrie in his "The Tyne and its Resources", the largest vessels using the river at this period did not exceed 400 tons register. Vessels of moderate size and draught were sometimes detained for weeks after loading. He records that a hundred-ton schooner lay aground in the channel "where certainly vessels of such classes ought at all times to be able to move."

Captain Washington, who conducted an Admiralty enquiry into the Tyne Conservancy Bill of 1849 recorded that the average depth on the bar in 1849 was the same as in 1813 - about six feet.

The steamers of the Tyne Steam Shipping Company - of 400 tons - 500 tons burden - and drawing 14-15 ft. of water had to complete their loading at North Shields although Newcastle was their depot.

Ferry passengers from Shields-Newcastle were often required to help "pole her off".

* "Fragments of the Early History of the Tees" by W. Fellows, published 1878.

** "The Making of the Tyne" by R.W. Johnson.

"A trip down the river was an enterprise full of eventualities in the forties and fifties, not to be hazarded by persons of weak nerves or temperament and least of all by those who had been so thoughtless as to come on board without provisions, for to descend to a sporting phrase, it was a five to one chance that they were not the victims of hunger before they reached their destination.*

"There were no piers at Shields - gales would blow tides up onto the beaches. Thirty stranded hulls were counted after one bad storm.

"The Tyne was a notoriously dangerous port to which the prudent seaman always gave a wide berth in bad weather or if he had the temerity to essay an entrance he was often glad to save his ship by running her high and dry on the south sands."

There were no docks and few quays. Although some loading was done from staiths, most of it was done via the keelboats - shallow of draught, which brought their cargo from higher up the river - linked by tramrail with their respective colliers.

When loaded the vessels would wait for high tide and a favourable wind- for small vessels the wait could be anything up to a few weeks; for large vessels it might be months.

Yet this was the second port in the kingdom. It had a greater shipping trade than Glasgow and outrivalled even Liverpool in the number of ships entering and clearing, though not in tonnage.

In 1846 Tyne ports had on register 1,477 ships of 302,351 tons, valued at £3,023,510 and shipped 3,265,334 tons of coal.**

The chemical industry and the manufacture of glass were in their heyday of prosperity. Most of the large alkali works such as those at Jarrow, Friar's Goose and Gateshead were flourishing. The name of Allhusen was known internationally. By the end of the century foreign competition was killing the chemical industry and had killed glass manufacture, e.g. Tyne Plate Glass works.

* R.W. Johnson, op. cit. p. 13.

** Ibid, p.21.

The iron trade had its triumphs in the great works of Losh, Wilson and Bell & Walker and the famous works of Hawks, Crawshay & Co., and John Abbott & Co., of Gateshead.

"The Tyne was not wholly given up to the mammon of industrialism. The smoke fiend had not spread his eternal pall over the land. Much of the natural beauty of meadow and strand still remained... The river waters at Hebburn washed a silvery strand where children played. Hebburn Hall was hidden in foliage. Byker and Sheriff Hills glanced green in the sunlight and Pandon Dene was still a sylvan retreat for strolling lovers.... Such was the Tyne of our fathers."*

By 1895 it was possible to cross the Bar in a 5,000-ton ship and one could navigate with ease up to Dunston. There were two piers at the mouth of the Tyne, one of 3,059 ft., the other 5,317 ft.

There were no dangerous shoals. For a mile and a half one could sail in 30 ft. of water, even at low tides. But improvement was bought at a price.

"Everywhere, from the dancing waters of the harbour to the ebb and flow of the throbbing city, industry, resource and expansion, coal staiths, shipyards, engine shops, dry docks, chemical works, forges, electric lighting laboratories, warehouses, merchants' offices, steamships, railway trains, without end, without number - from Shields to Scotswood, there is not its like in 13 miles of river the world over... Smoke-ridden, grimy, noisy as it all is, what is it but the free expression of 19th century energy, the epitome of modern industrialism, the thumb-mark of toil, by which the human race is destined to work out its salvation ?" **

This particular salvation was worked out by the Tyne ImprovementAct of 1850, although it was well into the sixties before any real improvements were discernible. The river improvements were essential to keep up with the changes in industry.

* "The Making of the Tyne", p.26.

** Ibid, p. 43.

As a Newcastle historian has written: "All these interconnected developments, the invention of the steamship and the railway, the tapping of deeper coal seams, the discovery of Cleveland iron, the building of docks on the Durham coast, the establishment of an effective commission for improving the Tyne, and the almost simultaneous foundation of Armstrong's and Palmer's, set the stage for the swiftest and most remarkable period of industrial expansion in the whole history of the northern coalfield."*

The Rt. Hon. William Gladstone added his own tribute when he visited the city as Chancellor of the Exchequer in 1862. He said: "I know not where to seek, even in this busy country, a spot or district in which we perceive so extraordinary and multifarious a combination of the various great branches of mining,manufacturing, trading and shipbuilding industry, and I greatly doubt whether the like can be shown, not only within the limits of this land, but upon the whole surface of the globe." **

* "Newcastle upon Tyne, its Growth And Achievement".
** Newcastle Courant.

CHAPTER 3

1860 - 1890

YEARS OF POWER

If the period 1840-1860 saw the most dramatic changes, the next thirty years were the years of consolidation and achievement. By the late 1880's and early 1890's the U.K. was responsible for more than 80% of world shipbuilding and the North East itself for more than 40%. Rarely, if ever, has a basic industry secured such a world-wide domination. Even a Government enquiry, which is not usually given to hyperbole, had to admit: "There were few important industries where the predominance of British manufacture has been more marked than in shipbuilding and marine engineering." *

And this dramatic success was reflected in the rapid rise of population in the North East. Between 1861-71 there was a natural increase in the area of 175,000 persons and a net increase in migration of 75,000.** This was a jump of population in the decade of well over a quarter compared with a figure of 13% for England and Wales.

In the following decade, the area's population had a natural increase of 250,000 and a net migration inwards of 34,000, making an increase of 24%.*** And between 1881-91 there was another increase of 16%. By 1881 Census figures show there were 10,263 shipwrights in County Durham. Ten years later the figure had gone up to 18,970, while in Northumberland the comparable increase was from 4,170 to 6,761.

In the 30 years, the area's annual output of ships went up from about 90,000 gross tons to over 500,000.**** And many of the ships were first-class ocean passenger steamers or mighty men of war built not only for the British Admiralty but for every navy of consequence throughout the world.

* Report of the Departmental Committee on Shipping and Shipbuilding, Board of Trade, 1918.

** J.W. House, "Population Movement in N.E." *** Ibid.

**** Total U.K. tonnage 903,697, of which N.E. Coast was responsible for 506,907, the Clyde 280,037, Rest of England 116,753.

"No mere verbal description of these vessels will convey to the mind the science, art and skill which they embody; they must be seen and fully inspected to be appreciated," said John Rowe. *

Although the general trend of output was strongly upwards, there were the usual fluctuations however. The 1860's had begun badly but then two or three years into the decade business started to boom. Output on the Wear rose from 40,000 tons in 1860 to 70,000 in 1863, of which 25,000 tons was in iron.** Tyne production jumped from 32,000 tons in 1862 to 51,000 in 1863.***And the boom persisted until 1866 when there was the usual sudden collapse. Tyne launchings dropped from 74,000 gross tons in 1865 to 35,000 gross tons in 1867 and on the Wear there was a drop from 73,000 tons to 52,000 in the same period.

John Wigham Richardson, who had taken over a yard in 1860, wrote in his autobiography: "After 1866 a prolonged commercial depression came over the country. There was so little work at Walker (the location of his yard, near Newcastle) that grass grew in the shipyard and the cart man requested permission to reap the hay." θ

By 1867 the slump was bottoming out and then production began to climb again. It stayed high throughout the seventies, with only a small dip around 1876, although this dip as we shall see was enough for employers to demand reductions in wages.

Again the recession was short-lived and was replaced by a heady boom. Between 1881-2 national shipbuilding output rose by a third and in the North East as a whole by just over a quarter. By 1883 the pendulum was swinging back again and Mr. F.C. Marshall of Hawthorn Leslie & Co. Limited, was complaining:

"Our yards were conspicuous for their resemblance to a blighted forest - a wilderness of bare poles around which grass grew luxuriantly."/ But again, as the decade ended trade was swinging up. In 1889 when the British Association paid its third visit to Newcastle, Tyne yards were launching 280,000 gross tons of shipping and those on the Wear 217,000.

* See his paper on Shipbuilding at the B.A. Meeting in Newcastle in 1889.

** Tables given in "Where Ships Are Born".

*** " " " "The Making of the Tyne".

p.t.o.

LABOUR RELATIONS

The wild fluctuations of output were among the main sources of friction in labour relations. For a downturn in trade was always followed by a request by the employers for a 5-10% cut in wages, while an upswing was equally automatically followed by demands for a 5-10% increase. Almost invariably these requests from one side or the other were met with immediate rejection and often a strike, or a lockout, would follow. There was as yet no conciliation machinery despite the attempts at Sunderland and employers often seemed to have no regard for the finer points of negotiation.

The most important and prolonged dispute in these years was caused by the Nine-hour Movement, an attempt to reduce the working day from ten to nine hours, making a 54-hour week.*

The men's argument was that such a reduction would equalise the benefits springing from the introduction of new machinery, whereas it had so far simply increased employers' profits. Shorter hours would also leave more time for "mental and moral" training to the benefit of the individual and the employer.**

In February 1866 a mass meeting of over 2,000 men agreed to send a petition to Charles Palmer at Jarrow calling for a nine-hour day. Palmer called a meeting and after a great deal of difficulty and against a steady barracking, he managed to convince the men not to use his firm as a battleground for the Nine-hour Movement. ***

Palmer's argument was that his labour costs were already high, certainly higher than on the Clyde, and there was a fear of increasing foreign competition. He added that many Tyneside employers had agreed on a common policy of resisting the demand, as had employers on the Tees, who would impose a lockout.****

Nevertheless, men on Teesside decided to press their case and went on strike. In Middlesbrough the strike lasted for about 12 weeks with two small concessions finally won by the men: the working week to consist of 59 hours; payment of wages to be weekly instead of fortnightly, thus reducing the need of the poorer-paid to rely on credit.θ

* J.F. Clarke.p.252-293. ** Ibid. *** Ibid. **** Ibid.
θ Ibid.

On Tyneside matters moved more slowly. Charles Palmer managed to get rid of Andrew Gourlay, a forceful character who had been the main centre of resistance to him. *

But by 1871 Gourlay was President of the Sunderland strike committee and he organised a strike in all the Wearside engineering works for a nine-hours' day. The strike lasted three weeks but ended in success. The employers agreed to a nine-hour day as from 1st July. Sunderland then set the pattern for the rest of the country.

By the end of April, when victory on the Wear was already certain, attention was turned to the Tyne. The men's leaders hoped to succeed without a strike but the employers' attitude, exemplified by William Armstrong, was not only negative but "cavalier", to use the "Spectator's" phrase.

Armstrong's was the biggest factory in the area, with 3,000 employees and it became the centre of the battle. Armstrong was determined to resist the demand; with success on Wearside the men were equally determined to press their demand. Trade unionism on the Tyne was less strong than on the Wear and thus financial strength would be weaker. But the Nine Hours League that was set up was in itself virtually a trade union. In fact, the Webbs wrote: "The Nine Hours League became in fact though not in name a temporary trade union, its committee conducting all the negotiations on the men's behalf, appealing to the trade union world for funds for their support and managing all the details of the conflict that ensued..."**

The employers' association turned down the demand and the men resolved to strike. "So began one of the most significant strikes in the history of the British working class, a strike by a huge body of non-trade unionists which lasted 20 weeks and in its final victory secured a general reduction of working hours for a national industry - engineering." ***

* "The Town That Was Murdered". p.94.

** "History of Trade Unionism," page 315.

*** J.F. Clarke - "Labour Relations in Engineering & Shipbuilding in North East in Second Half of 19th Century" (M.A. Thesis Newcastle University 1966).

About 7,500 men handed in their notices in an attempt to stave off prosecution against breach of contract. But this ploy was not altogether successful and the employers managed to sue them - and this inflamed passions still more. Many skilled men left the area. In fact the United States consul in Newcastle, Evan R. Jones, wrote in his Report to the U.S. Government, 1873 (page 9): "The U.S. acquired some first-class workmen in the course of the strike."

The strikers gained the sympathy and support of a number of newspapers and magazines. The "Spectator" wrote: "Masters who reply cavalierly by lawyers' letters to the demands of their men, refuse personal discussion and act as nearly as they can like despotic governments against revolutionary bodies can hardly expect their moral claim on the sympathy of the public to be conceded."

The employers eventually agreed to the 54 hours' week from 1st January 1872 as long as the men would work overtime at their request. The 54 hours' week remained the general rule until January 1919 when the 47-hour week was conceded. *

One Sunderland firm made the concession, however, as early as 1889. This was Short Brothers Limited of Pallion.** A commentator wrote: "The firm have found that instead of the production being less from the apparently shorter hours of work, it has on the contrary gradually increased... The men started at six o'clock and stopped at eight for a half hour for breakfast, had another interval of an hour at noon and the day's work finished at five. The conditions under which the old system was carried out were such that many workmen were incapable of maintaining the long hours. It was in point of fact quite common for a men with 24s. a week to lose on an average three quarters per week simply because he was unable to rise at six o'clock and work fulltime... Under the 48-hour system, the men start after breakfast at 7.30 and go on with only one break until 5 o'clock... They are able to do more work this way than under the old system and at the same time more work is got out of the machines." ***

* J.F. Clarke.

** See "Mowbray Quay to Pallion Yard" a history of Short Brothers Limited, published 1950.

*** The Times, 13th September 1896.

The success of the Nine Hour League encouraged trade unionism and the individual unions began to think of combining to form organisations comparable with the employers' associations. In 1873 a Newcastle and Gateshead Trades Council was formed. South Shields had formed one the year before and Sunderland was to follow in 1874. In 1890 trades councils were formed at Hartlepool, Stockton and Thornaby and in 1894 the North East Coast Federation of Trades Councils was established.

The employers had formed temporary associations when disputes arose for many years. In 1852 and 1856 employers on the Wear had tried to form lasting associations but without success.* It was 1870 before a durable association was formed.

During the 1860's there was an informal association on the Tyne under Palmer's leadership and often the Tees-side yards followed suit too. By 1880 wage agreements tended to cover both Tyne and Wear and by 1890 the Boilermakers' Society agreements covered all three main North East rivers.

Over the period now under review, wages continued to fluctuate according to the state of trade as below:-

WEEKLY EARNINGS OF BOILERMAKERS AT PALMER'S WORKS IN JARROW **

	1871 60 hrs.	1882 54 hrs.	1885 54 hrs.
Platers	54s. 6d	77s. 6d	57s. 1d
Riveters	34s. 5d	51s. 2d	37s. 3d
A.I. Smiths	45s. 9d	84s. 1d	55s. 3d
Caulkers	38s. 6d	45s. 9d	40s. 7d
Drillers	35s. 7d	34s. 0d	25s. 8d

* "Where Ships Are Born".

** From Royal Commission on Depression, 1886, 3rd Report, page 299.

During the early 1870's there were a number of disputes, apart from the Nine hours movement, over wages and the classification of jobs.* The disputes did not become serious until late 1874 when the downturn of trade made the employers on all three North East rivers call for wage reductions of 10% on day rates and 15% on piece-work rates. A meeting of joiners in Newcastle in December 1874 refused to accept the reduction "in as much as we do not consider the state of the trade is so depressed as to warrant such a large reduction." **

The Sunderland Trades Council considered the matter in January 1875 and also agreed to resist reductions.*** As a result of these indications of a firm attitude on the part of the men, the Wearside employers decided to drop their requests and subsequently notices on Teesside were also withdrawn.

But Tyneside employers remained firm in their determination to cut wages and a lock-out ensued involving thousands of men. After four weeks, the employers agreed to re-open their yards on the previous terms. Thus again the men found that concerted effort brought rewards that individual action could not.****

Throughout 1875, however, demand continued to drop and Tyneside employers revived their proposal for wage reductions. The proposed reductions brought a conciliation board into existence. At its second meeting at the end of November 1875 the Board arranged reductions for various trades. The Boilermakers' Society refused to accept the work of the Conciliation Board and negotiated with employers separately. The result was an acceptance of a 5% reduction in piecework prices.*****

The refusal of the Boilermakers to accept the findings of the Conciliation Board led the joiners to follow suit. When an employer, Andrew Leslie, also refused to accept its mediation, the Conciliation Board collapsed. θ

* J.F. Clarke. p.300-301.
** Newcastle Weekly Chronicle, 26th December 1874
*** J.F. Clarke, **** Ibid. ***** Ibid. θ Ibid.
p. 317.

The depression continued through 1877-8-9. In Sunderland, boilermakers reported that there was "not enough work for one third of our members... formerly employed."* Again, wage reductions were proposed. The Wearside employers sought to reduce the wages of shipwrights by 3s. a week but tempered this to 2s a week which was accepted.

On the Tyne, men were paid off for refusing to accept a 7½% reduction. The Newcastle Chronicle estimated that between 7,000 and 8,000 were idle. Within two weeks a settlement was agreed on a 5% reduction. **

The depression of the 1870's was followed by a boom at the beginning of the 1880's. Between 1881-2 national output rose by 33%, while on the Wear the comparable figure was 43% and for the North East as a whole 26%.***

By 1884 depression had returned again and was to last until 1887. Even so, Census figures for 1881 and 1891 show sharp rises in shipbuilding employment. In Durham the numbers of shipwrights increased from 10,263 in 1881 to 18,970 in 1891, while in Northumberland the numbers went up from 4,170 in 1881 to 6,761 in 1891.****

The boom of the early 1880's led to the expected demands for the restoration of wage rates. On Tyneside there was a general increase of 5½% from August 1880 and three months later another 2½% was conceded. Θ

The Boilermakers' Monthly Reports (Nos. 94, 95 and 98) described the situation on the Tyne and Wear as one where it was "almost impossible to find men to supply the demand or fill any vacancy that may occur."

These frequent wage fluctuations were a characteristic of the industry and sprang from its labour-intensive nature. If more than 70% of total costs arose from labour, then wages must be regulated according to the level of trade in order to bring more orders into play or to give labour its reward from over-demand. That was the argument.

* J.F. Clarke, ** Ibid. *** Ibid. **** Ibid. Θ Ibid. p. 338.

It sprang from the earliest days of shipbuilding as an industry, i.e. from 1820-30 onwards, and although as we have seen wage regulation often caused industrial unrest, the system was accepted as inevitable. In fact it overlooked two more important factors, the level of freight rates and the total production costs. Freight rates were - and still are - one of the most important determinants of orders.* Assuming that ship prices did not get wildly out of line with current trends, then shipowners placed orders on a rising freight market and withheld them on a declining one. In fact since the market is a summary of the most popular view at any one time this meant that most orders were placed at a time when everyone else was placing them and were withheld when everyone was withholding them. Such action, instead of being shrewd and intelligent, meant that on the one hand, orders were placed when yards were already full and could demand premium prices; and on the other hand not placed at a time when yards were slack and could offer a discount. The short-term was the only target, despite the missing of bargains or the payment of excessive prices and labour relations suffered as a result on the wrongful assumption that ships' prices were the critical factor. Yet, as indicated above, we can assume they never seriously got out of line, first because of the play of the competitive market and secondly because the wage reductions demanded were seldom more than 5%, which is tantamount to an indication that ship prices were not far out of line.

The second important factor that was overlooked with the wage-regulation system was the total production costs compared with labour costs. Within the shipyard itself labour provided by far the most important cost factor but shipbuilding was - and still is - primarily an assembly industry. "Nearly three quarters of the final cost of most ships represents bought-in materials and components including the main engine; the cost of shipyard labour is only some fifteen to twenty per cent of the total cost of the ship." **

* Relationship between shipbuilding production, prices and the freight market, by Maxwell Ballard in a paper to the N.E. Institution of Engineers & Shipbuilders, 3 December 1920.

** Shipbuilding Enquiry Committee 1965-6 Report, Cmnd. 2937, p. 12.

This is a severe indictment of the wage regulation system. It indicates that it was almost completely ineffective in its purpose yet the impact of such a policy on labour relations was extremely damaging to the industry. We have seen in the examples given above and we shall see in others below that thousands of man-hours were lost in strikes.

But the short-term effect was nothing compared with the long-term. A sharp division of interest was created between management and men, an attitude of "them and us", which has bedevilled the industry ever since. Throughout the whole of its recent history, shipbuilding has had a deplorable record of labour relations and much of the responsibility lies with the wages policy. The wage regulation system, although the worst aspect, was not the only culprit. Almost equal fault can be found with the system of differentials that existed between trades. It was these differentials and the petty jealousies that they created that were behind nearly all the inter-union disputes in the industry that became as common as the union-management disputes. It would not be too much to say that if wage regulation and the differentials could have been eradicated from the earliest days, many of the labour relations problems would have been solved too and a far higher level of production and productivity would have been possible. This is a comment that is applicable to any but perhaps the most recent period in the history of the industry.

In 1883 Wearside employers and boilermakers took a significant step forward in trying to eradicate wage fluctuations when they signed an annual wages agreement.* Robert Knight, the general secretary of the Boilermakers' Society, wrote in the monthly Report (nos. 129): "We should be pleased if all our members would follow this good example. We should have peace and... would profit much... in the end.

But disputes remained a part of life. "Here in Sunderland, there is sure to be a dispute of some kind on every vessel before they start and half a dozen before she is finished." **

** J.F. Clarke.

** Boilermakers' Society Monthly Report, No. 94.

The early 1880's saw a severe depression. The Wallsend Slipway and Engineering Company reduced its labour force from 1,245 to 812 within 12 months and average earnings fell from £89 to £70. *

Employers throughout the region called for wage reductions and reductions of 7½% - 10% were accepted on the Tyne and Wear without a strike.** By April 1884 the Shipping World reported that "not less than 7,000 workmen are lying idle" in Sunderland.

In January 1885 further wage reductions were accepted on the Tyne and Wear but on the Tees some men went on strike for 17 days before agreeing to a reduction in piecetime rates of 7½%.***

In 1885, the Wear was at last successful in setting up a conciliation board.θ It had a very difficult immediate problem to solve but it succeeded in doing so. Shipwrights on the river presented it with 300 instances where they should have been doing work given to joiners. After many meetings the Board reduced the points of difference to 11, and finally just three points had to be submitted to employers for a decision. This was the beginning of better times. James Laing could tell the Royal Commission on Labour in 1892: "Since then.. we have had no strikes on the Wear."

Further calls for wage reductions in 1886 did not meet with the acceptance that the immediately prior claims had met.≁ Between 6,000 - 7,000 men on the Tyne went on strike for seven weeks but eventually they had to agree to a cut of 5%.

By 1887 trade was beginning to turn upwards and 1888 brought demands for wages increases.+ In August there was a 5% increase on the Tyne and the Wear and in the following year two increases each of 5% were granted. Wage fluctuations thus continued at full spate as a normal way of life.

* "Launching Ways".
** J.F. Clarke. *** Ibid. θ Ibid. ≁ Ibid.
\+ Ibid.

Between 1879-1890 there were 13 changes in the piecework rates for shipyard workers on the Tees, more than one a year, and an even greater number on the Tyne and Wear. Over the period, as table XII in the final chapter shows, the decreases added up to 48% while the increases to only 35% indicated a considerable drop and in the living standards of the workers at a time of rapid industrial growth. At the same time there was a substantial fall in the cost of living so that real wages probably increased.

NEW METHODS

There was a growing sophistication in these years in materials and processes. By 1890, steel was widely used in almost every part of the structure. In fact over a million tons of steel shipping was being built. In consequence the price fell from £12. 10s. 0d a ton in 1881 to £6 a ton in 1893.*

Large furnaces were used for heating the plates. Huge shearing, punching and bending machines were in operation, together with hydraulic rolls for giving the proper curvatures to garboard and other plates. Some yards even possessed hydraulic riveters to close keel rivets of unusual dimensions. Powerful loco cranes were used and so were sheer legs to lift heavy machinery into the ship.

The new scientific methods and the larger capital investments meant that many small firms naturally disappeared. They meant, too, that the Solent and the Thames, which had been dominant in the days of wood, fell away. The new metal ships propelled by steam were built in areas like the North East, and the Clyde, where highly developed iron and steel and engineering industries were located. Some shipbuilding firms, like Palmer's, saw an advantage in possessing their own iron works. Some, like Andrew Leslie and Company, who amalgamated with R. and W. Hawthorn in 1885, saw an advantage in having their own marine engineering facilities.

* William Boyd, "The Story of the Wallsend Slipway and Engineering Company Ltd." 1871-1897.

On the other hand, an engineering works like Sir W.G. Armstrong's saw an advantage in going into shipbuilding. But establishing marine engineering facilities was not universal or essential. Laings, founded in 1793, Bartrams in 1837 and Thompsons in 1846, have all managed to survive simply as shipbuilders. On the other hand, some marine engineers, like George Clark, founded in 1854, and the N.E. Marine Engineering Co. in 1865, have remained specialists in that line.*

Because of the growing importance of marine engineering for its own sake and because it helped to reinforce in shipbuilding an appreciation of scientific methods, it is worth looking at the amalgamation of Hawthorn's and Leslie's in some detail.

Robert Hawthorn, the main driving force of the works, had died in 1867. "So passed one of the early pioneers of the marine and locomotive industry in this district, a man of humble origins, who, by his mechanical ability, skill as a craftsman and an inventive mind, built up from very small beginnings one of the most famous engineering works in the world."** Two years later William, Robert's son, retired and handed the business over to his son. But since the balance sheet had not been too healthy for years, father and son decided to offer the company for sale.

After a great deal of negotiation, 31-years old Mr. B.C. Browne was finally persuaded to take it over. Since he lacked marine engineering experience, he asked Francis Carr Marshall, then with Palmer's, to join him. Palmer's were so furious that they never placed an order with Hawthorn's again.***

Marshall realised his own value and he set his terms high. He wanted a salary of £1,000 a year, plus a quarter of all the profits earned after paying 5% dividend. Browne agreed. θ The next problem was that a big injection of capital was needed into the firm, £60,000 in all, but this was found too. Together with the new management, the new investment turned the business into a profitable one. Soon additional space was required. In 1872 the firm was placed on the Admiralty List and for many years the St. Peter's Works were employed almost entirely on Admiralty contracts. Warships were also engined for China, Chile, France, Japan, Russia and Italy, and the work was very profitable.+

* See "The Economics of Shipbuilding in the U.K." by J.R. Parkinson. p.40-41.

p.t.o...

By 1890 the triple expansion engine had superseded the compound engine which had been in universal use in 1880. Marshall's contribution to the change was substantial. It was in 1884 that he designed and built the twin screw triple expansion engine for the Italian cruiser "Dogali", which had been built by Sir W.G. Armstrong, Mitchell and Company. For those days, Marshall's engine which developed 8,000 i.h.p, had an extraordinarily low power/weight ratio. Its success brought many repeat orders. The triple expansion engine became the staple output of the works and Marshall became one of the leading marine engineers in the world. *

In 1885 the company decided to amalgamate with Andrew Leslie & Co., to form R. and W. Hawthorn, Leslie and Co.. Soon afterwards the Italian Government, which had been a good customer, decided that all ships and engines should be built at home. Hawthorn, Leslie's countered by setting up a subsidiary in Italy, Societa Industriale Napolitana Hawthorn Guppy, with a capital of £20,000. At first plenty of work resulted from this move, but it tailed off and in 1904 Hawthorn Leslie withdrew.**

At Hebburn the company continued to have plenty of work but the financial results were often disappointing. In September 1888 alone, for example, it booked orders for nine ships and their machinery and for four independent sets of machinery. Yet the results in that financial year showed a loss of £16,000 because prices had been set at too low a level. The estimating and costing methods seemed inadequate. The first warship built at Hebburn, the third-class cruiser H.M.S. "Bellona", resulted in a loss of £14,000 to the company.***

In the financial year ending June 1890, the company launched 11 ships, delivered 32 locos and the Hawthorn Guppy works were full of orders from the Italian Government. But the financial result was a profit of only £18,000. New capital, new machinery and new management were needed but it was some years before they were all provided. ****

* "A History of R. & W. Hawthorn, Leslie & Co. Ltd."

** Ibid. *** Ibid. **** Ibid.

MARINE ENGINEERING

During this period, two other Tyneside marine engineering firms who were to gain international repute had come into existence: the Wallsend Slipway and Engineering Company and the North Eastern Marine Engineering Company.* The former was the pioneer of marine engineering at Wallsend and was established by three shipbuilding or shipowning firms. They were: Charles Mitchell and Co., of Walker; Messrs. Watts, Milburn and Co. of Blyth and Newcastle; and Messrs. Nelson, Donkin and Co. of North Shields and Newcastle.

They decided to set up a slipway and repair yard, primarily for their own vessels. As a result the Wallsend Slipway Co. Ltd., was formed in November 1871 with an authorised capital of £45,000, of which only £8,250 was paid up at first.

An account of the works a couple of years after it began said: "It was rather a dreary looking place in these days. There was a small shop at the head of the slipways containing the hydraulic machinery for hauling up the vessels and a limited number of machine tools for executing the repair work. At the western end was the boiler shop, with a few tools. The whole being about 140 ft. long by 70 ft. wide overall."**

At this time in 1874 the firm employed 300 men and the annual wages bill was £22,000.*** It was in this year too with the arrival of a new managing director, William Boyd, that the company began to take a greater interest in the engineering side than in ship repairing. The first managing director, Charles Sheritan Swan, who had gone off to take over Messrs. Coulson, Cooke and Company's Wallsend shipyard, had been more interested in shipbuilding activities.

Within a few months, Boyd raised the question of manufacturing marine engines and boilers, mainly to keep the workmen together during slack repair times.

* See "History of the Parish of Wallsend." p.316.

** William Boyd.

*** Ibid.

The engineering business flourished and soon Boyd was turning to steel boilers. In fact, in 1878, his company made the first steel boiler on the Tyne. It was installed in the "Ethel", built by Mitchell's for Messrs. Henry Clapham and Co. The plates were of Siemen's mild steel and rolled at Landore in South Wales. The price was £14 a ton. In that year the word "Engineering" was added to the company's title.*

Four years later it built the first triple expansion engines on Tyneside. They were designed by Mr. Alex Taylor and fitted to the "Isle of Dursey" owned by Messrs. Dixon, Robson and Co. of Newcastle.

By the turn of the century, the company had grown to a huge engineering works. So, too, had the North Eastern Marine Engineering Company which was the first large works in the country to purchase electric power in bulk. For some years indeed the firm was the largest purchaser of electricity in the country.

It had begun business in 1865 at South Dock, Sunderland. In 1882 the company expanded by opening premises at Wallsend.**It built houses for its workmen at the same time: there were houses for foremen at Northumberland Villas, for the mechanics at North Terrace and for lower-paid employees at South Terrace.

All the time the frontiers of machine capabilities were expanding. From the 1850's we can see the rapid increase of boiler pressures from 15 lbs to the sq. in. to 150 lbs., the doubling and even trebling of speeds and yet constant reductions in fuel.

As late as 1872, for example, the average consumption of coal per indicated horse power per hour was 2.11 lbs. Only nine years later, this had dropped to 1.828 lbs - a reduction of over 13%. During the same nine years average piston speeds went up from 376 ft. per minute to 467 ft. and the average working pressures went up from 52.5 lbs to 77.4 lbs per sq. in.

In July 1895 when he was looking back over his 40 years in marine engineering, Mr. F.C. Marshall, of Hawthorn, Leslie, said: * **

* William Boyd. ** "History of the Parish of Wallsend," p.320

*** "The Making of the Tyne", p.258.

"In 1855 I conducted the trial of the "Brigadier", a Tyne vessel, and took my first set of indicator cards, showing 210 h.p. on 70 revolutions and steam 15 lbs. In April 1894 I attended the trials of the Italian ironclad "Sardequa", 13,800 tons displacement when she developed 24,000 h.p. or 112 revs. with a steam pressure of 150 lbs - showing by contrast ten times the steam power, over one and a half times the revolutions and 1,100 times the h.p., as the progress in 40 years."

NEW FIRMS

Meanwhile the number of yards on the Tyne had continued to grow. In 1863 Messrs. Schlesinger and Davis had started a company at Wallsend.* Martin Schlesinger had begun his career as an engineer at Stephenson's engine works while Frederick Davis had been trained as a shipbuilder under Mr. Charles Mitchell. The partner's first two ships were sailing vessels but in 1864 they laid down a steamship, the 411 gross ton "Llandafr". In 1880 Schlesinger's health broke and Davis bought out his partner's interest but continued the firm under the old name.

In 1859 Robert Marshall, the son of Thomas Marshall of South Shields who had built the first iron ship on the Tyne, opened a shipbuilding yard at Howdon. Being an enginewright rather than a shipbuilder, Marshall took on two managers, John Readhead and John Softley. When the business failed in 1865, the two managers set up on their own account. In 1871 the Howdon yard was taken over by two brothers from the south of England, Henry and Robert Cole, but after five years it again failed. The manager, William John Bone, believed it could have a successful future, however, and a few months later, with the help of some friends, he opened the yard again. "His skill, energy and manifest ability turned the tide and solid success rewarded his efforts," wrote one historian.**

His firm was called the Tyne Iron Shipbuilding Company and it became one of the most important on the river.

* See "History of the Parish of Wallsend" by William Richardson, published in Newcastle 1923, p.302.

** Wm. Richardson in "History of the Parish of Wallsend", p. 311.

Another important company had been formed in 1865 when Marshall's business at Howdon had failed. This was a partnership between the two former managers, John Readhead and John Softley.* The two partners set down £2,860 of their own capital and built a yard in South Shields.

Their first ship, the "Unus", was a small collier brig, of 183 tons, which traded to the Baltic, to France and the Mediterranean. The partnership prospered for seven years, during which time 87 small craft were completed, including the first ship ever to be classed 100 A.1 with Lloyd's Register. This meant that Lloyd's surveyors believed the ship would remain a top-class insurance risk for 100 years.

In 1872 the partnership was dissolved and John Readhead continued on his own.** Business flourished and by the end of the seventies, the founder was looking for more spacious premises. In 1880 the firm moved to West Docks, where ir reorganised the number of berths to take the larger and heavier ships to come. Just before the move in 1878, John Readhead had been introduced to Edward Hain, the 26 years old heir to a Cornwall fishing and deep sea shipping organisation. They liked the look of each other and Hain placed an order for a screw steamer "Trewidden". That was the beginning of an extraordinary association. Between then and 1888 fifteen ships in all were built by Readheads for Hain. But this was only the start. For many more orders were placed by Hain and to date Readheads have built 87 ships for the Hain Company, probably the biggest number in the world ever to have been built by one builder for one owner.***

At Blyth, developments were more gentle. The first dry dock had been opened there in 1811 by a builder named Stoveld. The premises were later sold to a shipbuilder called Robinson, who with Beaumont and Drummond had a yard at Cowpen Quay. There were another two yards at the Floating Dock owned by the Blyth Dock Company and Soulsby's.

* "John Readhead and Sons, a Hundred Years of Shipbuilding at South Shields", published by the firm, p.6.

** Ibid. *** Ibid.

By 1863 Soulsby had been joined by a partner, Hodgson, and in that year they took over the yard owned by Beaumont and Drummond. In 1879 they took over Robinson's yard.*

Meanwhile, the Union Co-operative Shipbuilding Company had been formed by Richard Lough and a partner called Heron in 1868. The latter was to carry it on until 1902 when it was closed.**

Wooden ships were built in the town until 1873-4. But there was no easy transition to iron shipbuilding. The first attempt at building an iron ship in Blyth was made in 1878 by Chapman Towers and Horn. The vessel was never completed.

The effective start in iron shipbuilding was then made in 1880 by Hodgson and Soulsby. They built two iron hoppers for the Russian Government. They followed this the next year by the "Speedwell", a cargo ship for a Cardiff owner. Two years later, their firm was taken over by the Blyth Shipbuilding Company.

Undoubtedly the two most important developments at this time, however, were the founding of Swan and Hunter and the amalgamation of Sir William Armstrong's business with that of Charles Mitchell.

As we have seen, Charles Mitchell had started one of the most successful Tyneside yards in 1852. He had been born in Aberdeen in 1820. When he was serving his apprenticeship he had arranged with the local policeman to wake him at four o'clock every morning to give him more time for study. For some years he had been assistant draughtsman to John Coutts, both at Aberdeen and at Walker, before starting up on his own at Walker.***

The business prospered. Contracts even included warships for the Russian Czar and between 1862-70, while these ships were being built, Charles Sheritan Swan, Mitchell's brother in law, lived in St. Petersburg to handle all negotiations.

In 1871 Mitchell acquired a small site at St. Peter's and two of his associates began building ships there under the title of Coulson, Cooke and Company.****

* "Port of Blyth" by C.E. Baldwin (1929). ** Ibid.

*** See "Launching Ways" a history of Swan, Hunter and Wigham Richardson, Ltd., published by the firm in 1953.

**** Ibid.

Two years later the new firm moved to a larger site at Wallsend but soon ran into financial trouble and had to be rescued by Mitchell. The latter placed in charge his brother-in-law Charles Swan, the former managing director of the Wallsend Slipway Company.

The new company did well but on 26th April 1878 Swan was killed when he fell over the bow of a steamer returning from Calais to Dover and hit a paddle. *

At about this time George Burton Hunter, a Wearside shipbuilder, who was still in his early thirties, dissolved his partnership with S.P. Austin. He was thus able to enter negotiations with Mitchell and Henry Swan, brother of the dead man. A new partnership was formed on 1st January 1880, Swan and Hunter, with Hunter as the managing director.

"Hunter was a man of outstanding technical and managerial qualities, coupled with a strong sense of vocation."** He had been born in Sunderland in 1845, the son of a shipowner and sailor. In 1860 he had been articled to the firm of Pile, Hay and Company and in 1869 he broadened his experience by going to the Clyde shipbuilders, Robert Napier and Sons. When he returned after two years he was made manager of Pile and Hay at the age of 26. Three years later he had joined S.P. Austin as a partner.

But now in 1880 his real work began. The Wallsend of those days was little more than a village. It had 6,000 inhabitants, most of whom were employed in mining. By 1903 the population had increased four-fold thanks to the success of the local shipyard.

In 1880 the Wallsend shipyard covered only seven acres and had a river frontage of 100 yards. The parish rent for land and buildings was £640 a year. The yard had four building berths, with a maximum length of 300 ft., and 700 men and boys were employed. The output in Hunter's first year was 8,532 gross tons.***

By 1883 the yard had built 40 iron cargo vessels and the following year it built Wallsend's first two steel ships, the "Burrumbeet" and "Corongamite", both of 2,420 gross tons, for the Australian passenger and cargo trade.

* "Launching Ways". ** Ibid.
*** "The History of the Parish of Wallsend."

Charles Mitchell was also involved in the formulation of the other great Tyneside enterprise that brought Sir William Armstrong directly into shipbuilding. In 1867 Armstrong's Elswick Company had decided to build warships and arrangements were made to build them at Mitchell's Walker yard. Between that date and 1885 about 20 warships were built, half of them for the Chinese Navy. The greatest weight was about 550 tons displacement and the top speed 12½ knots. *

In 1883 Armstrong and Mitchell decided to amalgamate and Armstrong took over Mitchell's Low Walker yard. Up to this time Mitchell had built 450 vessels. He employed 2,500 men and had turned out as much as 30,000 gross tons of shipping in a year. With the amalgamation a new yard was laid out at Elswick next to the ordnance factory for producing warships while the Walker yard was to concentrate on merchant shipping.* *The new Elswick yard was inaugurated in October 1884 when the protected cruiser "Panther" was laid down for the Austro-Hungarian Government. The following year, the "Victoria", the first battleship built at Elswick was commenced for the British Navy and a sister ship, "Sans Pareil" soon followed. During the next few years warships of every type were built at Elswick for Japan, China, U.S.A., Brazil, Argentine, Chile, Norway, Portugal, Italy, Roumania andSpain. ***

No wonder one observer commented: "The Elswick establishment (with its armament manufacture as well as shipbuilding) could be regarded as nothing less than an arsenal which in time of war would be invaluable to this country." ****

While another wrote: "Consider that the Elswick works began 48 years ago on the verdant banks beyond the western limits of the town with a handful of mechanics headed by a scientific dreamer of immature age and no experience. Consider that today (1894) these same works are a national glory, employing 13,000 men, dictating the methods of the world's warfare and having a reputation which has reached the ears of every intelligent man in Europe and America and then ask if this is not a romance in hard fact. The place is one of the sights of England--- Their size, their completeness, their tremendous productive energy, their variety of blast furnaces, foundries, machine ships and chemical laboratories,

* See a paper on Armstrong's warship production read by J.R. Perrett, Chief Naval Architect and General Manager of Sir W.G. Armstrong, Whitworth & Co. Ltd., to N.E. Coast Institn. of Engineers & Shipbuilders, July 1914.

** Ibid. *** Ibid. **** (P.T.O.)

teeming with human life, reverberating with the shriek of steam, the clang of hammers and the whirr of machinery, overhung by a pillar of cloud by day and of fire by night, present a picture of concentrated industrial activity which overwhelms and astonishes the average observer.*

There was indeed probably not another establishment like Armstrong's in the world. It contained steel works, using the Siemen's process; engineering works, where hydraulic machinery of every description was turned out and where alone 1,500 were employed; an ordnance department employing 3,500 to produce 2,500 tons of Armstrong guns a year; and a naval shipyard with an area of 16 acres, a river frontage of about 2,000 ft., and a depth in the finishing berth at low water of 26 ft. This depth was only possible because of dredging which had started in 1876 to help to get the Mitchell-built ships up to Elswick to load their armaments. The old Tyne Bridge was also demolished in that year and replaced by a swing bridge built by Armstrong.

The river Tyne had already been capable of building a complete warship. Some were built and engined at Palmer's and armed at Elswick; others were built by Mitchell at Walker, engined by Hawthorn, Leslie at St. Peter's and armed at Elswick. But now Armstrong could build a complete warship himself.

But warships were not the whole story, however impressive. For the new company, Sir W.G. Armstrong, Mitchell and Company, played a fundamental part in one of the greatest Tyneside developments of the century, the successful building of oil tankers.

OIL TANKERS

The Anglo-American trade in oil had begun quietly in 1860, when an enterprising Pittsburger brought small quantities of petroleum to this country.**

* "The Making of the Tyne" by R.W. Johnson, published Newcastle, 1895, p.261.

** Lecture to the Institution of Naval Architects, 27th July 1886.

But the trade flourished and by 1864 the United States was exporting 32 m. gallons. The petrol was originally shipped in barrels, a wasteful method, as Mr. B. Martell, the chief surveyor of Lloyds explained:*

"A barrel weighs on average 64 lbs. or one fifth of the oil it contains and to the uselessness of this weight must be added the space wasted in packing the barrels in the hold of the vessel. Thus a vessel capable of conveying 2,000 tons of cargo and which, if fitted with tanks, would carry nearly that quantity of oil, would, if fitted with barrelled oil, carrly only 1,030 tons instead of 2,000. Moreover the importer has to pay 4s. 6d or 5s. 6d for each barrel at New York and, with the exception of those sent back to America, they are sold in London when empty for from 3s. 6d to 4s. 0d each. The depreciation of 1s. 0d to 1s. 6d in the value of the barrel, which amounts to as much as £350 to £475 for one voyage in the instance of the 2,000 ton vessel referred to, would by saved under a bulk system."

Time, too, was important. A tank steamer of 2,000 tons d. wt., could load or unload in 10 hours under the supervision of one man. A similar tonnage in barrels would require a gang and would take them a week.

As far as we can now tell, the first person to build a bulk carrier was John Rogerson, a Newcastle businessman, iron manufacturer and shipbuilder. He was the owner of the "Mary Rogerson" which was reputed to be the first ship to transport crude petroleum in barrels from America to London.

On the 1st August 1863 his yard launched the "Atlantic" from St. Peter's on the Tyne. She was an iron sailing vessel designed to carry petrol in bulk "without the aid of casks" and Rogerson intended her for the Atlantic oil trade. She was 148 ft. long, 28½ ft. in the beam, 16 ft. 9 ins in depth andher hold was separated into compartments by sheet iron partititions. Her career is unknown but she is believed to have been the first bulk oil vessel to trade between the United States and the United Kingdom.

* See "35 Years of Oil Transport" by J.D. Henry, editor of "The Petroleum World", whose book was published in London in 1907. Most of the information in this chapter came from this source or from "The Beginning of the Oil Tank Steamer" a chapter in "The Making of The Tyne" by R.W. Johnson.

The division of the hold was to provide the eventual answer to safe petroleum transport but at that time the chemical properties of petrol were not properly understood and either the "Atlantic" or her sister ship "Great Western" blew up in the Thames while awaiting discharge. The accident meant that barrel shipments continued as before although a few wooden sailing ships were converted for bulk transport.

The actual beginning of the tanker steamer remains something of a mystery. This is perhaps natural, for with a general public fear of bulk oil shipments, it is only to be expected that owners wanted to keep such a facility quiet in case passenger bookings suffered. It is generally said that Palmer and Company (later Palmer's Shipbuilding and Iron Co.) built the first tank steamer. She was the "Vaderland". of 2,748 tons, and her owners were the Red Star Steamship Company of Antwerp. Unfortunately it cannot be shown that oil was every pumped into her tanks. She was followed by the "Nederland" in 1873 and by "Switzerland" in 1874 but their careers too have been swallowed up in the mists of time.

It was almost ten years later before the break-through was made. For in the early 1880's oil was discovered in the Baltic. The European oil business began and with it the search for an effective means of transport.

In early 1885 M. Henri Riety, who represented Nobel Brothers of Antwerp, demonstrated to Mr. J.M. Lennard, a Middlesbrough shipowner, the advantages of using tankers for the Russian oil trade. They both consulted the Middlesbrough shipbuilder Mr. E.H. Craggs, who felt the technical difficulties were not insurmountable although there was a good deal of prejudice against the bulk oil trade.

As an experiment, they decided to convert the "Fergusons" which was built as an ordinary cargo vessel by Messrs. Bertram, Haswell and Company of Sunderland. The plans show a tier of tanks in couples above the beams and a similar tier of larger tanks below the beams. The tanks were built in the shipyard berths, launched and towed to the sheer legs on the arrival of the vessel. The deck plates and beams were removed to make a wide enough space in each hold to admit the largest tanks. Powerful pumps were fitted to each hold. Expansion was allowed for by connecting groups of the tanks to a regulator in which a little oil was always kept under the control of the pumps.

The experiment was not altogether successful. The first time the vessel got into heavy weather there was a considerable movement of oil and the joints between the tanks could not be kept tight.

The "Fergusons", which was capable of carrying up to 2,000 tons, ran in the oil trade for three years before she was destroyed by an explosion at Rouen in 1889. One acoount of the disaster which blew her literally to bits said the cause was a workmen smoking in one of the holds.

A couple of years before "Fergusons" conversion, Mr. Charles Marvin, a Newcastle businessman, had visited the Baltic and he described his experiences in the Newcastle Chronicle. His articles were carefully read by a Newcastle shipowner and broker, James McNabb, who had personal knowledge of Russia. Being also a practical seaman, he sketched a rough ship design that he thought would be suitable for bulk transport. But now he needed someone willing to implement his ideas.

In March 1885 a practical and lucrative opportunity offered. An Austrian oil refiner called Singer, a partner in the firm of Offenheim, Singer and Company of Trieste and Vienna, came to Tyneside to try to find shipowners willing to carry oil from Batoum to the Adriatic. Singer had already been to London but had been unable to find any owners interested or willing to take the risk of bulk carriage. McNabb met Singer and learned from him a great deal about the character, the chemical properties and the commercial value of petrol. He learned about its expansion under different degrees of temperature and about its specific gravity. All this information, which Singer had gained from being involved in the oil trade with America, was most useful. Above all, it taught McNabb of the great need to devise means for drawing off and dispersing the evolved gases from the steamer's tanks.

McNabb's drawings were put into practical effect when R. and W. Hawthorn, Leslie and Company were given a contract to convert the "Marquis Scicluna" into a bulk carrier. The conversion consisted of dividing the vessel from fore to aft by a longitudinal bulkhead. Each side was then further divided by four transverse bulkheads in addition to the engine room bulkheads already fitted to the ship. The eight tanks each capable of carrying 250 tons were then covered by an oil-tight platform stretching the full length of the ship. A shaft tunnel ran into each tank for loading and discharging and was completely covered by an outside casing so as to leave a space bwtween it and the tunnel casing. This space would allow the accumulation of gases from the oil which were released to the open air through special escape holes. The converted vessel began running under her contract in September 1886 from Batoum to Fiume and Trieste.

The successful conversion led a well-known London shipowner, Mr. Alfred Suart, to ask for two ships, the "Chigwell" and the "Petriana" to be adapted by Hawthorn, Leslie on exactly the same lines as the "Marquis Scicluna". The "Chigwell" was given seven tanks, the largest of which held 420 tons. She was provided with expansion tanks and all the necessary equipment to pump her tanks at the rate of 50,000 gallons an hour. The "Chigwell" arrived at Hebburn for her conversion in April 1886 and was ready four months later.

Suart had a third steamer, "Bakuin" built by Sir William Gray and Company of West Hartlepool and a fourth, "Titian" converted by C.S. Swan and Hunter of Wallsend but on rather different lines since she was virtually two vessels, one inside another. The "Bakuin" was the first British-owned tank steamer turned out by a British yard. She had a cellular bottom. From there to the "tween" decks, the oil extended to the side. In the "tween" decks, however, there were a number of additional compartments which did not extend either to the side of the vessel or to the deck above. The intention was that the oil in the main hold would remain cool by the immersion of the vessel while the tanks in the "tween decks were kept cool by not extending to the sides. It was hoped that the tanks would also normally avoid injury if the hull should be damaged through a collision. The "Bakuin" was destroyed by fire in Callao Bay, Peru, in September 1902.

At about the same time in the mid-eighties, Henry F. Swan, a director of Sir W.G. Armstrong, Mitchell and Company, and managing director of their Low Walker yard, was working on an alternative method that was to provide the final answer. He wondered whether the hull could not be used as the receptacle. In November 1885 he took out his first patent for the construction of oil tank steamers and almost immediately implemented his designs in the "Gluckauf" for the order of M. Heinrich Riedemann of Bremen.

Swan's patent divided the vessel from fore to aft by a longitudinal bulkhead and sideways by transverse bulkheads, as McNabb had done. Again there were special expansion trunkways for the accumulation and escape of gases. But the shell plating of the vessel provided the bottom and the outer sides of the tanks while the top was formed by a platform or lower deck.

The design of the trunkways was the most important part of Swan's patent. A number of people had realised that need to allow gases to escape but Swan was the most successful in suggesting how this should be done. The upper part of the trunkways, that ran from the lower to the upper deck and were fitted to each pair of tanks, were fitted with large, water-tight apertures and hinged covers. These allowed access to the tanks. The trunkways were usually kept half-full toeensure that the tanks themselves were absolutely full in all weathers. This was the best guarantee of stability and obviated the need for double-bottom ballasting. On return journeys water-ballast could be carried in the oil tanks themselves. It was also found that general cargoes could be carried in the oil tanks provided the tanks were thoroughly cleaned and whitewashed beforehand.

The use of the vessel's skin as tank sides meant more than ever that the rivetting and all other joints had to be perfectly tight. Every compartment was tested with a head pressure of more than twice its normal strain. There should thus be no irregular spaces where gases could lodge. Mr. E.H. Craggs, who had converted the "Fergusons" remarked: "The shipbuilder may design and elaborate, ventilate and electric light, introduce the most powerful and complete pumping system and put in cofferdams and yet fail if absolute tightness is not aimed at."

The need for absolute tightness in fact acted as a powerful stimulus to improving the quality of work put into steamers and indeed all ships.

Addressing a meeting of Middlesbrough shipbuilders, a Mr. J. Head said: "We know that petroleum will find its way through almost any joint and it requires a shipbuilder to be very clever to stop it. We know also that some terrible explosions have occurred through the escape of petroleum and therefore it becomes of the utmost importance that vessels intended to contain it should be made absolutely tight and that means thoroughly good work."

The skin plating in the earlier steamers was a frequent source of trouble, especially in converted vessels. Even in new steamers a close inspection of the floors and frames after a few months generally disclosed indications of corrosion. In some of the converted vessels it was sometimes necessary to put butt straps inside and out to prevent straining and consequent leakage but a better method was the old-fashioned one of overlapping the plates and making sure they were really tight.

The "Gluckauf" was 2,300 gross tons and was the first tank steamer - her few predecessors in bulk oil transport had been sailing vessels. She discharged her first cargo at Geestemunde in July 1886. M. Riedemann immediately placed orders for the "Vorwarts", the "Gut Heil", the "Willkommen" and the "Energie", all from Armstrong Mitchell.

In fact almost at once Armstrong, Mitchells became the recognised builders of petrol steamers. From 1886 to 1895 they built more than 50 of them and in the following 25 years built another 120, making a total of well over a million tons.

At first Lloyd's Register refused to classify the new design, contending that the vessels should be built with an inner skin to contain the oil. But after a while Lloyd's became satisfied with the design's efficiency and gave it their highest classification.

Confidence in the oil trade in fact was not very prevalent at the start. Some owners thought it might prove a failure and they felt it wise to order tankers that could easily be converted into general cargo carriers.

Two events in particular disturbed the early days of the trade. The tariff war between Russia and Germany led at one stage to Russian oil exports to Germany being stopped and a number of oil vessels were thrown out of work. More serious, however, was the Suez Canal controversy. This had flared up in 1891 when an English syndicate had applied for permission to take bulk, oil-carrying steamers through the Suez Canal. Surprisingly, the request led to a bitter controversy involving the Suez Canal Company, the British Foreign Office and a number of petrol interests in Russia, America and the United Kingdom.

The Suez Canal Company was extremely reluctant to give permission. It felt that an accident to a tank steamer in the canal could have serious consequences. In particular, the Company feared that Russia might use the opportunity to block the canal and destroy shipping within it be deliberately blowing up a tanker. What was more, the Company had the sympathy of a wide range of shipowners and seamen themselves, who felt that tankers were dangerous.

After considerable diplomatic (and sometimes undiplomatic) sniping, the Company agreed to let tankers use the canal as long as they complied with the usual regulations. But despite both the technical and the public difficulties, the economic advantages of bulk carriage proved irresistible.

In 1886 when the "Gluckauf" was launched, there were only about 12 bulk oil-carrying vessels in the world. Five years later there were between 70-80 and many of them came from North East yards, as the following list shows:

OIL TANKERS BUILT IN THE N.E. IN 20 YEARS UP TO 1906 *

Name of Builder	No.
Sir W.G. Armstrong, Whitworth & Co. Ltd.	96
Palmer's Shipbuilding & Iron Works Ltd.	18
Sir Wm. Gray & Co., West Hartlepool	14
R. & W. Hawthorn, Leslie & Co. Ltd.	8
Sir Raylton Dixon & Co. Ltd., Middlesbro'.	1
Wm. Dobson & Co. Ltd., Newcastle	12
Sir James Laing, Sunderland	12
Swan, Hunter & Wignam Richardson	7
Doolds, Sharer & Co., Sunderland	2
Craig, Taylor & Co., Stockton	9
Tyne Iron Shipbuilding Co.	6
J. & L. Thompson & Sons, Sunderland	2
R. Craggs & Sons, Middlesbrough	7
Bartram, Haswell & Co., Sunderland	2
Sunderland Shipbuilding Co.	1
Iliff, Mormsly & Co., Sunderland	2
Furness, Withy & Co., West Hartlepool	1

TOTALS	Tyne	147
	Wear	21
	Tees	32
		200

By the 1890's most of the essential knowledge about the safe and profitable working of the trade had been gained. Thereafter it was a question of developing size and efficiency. The North East had designed the way for a most far-reaching revolution.

* J.D. Henry.

PALMER'S LAST YEARS

Charles Mark Palmer's revolution in building iron colliers was still unfolding. For 30 years his company held the premier position in producing a higher output than any other. This and his diversification into warship production, iron and steel manufacture and marine engineering saw the population of Jarrow increase eightfold in 30 years. In 1851 the population had been 3,500. By 1881 it was 25,000.*

Palmer's rolling mills, which he had erected in 1874, were now capable of turning out over 100,000 tons of pig iron and 50,000 tons of manufactured iron a year. The river frontage of his shipyard extended over 3,750 ft., and the Jarrow works as a whole covered 72 acres. He also had another shipyard at Howdon, where there were 4 berths. From 1881 - 3 the Jarrow firm scaled its zenith of prosperity, turning out 171,000 tons of shipping, an average of 57,000 tons a year. In 1883 the total turnover was £1,703,784 and the amount paid in wages to the 7,500 employees was £535,288. **

The output of the yard increased fourfold between 1851 and 1881. The annual average tonnage in the first decade, 1851-61, was just over 6,000 gross tons. In the ten years 1872-81, it was 24,700 gross tons and in the following decade rose still higher to 37,100. ***

Remarkable variations existed, however, in the annual outputs. For example, in 1874 the firm launched 25,057 gross tons, while two years later it launched only 8,635 tons. For the next seven years output rose steadily until in 1883, 61,113 tons were produced. The following year the figure was down to 28,911 tons and continued declining until 1887 when only 19,324 tons were produced.

Although the figures then started to improve, the company was getting into difficult times. In 1890 it made a loss of £11,000 and the following year the loss was £22,000. In 1893 Palmer resigned at the age of 71 rather than have to file a petition for bankruptcy. But he remained until his death the Liberal Member of Parliament for the town which he had so largely called into existence. The town indeed was his memorial. There was a hospital named after him and a mechanics institute. Many of the streets were named after early managers and directors of his companies. And many people in Jarrow today would not be there had not their grandfathers or great grandfathers left the Midlands or Sheffield, Scotland or Ireland to come to work for him.

* "The Town That Was Murdered", p.71. ** Ibid. *** Ibid.

He no doubt had all the faults of an archetypal Victorian entrepreneur. But his drive and imagination helped in great measure to build one of the greatest industrial centres out of green fields and a shoal-ridden river.

Meanwhile, every yard in the north east had now taken to iron and steel shipbuilding. Short Brothers at Sunderland had built their first iron ship in 1871. This was the "High Stretfield" built for J.S. Barwick for £9,150. Almost half of the price went to R. & W. Hawthorn for the engines, which cost £4,345. Plumbing work for one vessel at this time was £40 and a Sunderland upholsterer would furnish a vessel for £18. 13. 4d. *

A number of yards on the Wear went in for iron ships at about the same time: Bartrams in 1872; J.L. Thompsons in 1871; S.P. Austin in 1869; Wm. Pickersgill in 1880. **

But the old methods lingered. Some firms even tried composite ships with iron frames and wooden planks. On the whole this compromise failed although Laing's produced a composite ship which was among the finest sailing ships ever launched from the Wear. This was the "Torrens" launched in 1875. For 15 years she was the fastest ship in the Far East run and was capable of reaching Adelaide in 64 days. Her prowess was praised by Joseph Conrad, the novelist, who joined her as second mate on 2nd November 1891. He wrote: "The way that ship had of letting big seas slip under her did one's heart good to watch. It resembled so much an exhibition of intelligent grace and unerring skill that it could fascinate even the least seamanlike of our passengers." ***

The "Torrens" was the last full-rigged passenger clipper ever built. She cost £27,257. Her last passenger journey was taken in 1903 and she was broken up in Genoa in 1910.

The ever-growing use of iron brought the prices tumbling down. Iron ship plates, which cost £16 a ton in 1860, were obtainable for £4. 11. 9d in 1894. Steel plates were £20 a ton in 1875. Twenty years later they were about £4. 15. 9d a ton. And the price of shipping itself fell from £14-£15 a ton in the 1860's to £5. 10s. 0d a ton and even less in 1894. ****

* "Mowbray Quay to Pallion Yard" a history of Short Bros.

*** P.T.O. ** Where Ships Are Born".

Thus by 1890 Tyneside was one of the greatest industrial centres in the world. As one observer wrote: "A trip by water from Elswick to Shields harbour is full of interest and reveals an almost unparalleled scene of industry.* Great chimneys belching forth flame and smoke indicate the presence of iron and steel works, other equally tall structures tower above chemical works. The fusilade of riveters calls attention to shipyards which line the river right and left and hundreds of vessels plying on the Tyne, besides those taking in or discharging cargo, bear witness to the almost spasmodic energy of the district. A wonderful place truly ! And as long as commercial and industrial superiority depend upon strength of will, business capacity and hardihood, solong will the northmen with their unrivalled physique remain leaders among men."

* John Rowe in his paper on shipbuilding.

CHAPTER 4

1890 - 1914

ON TOP OF THE WORLD

WARSHIP BUILDING

Warship production played an increasingly important role in total output as the 19th century neared its close. With some very minor exceptions, it was concentrated on the river Tyne and with four firms in particular; Armstrong's, Palmers, Hawthorn Leslie and Swan & Hunter in that order. Armstrong's moved into warship building as a form of vertical integration from armament manufacturing. For the other three firms, warships were horizontal extensions from their basic activities of shipbuilding.

An analysis of production is given in Chapter 8. It is important to record immediately that in the ten years leading up to 1914 the eight leading navies of the world spent an estimated £1,340 million, half of which went on new warships.* So there was clearly a vast market to be supplied. Here we are concerned more with the story of its development. The story must have as its main theme the progress of Armstrong's.

"Armstrong's was the most successful exporter of warships in the world and they held this position by reason of the quality both of their products and their sales organisation."+

The latter was headed by one of the country's greatest armament salesmen: Sir Eustace Hugh Tennyson d'Eyncourt, a cousin of the Victorian poet laureate. In his manner, intelligence and energy, d'Eyncourt was an archetypal Edwardian Englishman. Yet he was also a man who sold the most

* See the Government's White Paper on World's Naval Expenditure published 18th October 1913.

\+ "The Big Battleship" by Richard Hough, published London, 1966, p.p. 14-15.

fearsome military power in the world to anyone who had the money to pay. So successful was he that only eight years after becoming Armstrong's chief salesman in 1914, he was made Director of Naval Construction, the highest post the Royal Navy had to offer.

Naval building was a natural development for Sir W.G. Armstrong and Company, the great armament manufacturers. In 1867 the company had signed an agreement under which ships would be built at the Walker yard of Dr. Charles Mitchell and then taken to Elswick for fitting out with armaments. The first ship built under this new arrangement was H.M.S. 'Staunch', completed in 1868 and described as a 'floating gun carriage with fair speed and great handiness'.*

Over the next 16 years another 20 vessels of similar proportions were built, eleven of them for the Chinese Navy, two for the Dutch Government and the remaining seven for British and Colonial Governments. They were all fitted with muzzle-loading guns capable of firing shells of up to 12½ inches. The greatest displacement was 550 tons and the highest speed about 12½ knots.**

By the early 1880's the agreement between the two companies was obviously a success. Orders were coming in regularly and in 1882 the companies decided to amalgamate under the new title of Sir W.G. Armstrong, Mitchell and Co. Ltd. The new company took over both the Elswick works and Mitchell's Walker shipyard for £1,575,000.

In the following year the new company pioneered a new class of warship, the fast protected cruiser. The first example of the type was the "Esmeralda", with a displacement of 2,974 tons, and a speed of 18¼ knots.*** She was fitted with two 10-inch breach-loading guns and six 6-inch guns. Originally laid down for the Chilean Government, she was later

* Perrett to N.E. Institution of Shipbuilders & Engineers, 1914.
** ibid. *** ibid.

sold to Japan and renamed "Idzumi". She was the first vessel of the Japanese Navy to sight the Russian fleet entering the straits of Tsushima before the great naval battle between the Russian and Japanese fleets in 1905.

This was a battle followed as closely in shipyard drawing offices in England as in the Imperial Palace of the belligerent nations. For many of the vessels involved in this battle on the other side of the world had been built in England, not a few of them on the Tyne. Armstrong's themselves had built eight warships for Japan by this time, including the battleships "Yashima" and "Hatsuse". *

On the other bank of the river, Hawthorn, Leslie had built eight cruisers for the Russian Volounteer Fleet between 1888 and 1896, while Swan & Hunter had also built three cruisers for the Russians in 1883.

There was naturally great jubiliation at Elswick when their large, swift warships armed with long range guns of such great striking power won the day so easily.

The market for Armstrong's naval vessels opened up so quickly that in 1884 the company decided to build a shipyard at Elswick for this type of work, thus leaving the Walker yard free for merchant ship production. **

Elswick, which only a few years before had been the home of sheep, was now the most complete arsenal for land or sea purposes in England and probably in the world.

The new yard was inaugurated in October 1884 with the laying down of the protected cruiser "Panther" for the Austro-Hungarian Government. This was quickly followed by the sister ship "Leopard". Both had a displacement of 1,582 tons and cost £200,000. ***

There then took to the water a multitude of men o' war, ships of terrifying proportions for many countries. There

* Perrett. *** Ibid. *** Ibid.

were the cruiser "Dogali" for Italy, (cost £156,040): Elswick's first battleship "Victoria" for the British Navy; cruisers "Chih Yuan and "Ching Yuan" for China; "Isla de Luzon" and "Isla de Cuba" for Spain; the "Elisabeta" for Roumania and the "25 de Mayo" for Argentina. There were also the "Buenos Aires" for the Argentine at a cost of £383,000 and the "Eidsvold" and "Norge" for Norway at a cost of £350,000 each and the "Albany" for the U.S.A., at a cost of £247,600. There were warships, too, for Chile and Portugal, Turkey and Brazil. In its 30 years of existence, the Elswick yard produced 84 warships - a great navy in itself by any standards. *

Many of these ships were the greatest of their time. The British battleship "Victoria" commenced in 1885 was the only ship then to carry 110 ton guns. The Italian cruiser "Piemonte" launched in 1889, was fitted with triple expansion, four cylinder vertical engines giving a speed of 22 knots - in excess of any similar vessel up to that date. And the Japanese battleship "Yashima" laid down in 1894, could produce 20 knots even though she had a displacement of 12,000 tons. She was a battleship with the speed of a cruiser and the firepower of a fortress. She had four 12-inch breach-loading guns, ten 6-inch guns and many small ones. **

In 1897 Armstrong, Mitchells amalgamated with the Manchester armament manufacturers Sir Joseph Whitworth & Co., to become Sir W.G. Armstrong, Whitworth and Co. Ltd. It was the last conquest for William George Armstrong, the solicitor with a practical, inventive turn of mind who had become interested in armaments almost by accident. By the turn of the century, he was employing 25,000 men. Of all the heroic north east stories of industrial enterprises, his was the greatest and his was the name with which Newcastle was proudest to be associated. In memory of him, the Corporation built an

* T.A. Brassey's Annual Naval Reviews.
** Perrett.

Armstrong Park and an Armstrong Road, an Armstrong Bridge and Armstrong Institution, an Armstrong statue and too many Armstrong busts to count.

He was succeeded as Chairman by his old friend and early partner Sir AndrewNoble, himself almost as imposing a figure as Armstrong. He was a former officer in the Royal Artillery who had resigned his commission in 1860 to join Armstrong's firm. Sir Andrew, a Scotsman, helped to carry out many of the experiments into fired explosives. They made his name and the fortunes of the firm. He was supported as chairman by his sons Saxton and John and by his son-in-law Alfred Cochrane and by John Meade Faulkner, who was later to become Chairman himself. There were many quarrels in the Boardroom over the need for new blood and new capital but the firm's reputation remained enviably high.*

It rose even higher when the Japanese Navy, built so largely by Armstrong's, scuppered the Russian Navy in 1905.

This decisive victory, based on large, swift, powerfully armed warships set off an immediate explosion for bigger ships from every navy of consequence in the world. The British committee on designs advocated the "all-big-gun" ship, H.M.S. "Dreadnought", and within weeks her keel plate was being laid at Portsmouth. She was launched within three months and ready for service in just over a year. Three more "Dreadnought" class battleships were immediately ordered, two from Government dockyards and the other, the "Superb" from Elswick.

From then until the outbreak of the First World War, Dreadnought fever swept the world, particularly in South America. The Chileans had actually started the chain reaction in 1902 when they had ordered two fast battleships, "Libertad"

* "Vickers - a history" by J.D.Scott. p.89.

and "Constitucion", the latter from Armstrong's. They wanted the ships to help in a critical frontier dispute with Argentina. But the full cost of the ships - £2,200,000 - together with a diminution of the crisis, saw Chile happy to have them taken off her hands by the Royal Navy, even at the reduced price of £1,875,000.*

During the crisis Argentina had ordered two fast cruisers in Europe and Brazil, feeling left behind, entered the make-believe contest in magnificent fashion. In 1904, the Brazilian Congress authorised a programme for twentynine warships, including three battleships, three armoured cruisers six destroyers, 12 torpedo boats and some submarines. Armstrongs built the first battleship, "Minas Geraes" and Vickers Sons and Maxim built the other, "Sao Paulo" at Barrow.

But in 1910 it looked as if Germany would win the order for the third battleship. The Brazilian Minister of Marine had been deeply influenced by the firm of Krupps and even by the Kaiser himself, who argued in favour of a sealed-down cheaper battleship fitted with 45 calibre 12-inch guns.

It was then that Sir Eustace d'Eyncourt secured his greatest triumph.** He hurried to Brazil with fresh proposals. He agreed with the Brazilian Minister of Marine, Admiral Leão, on the wisdom of a slimmer version and on the excellence of 12-inch guns. But instead of 12 of them, as Krupps had suggested, why not 14? Fourteen 12-inch guns in seven turrets, supported by twenty 6-inch and a number of 3-inch! This would represent the greatest number of heavy guns on any battleship in existence, yet would cost the Brazilian Government several hundred thousand pounds less than the original plans submitted by Armstrong's. The Minister of Marine was completely won over. Brazil was to have the greatest battleship in the world at a cost of £1,821,400.***

* Richard Hough, "The Big Battleship", London 1966, p.17.
** Ibid. *** Ibid. p.37-8.

But then in the summer of 1913 when the "big battleship" the "Rio de Janeiro", was well on the way to completion, Dreadnought fever died in South America as suddenly as it had started. Brazil suffered a big drop in rubber exports, her economy collapsed and with it her ability to buy a Navy. She cancelled the contract for the "Rio de Janeiro" and even had to offer the "Sao Paulo" and the "Minas Geraes" for sale. "It was the greatest abdication of power ever recorded in naval history."*

But, as it died in South America, the battleship fever rose in the Mediterranean. Turkey and Greece were making ever more threatening gestures at one another. The nearly completed "Rio de Janeiro" was just coming onto the market at the right time. After fierce bidding by the two countries, the ship was eventually bought by Turkey. She was to be ready by July, 1914 and was to be renamed "Sultan Osman I". **

In fact, just as she was due to be delivered, the ship was requisitioned by the Royal Navy, much to Turkey's disgust, and renamed the "Agincourt". She saw action only once at the battle of Jutland when she fired just 144 rounds of 12-inch shell and 111 rounds of 6-inch shell. She sank nothing and probably did not kill a single German. ***

As the war years approached, the demand for warships grew even stronger and the ships themselves grew even bigger. The difficulties of negotiating these huge monsters through the bridges of the Tyne became insuperable and Elswick was gradually abandoned in favour of a new yard at Walker. The new yard contained nine building berths, the largest able to take ships of up to 1,000 feet in length and the smallest a vessel of only 500 ft. The river frontage extended for nearly a mile

* "The Big Battleship" by Richard Hough, p.63.
** Ibid. *** Ibid.

and the yard's capacity was 200,000 tons a year. The Firm's general manager commented: "The inauguration of the new Armstrong yard at Walker marks an epoch in local and national warship building enterprise of an importance that can scarcely be exaggerated."*

But Armstrong's, although by far the greatest warship builders in the North East, were not above criticism. Some of the most critical comments came from Stuart Rendel, formerly an executive director of the company and after Armstrong's death the largest single shareholder. He made no secret of his anxiety for the firm's future under Sir Andrew Noble.**

Sir Andrew was a heroic worker, only taking a day's holiday at a time and often working in his office until midnight. But he liked to do other people's work as well as his own. He revelled in responsibility but this led to a refusal to delegate. He was a fine mathematician yet the company was an engineering concern.

Rendel wrote some bitter letters to Noble, criticising his leadership. He wrote of "the needless million" which Armstrong's had put into "the Mitchell and Swan pockets over the purchase of Low Walker, only to find Low Walker a grievous loss and perpetual embarrassment." He complained too that a binding agreement had been made by Noble behind the Board's back to buy another "more or less obsolete Tyne business, viz Hawthorne..... there seems a propensity some-where among us to fatuous Tyneside dealings". ***

Rendel was anxious above all to secure new blood on the Board and in 1911 he was successful. A concordat between the feuding elements was signed:

* J.R. Perrett, chief naval architect and general manager of Armstrong Whitworth, in a paper to N.E. Coast Institution of Engineers and Shipbuilders, July, 1914.

** J.D. Scott, p.89. *** Ibid.

"A solemn Treaty between the Executive Directors and the independent directors under which the Executive Directors implicitly pledged their honour to effect certain specified introduction of new blood on the Executive and on the Board provided the independent directors would accept responsibility for the executive directors' irregularities for many years past in secretly appropriating to themselves exceptionally large remunerations and would further sanction certain very liberal remunerations in future." *

Despite such nefarious internal activities, the public reputation of the company remained high. But it was not the only warship builder in the North East. Palmer's were not far behind as regards work for the Admiralty but, with a couple of exceptions, they sold no naval ships abroad.

Palmer had started naval production, as we have seen, with H.M.S. "Terror" in 1856. Six years elapsed before he built another warship, H.M.S. "Defence", an armoured frigate; another four years before he built his third and a further four years before his fourth. But then with the frigate "Swiftsure", costing £192,680, warship building began in earnest. In the 1870's the company built four battleships, with aggregate displacement tonnage of 20,780, and 12 river gunboats. **

From then, until the end of the First World War, the Jarrow yard was scarcely ever without at least one warship on the stocks.

The ships included the battle cruiser "Queen Mary" of 27,000 tons displacement, which at £2,078,491, was the costliest ship ever built at the yard. They included, too, such, famous battleships as the "Russell", "Lord Nelson", "Hercules" and "Resolution", together with 11 cruisers, 48 torpedo-boat destroyers and even two submarines. ***

* J.D. Scott, p.93.** "The Town That Was Murdered", p. 63-4.
*** Palmer's Own Records.

Nearby, at Hebburn, Hawthorn Leslie had won its first Admiralty contract in 1889. This was for the 20-knot, third-class cruiser "Bellona" on which the company made a loss of £14,000. It had already, however, built three cruisers for the Russian Volunteer Fleet and was to build another five.*

But apart from this rather unhappy connection, all the company's naval orders before the First World War were from the British Admiralty and nearly all of them were for torpedo boat destroyers. Between 1890 and 1916 it built 45 such vessels.**

Swan and Hunter had also entered naval production in the 1880's by building three cruisers for Russia, the "Czar", "Czarevna" and "Czaritsa", each of 2,340 displacement tons. The first Admiralty contracts were not given until 1908 and during the next few years the company, under its new name of Swan, Hunter and Wigham Richardson built a handful of torpedo boat destroyers. But if the company was so far of little account in naval building it had made great strides in merchant building. In fact, in 1906 it had the largest output of any firm in the world, a position that was confirmed by the "Mauretania". ***

THE "MAURETANIA"

She was the fastest and most opulent ship of her day and her career began at 4.15 p.m. on Thursday, 20th September, 1906, when she slid into the Tyne. A Commentator wrote:- "The construction of the "Mauretania" and of her Clyde-built sister, the "Lusitania" represents by far the most stupendous task ever entrusted to shipbuilders and engineers. With the launching of the "Mauretania" Tyneside is at once established in the forefront among the world's shipbuilding centres by the construction of one of the two largest, swiftest mail steamships afloat, the building of which involved

* J. Bulman in "The Private History of R. & W. Hawthorn, Leslie & Co." ** Ibid. *** "Launching Ways".

the scientific solution of the most difficult problems in naval architecture and marine engineering."*

The North East reputation had been based, as we have seen, on a high output of plain cargo tramp vessels, of colliers, oil tankers and of warships. But at the turn of the century the area turned increasingly to high-class passenger ships, of which the "Mauretania" was an unsurpassable example.

And it was at this time that British opinion began to swing back in favour of fast liners after a period when intermediate liners with lower running costs had been preferred. This swing-back was given further momentum when the Germans built four very fast liners and in 1903 the British Government signed an agreement with Lord Inverclyde, Chairman of Cunard, for the construction of two ships of unprecedented speed and dimension. They were to be "capable of maintaining during the voyage across the Atlantic a minimum average speed of 24-25 knots in moderate weather." **

The Government agreed to provide a sum not exceeding £2,600,000 at 2¾% interest and a further annual subsidy of £150,000. In return the vessels were to be constructed to Admiralty requirements as auxiliary cruisers and the Government was to have the right to require their services in wartime.***

The agreement was the culmination of talks and discussions which had lasted for almost three years.
Swan, Hunter and Wigham Richardson (or Swan and Hunter as they were then) had first begun to submit designs in 1901. The main initial problem was the shape of the vessel and many experiments were carried out. In fact, to obtain better results than any possible from towing models in a tank, a

* "Shipbuilder", Vol. 1, page 61.
** Ibid. *** Ibid.

self-propelled model 47 ft, 6 ins. long - a sixteenth of the actual size of the completed ship - was built for elaborate testing in an enclosed dock.* The experiments showed a decided advantage for a broader and somewhat finer ship which required about seven per cent less power to attain equal speed. The increased beam proposals were too much for Vickers, Sons and Maxim, the other potential builders.** Their docking facilities at Barrow would not allow such breadth and they withdrew. This allowed John Brown, who had already built thirty vessels for Cunard, to come forward and the Clyde trustees agreed to widen and deepen the river to take the "Lusitania".

Both Swans and Vickers, whose designs had been provisionally adopted, suggested reciprocating engines capable of developing together over 60,000 horse power, Cunard, however, had had some experience with smaller turbine-driven ships and they wondered whether turbines could be used for these larger vessels. They set up a special commission which was still sitting as work on the hull began in 1905. The Commission eventually reported in favour of turbines - with Charles Parson himself a member, it might have been difficult to have done otherwise! ***

The Commission recognised that although turbines would be much larger than any machinery of that type then at work, they promised an absence of vibration, a saving in total weight of propelling machinery, a reduction in engine room staff and above all a cut in the cost of maintenance.

Before starting work, C.S. Swan and G.B. Hunter amalgamated with Wigham Richardson to increase their resources

* From "Forty Famous Ships" by H.B. Culver & G. Grant, published New York, 1938.

** "Mauretania", a special number of the "Shipbuilder", November 1907, by A.G. Hood and H. Bocler.

*** Ibid.

including an interest in the Wallsend Slipway and Engineering Works where all the machinery was made.* The combined firms made many important improvements and extensions to their premises. Two new building berths, capable of building the biggest ships, were laid out and covered by glass roofs 150 ft. high to allow work to continue in bad weather. Seven overhead electric cranes were provided. Large sheds were erected near the berths containing the most powerful machinery for steel work- beams of up to 88 ft. normally rolled in two lengths, could now be rolled in one - while another group of sheds was put up for preparing frames and floors of the largest size. Railway sidings, with direct connections to the North East Railway Company system, were added to allow materials to be brought direct to the building berths. **

From the keel-laying to the launch, about eighteen months elapsed. By then the "Mauretania" was one of the most impressive ships in the world. She had an overall length of 790 ft. was 88 ft. wide and 60 ft. deep. She had accomodation for 560 first-class passengers, 500 second-class, 1,400 third-class and 800 crew - a total of 3,260. Each passenger had fifty per cent more space than in any other Atlantic liner. There was a complete telephone system aboard and a complete electric installation, including electric lifts to convey the passengers among the nine decks. ***

"The passenger accommodation of the 'Mauretania' wrote one observer, "When its spaciousness and beauty of decoration are taken into account, certainly justifies the use of a somewhat extravagant term 'a floating palace'."ɵ

There were 664 staterooms provided for passengers as well as numerous public rooms. Each seemed to be a classic of its kind. "The grand entrances and staircases are treated in the 15th century Italian manner. The woodwork is French

* "Launching Ways". ** Special Nos. of "Shipbuilder".
*** Ibid. ɵ Ibid.

walnut, the panels being veneered with some of the finest figured wood that one could wish to see.

"The grand staircase in unequalled in size and beauty in any vessel afloat and indeed it is worthy of any mansion ashore.... The two first-class dining rooms are panelled in straw-coloured oak in the style of Francis I..... The rooms are upholstered in deep pink and a fine 16th century tapestry at one end gives an admirable effect..... The first-class lounge or music room is a noble apartment treated in that charming style which obtained in France in the last quarter of the 18th century and of which the Petit Trianon is perhaps the most typical example. The arrangement of the panels, and the delicacy and design of the carvings and columns, might have been the work of Gabriel or Migue but the architect has, in his scheme of colour, been inspired more by the sumptuous furniture of the period than by the wall decoration and that with the happiest result..... Sixteen pilasters of Fleur de Peche marble with ormolu capitols and bases, a chimney piece of the same materials, soft creamy curtains with coloured borders and three fine panels of French tapestry, produce a colour effect which leaves nothing to be desired..... The library or writing room..... will probably be regarded by many passengers as being the most beautiful in colour in the ship... The wall panelling is of sycamore stained a silver grey..... The smoking room..... is greatly enhanced by the waggon-headed roof which is divided into three sections and decorated with beautifully-modelled plaster work." *

There were two regal suites each comprising drawing room, dining room, two bedrooms, bathrooms and private corridor; 68 special state and 'en suite' rooms, in addition to the first, second and third class accommodation.

The launch was a tremendous spectacle, seen by a conservative estimate of 80,000 people. In itself it was a remarkable achievement for the "Mauretania's" weight in

* Special Nos. of "Shipbuilder".

motion equalled 17,000 tons - a launching weight never matched before. Over 290 hundredweights of tallow was used, together with 12 cwts. of train oil and 22 cwts. of soft soap to make her slip down the berth. Then six drag chains on each side, with a total weight of 1,000 tons, were used to pull her up. *

The Times devoted more than a column to the launch and commented: "The occasion was of unusual interest, even in a river where many giant vessels have been built, and the crowd of spectators was enormous."* *

And the Newcastle Daily Chronicle added: "The anxiety to witness the launching was very great and the afternoon trains carried thousands of visitors to Wallsend, from Newcastle, Shields and elsewhere. The streets round about the yard all had a complement of townsfolk. It was indeed a gala day in the mid-river town."***

A little over a year later, on the 6th November, 1907, she began her maiden voyage across the Atlantic with a consignment of £2½ m. in gold from the Bank of England to the United States Treasury. θ The journey lasted five days, five hours and two minutes. Returning on 30 th November, she reached Queenstown in four days, twenty-two hours and twenty-nine minutes at an average speed of 23.69 knots, breaking all previous records for trans-atlantic crossings. †

There followed a short period of retirement to adjust several details in her machinery. But the adjustments were not as important as a change which was made in 1909 when screw propellers of a new type were fitted. This change soon led to

* Special Nos. of "Shipbuilder".
** The Times, 21st September, 1906
*** Newcastle Daily Chronicle, 21st September, 1906.
θ "Forty Famous Ships" by H.E. Culver & B. Grant", New York 1938
† Ibid.

new records for both the eastward and westward journeys. Going to America from 10th June 1909 she completed the journey in four days, seventeen hours and twenty-one minutes at an average speed of 25.88 m.p.h. It was on this trip that she covered 671 miles in 24 hours - by far the greatest distance then covered in a day's run.*

But more was to come. On a round trip beginning on 9th December 1910, the "Mauretania" crossed the ocean in a little less than 12 days. In 1931 she established another record by crossing four times within a single month - a distance of 12,400 miles.** So much for the North East's reputation for being able to build only cargo vessels!

The growing war fears in 1912 - 13 led the British Admiralty to exercise its right of requisition. Gun mountings had already been installed so that when war came in 1914 the "Mauretania" was ready to receive the necessary armaments to fit her as an armed transport ship. ***

One of her tasks was to take troops to Gallipoli and she carried over 10,000 soldiers. In September 1915 she was converted into a hospital ship and in 1918 she helped to carry United States troops to France.

Her great speed enabled her to penetrate many submarine zones and she was one of only five troop ships that steamed by themselves, no convoy being able to maintain her speed.

After the war, she returned to her haunts in the Atlantic where new competitors faced her. Even in 1929, perhaps spurred by the efforts of the newly-launched "Bremen"+ and "Europa", she could still make the run from the Ambrose Channel lighthouse in New York to Plymouth in four days, seventeen hours and fifty minutes. And on her next westward journey she pulled back

* "Forty Famous Ships". ** Ibid. *** Ibid.

\+ On her maiden voyage, the "Bremen" beat "Mauretania's" fastest westward time by nine hours.

the "Bremen's" lead to five hours two minutes. For a 23-year old ship it was considered to be a very fair achievement.

But she was still to achieve her best performance.* On 5th August 1929 she completed her fastest run for any 24-hours by covering 687 miles at an average rate of 27.48 knots. And four years later in 1933, just two years before she was broken up, she achieved her ~~highest~~-ever speed of 32 knots, which she maintained for 112 miles.

Altogether, the "Mauretania" made 350 voyages across the Atlantic for a total of over 2,500,000 miles. Her last crossing began at New York on 26th September 1934 and ended at Southampton just as the "Queen Mary" was being launched.**

In April 1935 she was sold to be broken up. The auction sale to dispose of parts aroused a tremendous wave of sympathy and there was a great deal of bidding for souvenirs. Even single letters which had composed her name at the bow or stern fetched high prices. And other relics such as her ensign staff realised still higher figures. It seemed that every sea-lover in England wanted a part of the "Mauretania" which had dominated the Atlantic for 22 years from 1907 to 1929 as the fastest liner in the world. ***

THE "TURBINIA"

The great success of the giant "Mauretania" was due above all to a development that had taken place 10 years before she was launched - a development pioneered by the tiny "Turbinia".

By the end of the 18th century, as we have seen, British shipbuilding was supreme. And there was probably no more effective demonstrations of this fact than the Naval Review held at Spithead in June 1897, in honour of Queen Victoria's Diamond Jubilee. It seemed to symbolise for a euphoric public the height of English power, economic and military. Over 160 war

* "Forty Famous Ships". ** Ibid. *** Ibid.

vessels were on display, arranged in four lines, each five miles long. It was an emotional, patriotic sight, as the Times reported:*

"The Review tomorrow..... cannot fail to be one of the most characteristic and striking national ceremonies in celebration of the Diamond Jubilee. It possesses a significance which is directly and intimately connected with the welfare and prosperity of the Empire..... and may indeed be regarded as an inspection or stock-taking of Britain's sea-guard..... The fleet..... is certainly the most formidable in all its elements and qualities that has ever been brought together and such as no combination of other countries can rival."

The Times was not disappointed. It was a magnificent occasion of unmatched power witnessed by unsurpassable nobility. Half of Europe, it seemed, had come to see the Prince of Wales inspect the Fleet on behalf of his mother.

But no sooner was the inspection over than the solid pomp and splendour of the occasion was shaken by a tiny ship, only 100 feet long and nine feet in beam, nipping at 30 knots up and down the lines of stately warships.

Her name was "Turbinia" and she had been built in Newcastle by an Irish aristocrat, the Hon. Charles Algernon Parsons. No other North East invention was to have a bigger influence on marine engineering, but just after 2.0 p.m. on Saturday, 26th June 1897, her appearance seemed audacious, unbelievable. The correspondent of the Times wrote:**

"During the passage of the Royal procession the lines were kept creditably clear by the vigilant and ubiquitous patrol-boats told off for the purposes, but in spite of all their efforts some

* The Times, Friday, 25th June, 1897.

** The Times, Monday, 28th June, 1897.

few small craft and steam boats managed to defy their authority. Among these was the now famous "Turbinia," the fastest vessel in the world. At the cost of deliberate disregard of authority, she contrived to give herself an effective advertisement by steaming at astonishing speed between the lines A and B shortly after the Royal procession had passed. The patrol boats which attempted to check her adventurous and lawless proceedings were distanced in a twinkling, but at last one of them managed by placing herself athwart her course to drive her out of the lines astern of the French cruiser "Pothuau." Her speed was, as I have said, simply astonishing, but its manifestations was accompanied by a mighty rushing sound and by a stream of flame from her funnel at least as long as the funnel itself. Unless these commonplace but very serious defects can be corrected, it is manifest that the system of propulsion devised by Mr. Parsons cannot be applied to Torpedo boats for whose operations silence, secrecy, and invisibility are indispensable. The "Turbinia" again made her appearance as the Royal yacht was weighing anchor and assuming a position, rather slowly and with much backing of her engines accompanied by the setting of a jib, which would enable her to steam through the lines. The "Turbinia" waited astern of the "Powerful" until the "Victoria and Albert" was well under way, and then followed her, at first with moderate speed, but gradually quickening up until the sea in her immediate wake was churned into a mass of white and seething foam. Probably she overtook the yacht within a very short distance and passed her at full speed, and perhaps her lawlessness may be excused by the novelty and importance of the invention she embodies. But visitors to the Jubilee Review 1887 will perhaps remember that a prominent feature of that occasion was the appearance of the Nordenfelt submarine, or rather submerged boat, just as the appearance of the "Turbinia" was a prominent feature of the present occasion. Little or nothing has since been heard of the

Nordenfelt boat as a practical invention. Absit Omen. Everyone would regret if the "Turbinia", after her brilliant but unauthorised exhibition of yesterday should turn out only a similar nine days' wonder."

As it happened, she was anything but a "nine days' wonder" nor was her appearance, apparently, unauthorised. A letter in the Times the next day from Mr. George Baden-Powell, took up the point:*

"Sir,

Your correspondent at the great naval review writes of the remarkable performance of the "Turbinia" - 'the fastest vessel in the world' - that she 'contrived at the cost of a deliberate disregard of authority' to make a 'brilliant but unauthorised ' exhibition of 'astonishing speed'.

I happened to be on board the "Turbinia" at the time, and in justice to her designer, the Hon. Charles Parsons, and to Mr. Leyland, who were running her, I ask leave to state that the astounding runs she made between the A and B lines on Saturday were in obedience to a message brought by a picket boat that the admiral wished her to show her best speed, more especially for the benefit of His Royal Highness Prince Henry, who was watching her from the German man-of-war.

The exhibition of speed, so far from being unauthorised, was especially invited by the authorities.

Experts will like to know that on this run the "Turbinia" topped the unprecendented speed of 34 knots. The most noticeable feature was the entire absence of vibration.

I am your obedient servant,

George Baden-Powell.

Carlton Club.

* The Times, Tuesday 29th June, 1897.

There can be no doubt, however, that Parsons had taken Turbinia to Spithead on his own initiative and that he was determined to achieve maximum publicity.* This he certainly did.

Within a month the Admiralty began serious study of turbine propulsion and within six months had placed an order for the world's first turbine-driven torpedo-boat destroyer.** Only 13 years later Parsons turbines were powering 333 vessels throughout the world. They represented an aggregate horse power of 4,700,250.***

That, however, was an unknown future in 1897 for Charles Parsons. He had been born in London on 13th June, 1854, the sixth and youngest son of the third Earl of Rosse. The family home in King's County, Ireland, often entertained the leading scientific men of the day who no doubt fired the imagination of young Charles.**** Like his brothers, he was not sent to school but received private tuition from men of such scientific standing as Sir Robert Ball and Dr. Johnstone Stoney.

He later went to Trinity College, Dublin and to Cambridge before starting a four year's engineering apprenticeship at the Elswick Works of Sir William Armstrong & Co. This was followed by two years in Leeds, where his enormous inventive talents were already evident. In 1884 he acquired a junior partnership in the Gateshead firm of Clarke, Chapman & Co., and was put in charge of their newly-formed electrical department.

* See "Turbinia" guide book in the Museum of Science and Engineering, Newcastle, reprinted from the Link house organ of the Richardsons Westgarth Group, p. 5.

** See "The Steam Turbine and its application to the Propulsion of Vessels" by the Hon. C.A. Parsons, trans. Institution of Naval Architects, Vol. 45, June 1903.

*** See "The Evolution of the Parsons Steam Turbine" by Alex Richardson, London 1911, p. 14.

**** "The Steam Turbine" by R.H. Parsons, published for the British Council by Longmans, Green and Co., in 1942 p. 28.

Parsons immediately began to take up the problem of turbines. The Fundamental idea itself was not new. Between 1843 and 1848 considerable progress had been made in turbine design but constructional difficulties had proved insuperable.* A Swedish engineer, Dr. Gustaf de Laval of Stockholm had overcome some of them in the early 1880's but his designs were only useful for driving comparatively small machines.

Parsons "alone possessed the genius and courage to transform a possibility (the turbine principle) into a reality."** Turbines produce power by using the velocity of a jet of steam instead of using the pressure of the steam to drive a piston as in the ordinary reciprocating engine. Earlier inventors had already shown that a jet of steam could be made to turn a wheel by acting on blades set around its circumference. The difficulty lay in using the excessive velocity of steam. Even at low pressure it can escape into the atmosphere at 2,500 ft. per second or 1,700 miles an hour. To make effective use of such velocities in a simple turbine the blades and other moving parts would have to travel at about half the speed of the steam. This was clearly impossible if only because of centrifugal force. What Parsons therefore set out to do was to reduce the steam speed to a manageable amount. In his booklet on the steam turbine R.H. Parsons wrote:***

"Now the speed of a jet of steam will obviously depend upon the difference of pressure that causes the flow. It occurred to Parsons that he could attain his end by the device of causing the whole expansion of the steam to take place by a series of steps, each partial drop of pressure being only sufficient to generate a velocity that could be efficiently utilised by blades running at a moderate speed. To put this

* Charles Parsons, His Life and Works by Rollo Appleyard London, 1933, p. 34.

** "The Steam Turbine" by R.H. Parsons, p. 2.

*** Ibid.

idea into effect he constructed a turbine consisting of a cylindrical rotor enclosed in a casing. The steam flowed along the annulus between the two, parallel to the axis of the machine, and in so doing it had to pass through rings of blades fixed alternatively in the casing and rotor. The passages between the blades of each ring formed virtually a set of nozzles in which a partial expansion of the steam could take place. In passing through each ring of fixed blades the steam acquired a certain velocity due to this expansion, and the jets so formed gave up their energy in driving the succeeding row of moving blades. The passages between the latter blades also acted as nozzles, permitting a further expansion, so that the moving blades were impelled partly by the "action" of the steam entering them and partly by the "reaction" of the steam leaving them.

This method of division into stages, known as "pressure compounding" reduced the jet velocity from several thousand to two or three hundred feet per second. All this Parsons achieved in 1884. By 1885 Parsons' first steam turbine was running successfully at Gateshead, giving six horse-power at 18,000 revolutions per minute".*

His earliest patents taken out in 1884 show that from the start he appreciated the part which turbines could play in marine propulsion. But it was not until 1894 that he was able to turn to this aspect. By this time he had had a quarrel with Clarke, Chapmans and severed his connection and had set up his own firm at Heaton. In so doing he had lost the right to his earliest designs and a long, legal argument ensued for five years before he retrieved them.** In the meantime, undaunted, he had

* "Charles Parsons" by Rollo Appleyard, p. 32.

** "Charles Parsons" by Rollo Appleyard, p. 74.

developed another but less successful type of turbine, the radial-flow machine, almost as a competitor against himself.*

In January 1894 Parsons formed the Marine Steam Turbine Co. Ltd., to adapt turbines to marine work. The Hon. C.A. Parsons himself was managing director. The company immediately began to build and equip the "Turbinia" at a cost of £16,000.** By the 14th November, the vessel was ready for her first preliminary trial. But initial hopes were not immediately realised and during the next two years 31 trials had to be held and many alterations made. *** The speed achieved on early trials by the "Turbinia" was far below Parsons' expectations worked out in a pond at Ryton-on-Tyne, where he lived. Using first a 2 ft. model and later a 6 ft. model, he had been able to determine both the torque and the resistance.**** From the results he calculated the efficiency of the propellor and the 'slip ratio'. It is worth recording that the difference between his calculations and those made in the Government tank at Portsmouth three years later was only 2.3 per cent.

But the "Turbinia" herself was well wide of his predictions, largely, it was felt, because of excessive propellor slip. Both two-bladed and four-bladed propellors were tried, but with little difference. Then it was decided to use multiple propellors and they brought the mean slip down from 48.8% to 37.5% *****

Nine different sets of propellors in all were used but the results in every case showed a low propellor efficiency. The original turbine engine was removed and replaced by three separate turbines in series each driving a shaft. And it was

* Turbinia, p. 2.

** Charles Parsons, p. 88.

*** Turbinia, p. 3.

**** "Evolution of the Parsons Steam Turbine" p. 70.

*****Turbinia, p. 3.

decided to use the parallel-flow type before the Turbinia was built but because up to that date no parallel-flow turbines had been built to a size larger than 75 k.w., it had been decided to use the radial-flow turbine. By the end of 1895, however, Parsons had received a report of satisfactory results from a 350 k.w., parallel-flow turbine generator installed in Manchester.* This type was now put into the "Turbinia," although it was always appreciated that it was the propellors at fault rather than the machinery itself.

Careful fundamental research into propellor design led to a big improvement in efficiency. It was found that the best results were achieved with three propellors of 18 ins. diameter and 24 ins. pitch on each shaft.

Trials began again in February 1896 and speeds of 32 knots were soon achieved. Such speeds of course were revolutionary at that time, but they completely fulfilled Parsons' beliefs.

During all this time, the Admiralty had been kept fully informed of the difficulties and the ways in which they were being overcome. But when success was achieved their Lordships showed little real interest. Parsons decided on a practical demonstration which could not be ignored. The Naval Review at Spithead was just the occasion he was looking for.

Within six months of that famous demonstration of turbine capabilities, the Admiralty placed an order with Parsons Marine Steam Turbine Company, of Wallsend for a 31-knot torpedo-boat destroyer, 210 feet in length, 21 ft. in beam and of 370 tons displacement.

The Admiralty also agreed that a torpedo-boat destroyer the "Cobra", then being built at Elswick by Armstrong Whitworth should also receive turbine machinery. The "Cobra" was the first

* "Charles Parsons", p. 102.

torpedo-boat to be so fitted and upon her fell the greater share of the preliminary trials.*

The engines in both vessels were similar to those in the "Turbinia", except that they consisted of two distinct sets of engines on each side of the vessel. There were four screw shafts in all, entirely independent of each other. Both vessels performed splendidly on trials. The "Viper", for example, with full trial weights on aboard achieved a mean speed of 36.5 knots on a one hour's full-power trial. This speed represents about 11,500 i.h.p. in a vessel of 370 tons displacement as compared with 6,000 i.h.p. developed in similar ships. The "Viper" more than fulfilled all the guarantees in the contract - her speed was 5 knots greater than specified and her coal consumption less.**

Charles Parsons wrote: "The turbines worked most satisfactorily and with an immunity from trouble quite unknown with the reciprocating machinery of similar vessels."

Unfortunately trouble of another sort soon struck. On 3rd August, 1901, the "Viper" foundered on rocks near Alderney in thick fog, becoming a total wreck, and five weeks later, on 18th September, the "Cobra" broke in two off the Lincolnshire coast, with the loss of 44 lives, many of them being chief members of Parsons' Wallsend staff.

"The effect of this second tragedy cut deep into the hard metal of which Parsons was wrought." wrote his biographer, Rollo Appleyard. Appleyard added: "To Sir Charles Parsons the fate of his faithful men in that calamity was a sorrow that clung to him through life. At the very last meeting of the directors of his company at Newcastle, a few weeks before his own death, his thought was for the dependents of those lost in the "Cobra " disaster."***

* "Charles Parsons" p. 102.

** "The Steam Turbine", by Hon. C.A. Parsons.

*** "The Steam Turbine", p.153.

Appleyard went on: "The facts relating to the wreck of the 'Cobra' have for 30 years been recorded in the archives of the Admiralty. They have been the subject of enquiry by Coroner's Inquest, Court-martial and a committee on torpedo-boat destroyers, but the cause of the collapse of the vessel has never been conclusively settled." *

The Court-martial came to the conclusion that the "Cobra's" loss was "attributable" to the structural weakness of the ship. The court also found that the "Cobra" was weaker than other destroyers, and in view of that fact, "it is to be regretted that she was purchased into His Majesty's Service."**

In view of this finding, the Admiralty appointed a special committee, "The committee on Torpedo-boat Destroyers", to enquire into the construction of the "Cobra". After exhaustive comparative tests on another destroyer, H.M.S. "Wolf," the Committee found that the system of building the "Cobra" did not differ from that of the 30 knot vessels designed and built for the Admiralty.

Phillip Watts, who in 1903 had become Director of Naval Construction, regarded the report as very satisfactory and as likely to restore confidence in existing destroyers.*** Parsons, of course, was even more pleased. As Appleyard wrote: "It completely vindicated Parsons, it cleared away any lingering doubts that might have existed to the adoption of the turbine for marine propulsion from the point of view of safety to structure, and it emphasized the need for strict supervision in the construction, maintenance and handling of high speed craft. There was a devout desire among engineers and the public that the mystery of the sagging and tearing asunder of the "Cobra" when she broke her back might be placed beyond dispute, but an element of doubt has always enshrouded the cause."

** "The Steam Turbine", p. 152. * "Sir Charles Parsons.".
*** Ibid, p. 157.

Meanwhile, unless something drastic could be done to retrieve the situation Parsons feared that the whole marine turbine venture might fail.*

But at least one member of the shipping community had faith in turbines. He was Capt. John Williamson who ran a steam-boat service on the river Clyde. In 1899 he approached the Parsons Marine Steam Turbine Company to see whether it was possible to re-engine a paddle ship, i.e. take out the engine, remove the paddles and put in turbines to drive the propeller.**

Parsons thought it was possible and the "King Edward" became the first turbine passenger ship in the world. She was converted by Denny Brothers of Dumbarton in 1901 for the Fairlie and Campbeltown service. Williamson and his passengers were so pleased with his 20 knot vessel that he placed an order for a second one in 1902, the "Queen Alexandra", again built by Denny Brothers with turbines from Wallsend.

Within the next year turbine propulsion was adopted for the cross-channel boats, "Queen" and "Brighton". The steam yacht "Emerald" built for Sir Christopher Furness in 1903 became the first turbine vessel to cross the Atlnatic, closely followed by the Allan Line's two 13,000 ton vessels "Virginian" and "Victorian" and the Cunard Company's 30,000 ton liner "Carmania".

Meanwhile the Admiralty had partially recovered from the shock of the "Cobra" and "Viper". When it placed orders for four 3,000 ton cruisers in 1902 it was decided that one of them, H.M.S. "Amethyst" should be fitted with turbines for direct comparison with its sister ships, which were fitted with reciprocating engines.

*   The Steam Turbine, by Hon. C.A. Parsons, p. 158.

**   Ibid, p.158.

The results were so obviously in favour of the Amethyst that the Admiralty's last prejudices were broken down. The result was that a committee on Naval Design, appointed by the Admiralty in 1905 advised that in future turbine machinery should be used exclusively in all types of warships. That year the keel was laid for the "Dreadnought", the fastest and most powerfully-armed battleship in the world.

The final triumph came for Parsons when the Cunard Company decided, after careful investigation, to install turbines in its two giant passenger ships, "Lusitania" and "Mauretania", by far the biggest ships then in existence. It can be appreciated how courageous this decision was when it is realised that the two vessels were fitted with 70,000 h.p. turbines at a time when the most powerful turbine ships afloat did not exceed 14,000 h.p. Virtually every Navy in the world and every mercantile marine subsequently took up the turbine. Its contribution to the Royal Navy can be seen from the following table: *

	Royal Navy	
	August 1914	September 1939
No. of ships (torpedo-boats and larger)	641	458
Total displacement of these ships	2,080,000 tons	1,546,000 tons
Total horsepower of these ships	6,731,000	12,267,000
Percentage of above h.p. developed by turbine machinery	53	98
Fraction of the above percentage with mechanical gearing transmission	1/50	47/50

* Parsons Memorial Lecture by Sir Stanley Goodall, Royal Society of Arts, 26th March, 1942.

Sir Stanley Goodall commented; "It is no great exaggeration to say that in this war, when our warships go to sea, they are largely propelled by the brain of Sir Charles Parsons, for to him we owe the marine steam turbine and mechanical gearing transmission." *

Mechanical gearing was necessary to allow the turbine engine and the propellor shafts to rotate at their most efficient speed. Since they are operating in different media- steam and water - there is a wide difference in their best operating speeds. For warships and the fastest mercantile ships were able to operate perfectly well but in order to adapt the turbine for use by the immense fleets of slow cargo ships some form of mechanical gearing was necessary. Parsons turned to this problem in about 1907 and carried out exhaustive tests. A couple of years later, he made a practical demonstration in the "Vespasion" which worked perfectly. Only ten years after the "Vespasion" trials, it was estimated that 18 m.h.p. were being transmitted through gearing in warships and merchant vessels.

Parsons inventions were not confined to engineering.** As a father he was continually inventing new mechanical toys for his children. And as a young man in Gateshead he had devised methods for the manufacture of incandescent electric lamps for the Sunbeam Lamp Company, of which he was one of the founders. In 1893 he built a steam-driven helicopter which flew for a few yards. He made an "Auxetophone" for the amplification of musical and vocal sounds which was "as remarkable for its mechanical perfection as for the volume and purity of sound it produced." Throughout his life he was fascinated by the problem of making diamonds by the crystalliation of carbon and in all he spent £20,000 on his research but without any real success.

** "The Steam Turbine" by R.H. Parsons.

* "Sir Charles Parsons & The Royal Navy" by Sir Stanley Goodall in a lecture of the Royal Society of Arts, March 1942.

His work, his energy, his inventiveness, led to nine universities bestowing honorary degrees upon him. He was given the Companionship of the Order of the Bath, followed by a Knighthood. And in 1927 he became the first engineer to receive the Order of Merit. He died in February 1931 at the age of 76.

DOXFORD'S DIESEL

Although the advances represented by warship production or by the "Turbinia" and the "Mauretania" were by far the most important, they were by no means the only developments taking place in north east shipbuilding at the turn of the century. For example, the Sunderland yard of William Doxford, the biggest on the river by this time, made two very significant innovations. First, it designed a new type of cargo vessel, the "Turret" ship, and then a few years later it started to experiment with diesel engines.

As we have seen, Doxford's began business in 1840. * Despite the depression that coincided with its early years when 30-40 Sunderland builders went out of business, the firm came through. In 1857 it moved from the original location at Coxgreen to Pallion, where it soon established a world-wide reputation. In 1879 it built the largest steamer afloat, the 4,500 ton "Grecian". In 1896 it achieved the same honour again by turning out the three largest single-deck ships afloat, each of 12,000 tons. And in 1905 and 1907, its output figures of about 90,000 gross tons were the highest for any yard in the world. This was made possible by the 1904 rebuilding programme when the original five berths were scrapped to make way for three berths of greater length, each capable of building 12,000 ton ships. But, above all, its success was based on the rapid popularity of the turret design introduced in 1893. **

The turret design was based on an American idea patented by Captain A. McDougall of Duluth, Minnesota. This was for a whaleback steamer with a spoon-shaped bow and an upper

* "Where Ships are Born".p.37. **.p.t.o.

deck to carry the deck houses and deck machinery. The advantages of the design were said to be cheapness in construction because of the simplified hull form, greater safety at sea because water could not lie on the upper deck and less chance of damage to the deck-houses because of the shape of the turrets.*

In September 1891 Doxford's received their first enquiry for a modified whaleback and within three months the company had produced their own designs. The main innovation was a continuous turret from stem to stern. It was felt that this would provide a high navigation platform on which all vulnerable openings could be sited, a much higher reserve buoyancy, a lower tonnage but a higher stowage capacity and a cheaper price. **

Despite these advantages, the shipping world was initially suspicious. Doxfords had to help to set up a special company, the Turret Steam Ship Co. Ltd., to buy and operate the prototype. They even offered favourable credit terms and accepted old vessels in part exchange to encourage owners to take up the model. ***

Slowly interest was aroused. By 1895 the company was building nine turret ships. Between 1892 and 1911, when thelast turret ship was built, Doxfords built 176 of them with a total gross tonnage of 683,458. ****

Besides Doxford's own output, Hawthorn Leslie, Swan and Hunter, and Vickers, Sons & Maxim built six turret ships between them under licence.

Even after the initial fears had been quietened, there were two other problems. At the end of 1907, the "Grindon Hall", owned by Edward Nicholl of Cardiff, foundered on her way from Sulina to Glasgow with a cargo of barley and maize. A secret investigation found that she was unstable in the way she was laden. The press demands for an official enquiry were strengthened by further incidents. The "Walkure" keeled over

* N.A. Roberts.
** Ibid. *** Ibid. **** Ibid.

and tipped her deck cargo of timber into Barry Dock, while the "Stiklesstad" went missing on a passage from Glasgow to Sydney with general cargo. Within two months, on 31st January 1909, the "Clan Ronald", laden with grain and flour, capsized and sank off Adelaide with the loss of 40 lives. This time there was a Board of Trade enquiry which attributed the loss to an incorrect method of loading the ship. *

Doxford's issued special loading instructions to all turret owners to try to correct the bad name that these ships were gaining. This seemed to solve the problem. For although turret ships had a stability problem, they were perfectly safe if loaded properly and many of them went on to enjoy a long life. The last surviving turret ship was wrecked in 1963. **

The second problem was that of patents. In 1903 A.H. Haver, who had been the company's chief draughtsman, sued William Doxford and Sons, claiming that he was the actual inventor of the turret deck vessel which had been patented in the name of Charles Doxford. ***

Doxford's argued that Haver had beem amply rewarded by an increase in salary from £130 to £500 a year, by a gratuity of £500 and by receiving £500 in the shares of the company. The jury at Durham Assizes found for Haver, however, who was awarded damages of £1,250, still only a slice of the £150,000 profit which Doxfords were said to have made by that time out of the invention. ****

The success of the turret deck design led to many imitations. The most formidable rival was the trunk deck vessel, patented by Ropner and Sons of Stockton in 1897, which was almost always discontinuous running between poop, bridge and forecastle. The following year J. Priestman of Sunderland built a tower deck design which had top sides sloping gently down from the tower deck to a narrow harbour deck.

* N.A. Roberts. ** Ibid. *** Ibid. **** Ibid.

None was so successful as the turret design itself, however, which "trasnformed a small shipbuilding company..... into one of the largest merchant shipbuilders in the U.K., and laid a firm financial foundation for the development of the Doxford diesel engine with which experiments were being conducted concurrently with the building of the last turret deck vessel."*

Doxford's interest in marine oil engine was awakened in 1910 when the company started to design its first experimental engine. At this time Continental yards were far ahead of their British competitors in oil engine building, while, in the words of Mr. R.P. Doxford, "the old Country had practically no knowledge of the subject." **

Doxford officials therefore paid many visits to the Continent and "obtained much information in respect of what was good in the designs we saw and what was thoroughly bad".***

The company built its first experimental oil engine in 1912. This was a single cylinder, single piston, two stroke cycle engine, with a bore of 20 inches and a stroke of 36 inches – a very big cylinder at that time. The engine operated on the Diesel constant pressure cycle with air injection of the fuel, the compression and maximum combustion pressures being about 500 lbs. per sq. in. ****

Although the engine was capable of exceeding its designed performance, several inherent defects became apparent.

The principal defects were the weakness of the cylinder head because of the large valve pockets and the heavy pressure; the difficulty of transmitting the heavy piston loads through the engine framing and main bearings; and the rather high lubricating oil consumption. +

* N.A. Roberts in a privately produced history of "The Turret Deck Vessel", published by the firm, March, 1967.

** Speech of Mr. R.P. Doxford at the official sea trial of the "Yngaren", 14th June, 1921.

p.t.o.

Because of these defects "we did not consider the conditions demanded by sea-going vessels could be fulfilled but we had gained a lot of information during the two and a half years of building and trial of that engine. You can readily understand it required a considerable amount of courage and confidence to ask the Directors' permission to continue the experiments. This, however, was given and the then £30,000 spent in experiments quickly became £100,000."*

Developments by a German firm had shown the way to the opposed piston principle and by using this "a masterly solution could be obtained for the principal troubles of the 1910 engine." **The use of opposed pistons eliminated cylinder heads and the main bearings were relieved of combustion loads and the engine frame had only to withstand torque-reaction forces.

In 1913 the company designed its first opposed piston engine, 20 inches in diameter and 30 inches stroke of each piston. During November, and December, 1914 this engine ran a five week's day and night trial under the constant surveillance of Lloyd's Registry surveyors. The results proved "very satisfactory". ***

But the company was still not sufficiently satisfied. It turned its attention towards solid injection rather than the air injection which had been used so far. With the latter, the fuel oil was pumped into a receptacle in the fuel valve body where it remained under air pressure until the valve opened when it was forced by the air into that cylinder. ****

But this was more complicated and costly than solid injection where the same oil is ready to be forced into the cylinder by its own pressure the moment the same fuel valve

* Speech of Mr. R.P. Doxford, at the official sea trial of the "Yngaren", 14th June, 1921.

** Dr. Ker Wilson. *** Ibid. **** Ibid.

permits. Solid injection therefore dispenses with the otherwise essential air compression pumps which absorbed ten per cent of the power of the engines.

By 1919 Doxfords were ready for their first full scale opposed piston marine oil engine. It had four cylinders, 23 inches in diameter with a stroke of 45½ inches and of course relied on solid injection of the fuel. Even ten years later, in 1929, the majority of marine oil engines were still using air injection. *

This engine was installed in the motorship "Yngaren" built for the transatlantic Steam Ship Company of Gothenburg. Trials held in 1921 showed that her heavy oil consumption was only 9 tons a day at 10½ knots average speed, while her sister vessels required 36 tons of coal a day for similar speeds. And the "Yngaren" was able to maintain this speed at only 70 revs., well below the contemporary practice in other motors. Between 1919 and 1924 five engines of the same dimensions as the prototype were built and considering the novelty of the design the teething troubles were negligible. During this period the company discontinued the manufacture of steam engines and boilers to concentrate on the production of oil engines. They were in fact the most successful oil engine manufacturers in this country and the only company really able to compete with Continental engineers. By 1943 Doxford engines totalling about 2 million indicated horse power had been installed. Licences for the construction of the engine were held by six firms in this country and a seventh in the United States. **

OTHER MEN, OTHER METHODS

Many other developments, of less importance that those outlined above are worth noting. The Hartlepool firm of Edward Withy & Company, pioneered the "well-deck" cargo vessel, which became a speciality of the port. Between 1865 and 1889

* Dr. Ker Wilson. ** Ibid.

more than 350 of these vessels were built at West Hartlepool with an aggregate tonnage of over half a million. And from 1885-9 the three Hartlepool firms of William Gray & Company, Irvine & Company and Edward Withy & Company built nothing else.*

The first modern shipyard at Hartlepool had been started by Thomas Richardson and John Parkin in 1835. Within a few years they had rivals in Luke Blumer & Son; Pile, Spence & Co. Ltd., and J.P. Denton. The last mentioned was joined in partnership in 1862 by William Gray, a draper who had been born in Blyth. The firm then became known as Denton, Gray and, in 1871 when Denton died, as William Gray and Company.

A local historian claims that it was Denton, Gray who pioneered the well-deck steamer with the "Sandsend" built in 1869 or perhaps with the "Lizzie English" built a year earlier.**

The "well-deck" vessel solved the problem of keeping cargo vessels on an even keel whether they were loaded or not Before 1865 shipowners used "flush deck" steamers for their carrying trade. These tended to dip forward because the forward holds had a greater cubic capacity than the after holds. ***

The first solution was to block off part of the forward holds but this diminished the earning power of the vessel. It was then decided to move the engines further forward. This had the disadvantage, however, that when the ships were in ballast the propellor was too lightly immersed and speed was reduced. North East shipowners and builders found the answer lay in building a raised quarter deck which gave the after-

* Paper by G.W. Sivewright to N.E. Coast Institution of Engineers & Shipbuilders, February 1889.

** Robert Wood, History of West Hartlepool, West Hartlepool Corporation 1967. p.60-61.

*** Ibid.

holds the same capacity as the fore holds and held the aft well down in the water when sailing in ballast.

Another innovation, which was not so successful, was the "Monitor" type of vessel.* This went against conventional theory in increasing the wetted surface by having a groove running along the sides of the vessel under the water. The theory, worked out by William Peterson and Arthur Haver, the former Doxford's chief draughtsman, was that the groove would reduce resistance. Indeed Haver, who by 1906 was architect for the Monitor Shipping Corporation of Newcastle, found, after a year's experiments, that resistance was reduced by between 8 and 16 per cent. This was achieved because the groove reduced wave formation which was responsible for absorbing 40 - 60 per cent of the vessel's effective horse power. **

Some of the main force of the waves came from eddies swirling up in a circular motion. The grooves reduced the vertical speed of these waves and thereby cut their resistant force. Haver himself said: "Wave formation has practically been left alone as an ever-present evil, impossible of treatment either to reduce or remove, except to a very limited extent..... (but I am convinced) that in a groove, if placed properly, we have a far reaching and valuable improvement in the total efficiency of ships."***

The experiments seemed to indicate that important savings could be made. For a given deadweight tonnage it should have been possible to reduce the size of the engines and the hull, thus reducing first costs and economising in working charges and in coal consumption. Unfortunately these savings did not materialise in practice and the project faded out.

Mr. Joseph Isherwood, a director of the Middlesbrough shipbuilding firm of R. Craggs and Sons, devised a more

* "Shipbuilder" magazine, Autumn 1906. ** Ibid.

*** "Shipbuilder" magazine, Autumn 1906.

successful and far more important innovation - the longitudinal framing of ships.* This length-wise framing of a ship was in direct contrast to the sideways or transverse framing which was then normal.

Isherwood's new system sprang from his observations as a surveyor for Lloyd's Register. He had been born at Hartlepool in 1870 and after serving his apprenticeship as a ships's draughtsman with Furness, Withy and Company, the West Hartlepool ship-builders, had joined the staff of Lloyd's Register in 1896.

While studying plans for new ships submitted for the approval of Lloyd's register, Isherwood became convinced that the prevailing transverse system of ship construction was wrong from a scientific point of view. He felt that in this respect there was a profound difference between wooden ships, where the transverse system was essential, and iron and steel ships, where improvements could only be made by means of a new system.

John Scott Russell and Isambard K. Brunel had gone a long way towards devising a new system in the construction of that leviathan "Great Eastern". But it was not until 1907 that a system of universal application was perfected by Joseph Isherwood.**

Deep girders, spaced from 12 to 20 feet apart, extended right round the ship in a lengthwise direction and were joined to transverse plate frames which could now be put wider apart. This arrangement produced a more economical distribution of material, saving 100 tons in weight for a vessel 330 feet by 45 feet by 25 feet. It also opened the way to larger cargo-carrying ships. Oil tankers, especially, were considered dangerous in some respects before the Isherwood system was

* "Longitudinal Framing of Ships", article in "Shipbuilder" Autumn 1907.
** David Pollock in "Shipbuilder", magazine, Spring 1909.

introduced. They often broke their backs and hundreds of lives were lost in the ever-increasing oil-carrying trade.

In 1907 Isherwood severed his connection with Lloyd's Register. A few months later, the Middlesbrough shipbuilding firm of R. Craggs & Sons was building the first of the "Isherwood" ships. This was the 6,600 tons d.w. oil carrier "Paul Paix" for Lennards Carrying Company. It was followed by the shelter-deck River Plate Liner "Gascony" Of 5,660 tons d.w. for David MacIver, Sons & Co., Liverpool. The two vessels were immediate and complete successes.

By January 1914 a total of 276 ships, representing one and a quarter million gross tons, had been built to this method.* At that time 85% of all oil tankers under construction were being built in this way. By 1921 1,400 vessels had been built or were under construction to the Isherwood system. It was estimated that on a total 12,000,000 tons of shipping this represented, the Isherwood system had saved over 250,000 tons of finished steel or 1,250,000 tons of raw material. At the same time it had increased the aggregate deadweight carrying capacity of these vessels by 300,000 tons.

In June 1921 Isherwood was created a baronet. The Americans gave him their own version with a dinner in the Waldorf Astoria, New York, and a eulogy which began:

"When God intended that we should ultimately harness Jupiter and utilize the unseen forces of the ether for the benefit of mankind, He created Benjamin Franklin. When He intended that the peoples of the earth should come in closer communication with one another He created Morse and Alexander Graham Bell; and when it became His will that a greater safeguard be thrown about the lives of human beings on board ships at sea, he created Joseph William Isherwood."

* "Shipbuilder" January 1914.

A more important figure, certainly on the business rather than the practical side of shipbuilding, was Christopher Furness. Born in West Hartlepool in 1852, he became one of the most vigorous and successful of businessmen the country has ever produced - a model of the Victorian entrepreneur.* He received his first commercial experience in an importing-exporting firm run by one of his seven brothers. The business grew and the two brothers decided to buy their own ships, particularly for trading between the United States and the North East.

During the early 1880's the brothers dissolved their partnership and Christopher continued alone. In 1884 he acquired the controlling interest in Edward Withy & Co. shipbuilders of Hartlepool and eventually the two firms were amalgamated under the title of Furness, Withy & Co. He later took over Irvine's shipyard and graving dock and then secured engine - manufacturing provision by amalgamating three small, local firms into Richardson, Westgarth and Co. **

Furness' empire grew to an gigantic size for it had interests in collieries and iron works, both at home and abroad as well as in owning and building ships. In fact Christopher Furness became the largest individual shipowner in the world. By 1910, the year he received his peerage, he owned 135 vessels. He was a director of a multitude of companies, including four shipbuilding firms alone. Two years later at the age of 60, he died and was succeeded by his nephew, Sir Stephen Furness, who in turn was succeeded on his death two years later, by the second Lord Furness. ***

THE OUTPUT PICTURE

By the 1890's British Shipbuilding was in a supreme world position. In 1892, for example, United Kingdom yards launched

*   Robert Wood, "History of West Hartlepool." p.274-8.
** Ibid.
*** Ibid.

681 merchant vessels with an aggregate of 1,109,950 gross tons. This tonnage represented 81.7 per cent of the total tonnage launched throughout the world.

In the same year, the first in which Lloyd's Register started to give a district by district sub-division for merchant building, the North East coast, stretching from Whitby to Blyth, launched 251 ships or 570,296 gross tons, 41.9 per cent of the world total and just over half of the total United Kingdom figures.

Throughout the last decade of the nineteenth century, the United Kingdom continued to supply about three quarters of the World's ships and the North East well over a third of them. But a high degree of fluctuation was already well established as a characteristic of the industry.

In 1893, for example, United Kingdom launchings fell by a fifth to 836,383 gross tons and in the following year they returned to over a million tons. And the same pattern was reflected in the North East. When we look at the region alone, however, it is interesting to see how from one year to the next the Tyne and the Wear challenge one another for supremacy. In 1892, the Wear had a fractionally higher output than the Tyne. But in the following year the Tyne had a clear lead over the Wear which it held for the next two years. From 1896 to 1898 inclusive the Wear was the most important river. Throughout this period, the combined output of yards at Stockton and Middlesbrough achieved third position, with Hartlepools and Whitby not far behind as the fourth most important centre in the region.

Sunderland was always proud to claim that it was the most important shipbuilding town in the world for all the yards of the river fell within its boundaries. The Tyne's totals, on the other hand, included output from yards at Wallsend, South Shields and Blyth.

But chinks were already beginning to show in the solid achievements of the North East shipbuilding, and nowhere more ominously than Palmer's. Forty years later, in the 1930's the M.P. for Jarrow, Miss Ellen Wilkinson, was to allege that Palmer's - and therefore Jarrow - was murdered by a gang of financial assassins. But evidence was already beginning to pile up as early as the 1890's that the company itself was being badly managed.

In 1889, for example, during a trade depression, the company had deliberately sent in low tenders to construct H.M.S. "Resolution" and H.M.S. "Revenge". In the event, the tenders were even lower than they needed to have been and the company lost heavily. In 1890, Palmer's had a trading loss of £11,000 and the following year of £22,000.

In 1893 accounts were not produced at the normal time and critics speculated on the future of the company. "Charles Mark Palmer fought hard for his company. He threw his personal prestige into the balance..... appeared everywhere, in apparently the highest spirits."* But it was not enough. Bankruptcy seemed to be fast approaching. To avoid the humiliation - and the loss of his Parliamentary seat - Palmer resigned. A mortgage of £650,000 was raised to provide new capital and in 1896 the £35 shares were written down to £20.

For a number of years, the company's affairs improved. Even during the depression of 1902-4 the company made large, indeed record, profits, the largest in its history. How had it managed to do so well? The Chairman, Sir Charles McLaren, told the shareholders that it was on account of the board's 'fiscal policy'. "Our fiscal policy consists in strengthening

* Ellen Wilkinson, "The Town that was Murdered". p.111.

and developing every department of the company out of revenue and in keeping down the dividends to the smallest amount that we can decently pay..... we are able to show that even in bad times an up-to-date and well-managed concern can secure a fair return for the shareholders."*

With a record profit of £64,184, the board proposed to pay what Sir Charles called the 'usual' dividend of 5% on both preference and ordinary shares. Considerable sums were again to go for extensions and improvements. Between 1895 and 1903 the company spent £213,000 on extensions, all of the money coming out of revenue.

For a while, profits continued to rise. From 1905 to 1907 they werenever less than, £80,000.. But in 1908 the company made a loss of £58,000. Another mortgage was raised and the shareholders agreed that no dividends should be paid on preference shares or on debentures until it was paid off.

Matters did not improve. In 1909 the company made a loss of £63,669 to which had to be added debenture and loan interst of £15,983. The total debt then stood at £127,380.

Sir Charles McLaren commented: "It would be hard to exaggerate the difficulties with which the company had had to contend in carrying on operation during the year."** The battleship "Lord Nelson" had taken 11 months longer to build than had been anticipated, while three first-class torpedo-boats had also taken months longer to build.

The loss in 1910 came to only £11,353 and in 1911 the company showed a net profit of £41,900 all of which was used to reduce the debit on the profit and loss account from £138,737, to £96,837.

The board must have thought that the tide of bankruptcy had been turned. That seems to be the only explanation for its

* Address to the shareholders at the 38th A.G.M. held in September, 1903 reported in Palmers record, a company magazine Vol. /11, No. 5. p. 55.
** Jarrow Guardian, 1st October, 1909.

decision to take over the Hebburn establishment of Robert Stephenson & Co., consisting of a shipyard, graving dock, boiler shop, foundry and other departments. The new premises were to be reserved for merchant work while the Jarrow yard, which was to be further extended, would specialise in warship building. But why the company should want to add further to its capacity when the industry had just been through a severe depression and when it itself was in such heavy debt is not clear.

The troubles were underlined the following year, 1912, when another loss took the total debt up to £128,413. "This uncertain progress was causing anxiety. But all the cracks were hidden by the outbreak of war," wrote Miss Wilkinson. But the evidence of these years shows clearly that the company was getting itself into trouble and was not, as Miss Wilkinson alleged, the innocent victim of wicked capitalists.

The boom at the turn of the century saw the North East launching over 870,000 tons of shipping in 1901. None of the area's four rivers had ever produced as much as they did that year with the Tyne supreme, launching 116 ships of 292,989 gross tons. Yet because of a large increase in shipping from other countries, both the United Kingdom and the North East percentages of world trade fell. The country as a whole produced only 58.2 per cent of the world figure and the North East only 33.4 per cent.

Both were to slip even further in the recession years of 1902 and 1903 before the revival that started in 1904 took them on to great heights in 1906. In that year the North East produced over a million tons of merchant shipping for the first and only time. Yet strangely enough only Sunderland produced its highest ever output in that year. The other three rivers in the North East produced their all-time record totals in other years: for the Tyne 1911 was the record year with an output of 412,959 gross tons; for Hartlepools and Whitby it was 1913 with 153,071 gross tons; and for Middlesbrough and Stockton the record year was 1920 with an output of 195,452 gross tons.

In 1906, North East launchings of 1,005,148 gross tons compared with 823,195 gross tons from the rest of the country so the area's share of the national total had never been greater. And this supremacy served to underline a remarkable fact - that this coastline of 40 miles was, had been for some years, and was to remain for a considerable further period of time, the most important shipbuilding area in the world.

In that year the Tyne alone produced virtually as much shipping as the whole of the United States, more than Germany, three times as much as Holland and almost ten times as much as the Japanese. And it again won the Blue Riband for the biggest single output from one firm, a record that fairly regularly in this period went to the North East firms. William Doxford's of Sunderland gained the honour in 1905 and were to do so again in 1907. But in 1906 the record went to Swan, Hunter and Wigham Richardson with 25 vessels of 118,039 gross tons, only the second British firm to produce a six-figure output, while Doxfords were third and William Gray and Company of Hartlepool were fifth. The top marine engine builders were the North East Marine Engineering Company Ltd., with a total of 117,534 indicated horse power fitted to no less than 64 vessels.

But despite the big output, profits were disappointing. Orders had been placed in the lean years of 1903-4 when shipbuilders had been keen to get business even at reduced rates. One shipbuilder quoted only £5. 10. 0d a ton for shipping booked in 1904-5 whereas a year earlier he had received over £7 a ton. *

* See appendix - List of prices quoted by John Readhead and Sons Ltd., South Shields.

So, many people saw dangers ahead in the boom year of 1906. Mr. D.C. Cummings, the general secretary of the Boilermakers and Iron Shipbuilders Society, wanted to try to regulate output in some way, perhaps by the amalgamation of firms. * Lord Pirrie, the chairman of Harland & Wolff, wrote: "I fear it would be very difficult to arrange a scheme for regulating output that would be satisfactory to all parties." ** He called instead for shipbuilders to refrain from soliciting orders from owners who already had a regular owner.

By 1907 the over supply of ships brought a great reduction in new orders reflected in the 1908 output figure of only 355,859 gross tons from the North East, the lowest figure since separate area records were kept. In December 1907 there were 8,000 unemployed shipyard workers in Sunderland alone and the Mayor opened a relief fund. The Local Government Board subscribed £6,500.

Despite the slump, the North East remained the biggest centre in the world for shipbuilding and four of its yards were among the top seven world producers. There were William Doxfords which was first with 22 vessels and 91,254 gross tons, Swan, Hunter second with 75,460 tons, Armstrong Whitworth third with 74,228 tons and Joseph L. Thompson seventh with 48,218 tons. The North East Marine Engineering Company was also again world champions with an output of 121,470 indicatedhorse power.

By 1908 shipbuilders were in the middle of the worst depression they had known in living memory as the supply of ships continued to wait for demand to catch up. Never before had so much capacity and labour been idle. To try to counter the effect, shipbuilders were tendering at cost or below, a situation that produced heavy losses for Sir James Laing and Sons, and for Palmers and resulted in the closure of Robert Stephenson & Company's yard at Hebburn.

* "Shipbuilder", vol. 1. 1906. ** Ibid.

The depression eased in 1909. Output improved marginally in all North East rivers except for the Wear, where it made a spectacular jump from 86,547 tons in 1908 to 132, 371 tons in 1909. Ten of the river's twelve firms reported a greatly increased output but Sir James Laing and Company, which in 1908 produced only 9,700 tons, launched nothing at all in 1909.

The improvement continued during the year 1910 as the supply of ships and the demand for them reached a more equable point. By 1911 British and North East shipbuilding reached the high peaks of merchant ship production that were to remain until the war began. By the end of March 1913, Lloyd's Register was reporting that a gross tonnage of 2,063,694 was under constructions in the United Kingdom - the highest figure ever recorded to that date in Lloyd's returns.

In these conditions, the cost of ships began to creep up noticeably. One builder who had been asking for £5.1 per ton in 1909-10 put his price up to £5.6 per ton in 1911 and to £6.7 per ton in 1912-1913.

The high prices of new vessels together with a dip in the freights rates persuaded some owners to hold off placing new orders. By the summer of 1913 Mr. Herbert Rowell, the managing director of Hawthorn, Leslie was reporting that his company was receiving only a quarter of the enquiries for new tonnage that the firm had received only a short time before. This slight dip in demand hardly made itself felt, however - it was in fact an easing of a headlong position in which labour had become increasingly difficult - both in terms of increased demands for higher pay and in a greater reluctance to work overtime.*

* Beatrice & Sidney Webb, "Industrial democracy", p. 513.

LABOUR RELATIONS

The years of supreme achievement at the end of the 19th century were marred by worsening conditions in the field of labour relations. There were many conflicts and they were not all with the employers, Indeed the Webbs estimated that "within the space of 35 months 'between 1890-3' there were no fewer than 35 weeks" in which one or other of the most important sections of skilled men on Tyneside were idle because work to which they laid claim was being done by others.*

Another observer estimated that between 1894 and 1906 there were 130 industrial stoppages in North East shipbuilding, 75 of them on the Tyne.** This compares with 24 stoppages in engineering in the same area over the same period. The North East coast was clearly the main centre of trouble for shipbuilding disputes in the country.***

There can be little doubt that the area's very success in a wide range of ships from oil tankers to luxurious passenger liners in itself created the trouble. For it created work for a variety of crafts, some of them fairly new to the industry or trying to widen their sphere of influence and these rival unions "fought each other savagely to establish their overlapping or conflicting claims." Thus the industry had the misfortune to be the meeting ground of many well-organised crafts during a revolution in its technique and to offer an expanding range of new jobs which lent themselves to much hair-splitting debate."****

The main difficulties lay with the shipwrights and for a good reason. The rise of iron shipbuilding strengthened the boilermakers who recruited to their ranks the riveters,

* Beatrice & Sidney Webb, "Industrial Democracy" p. 513.

** J.F. Clarke, Newcastle University M.A. Thesis , p.512-517.

*** "A History of British Trade Unions 1889-1910" by H.A. Clegg and others, Published 1964, p.128.

**** Ibid.

platers, angle ironsmiths, caulkers and holders-up. The shipwrights, the masters in the old wooden days, saw their livelihood being increasingly squeezed and so they in turn tried to regain some of their losses from ship joiners.

A sixth of all the disputes involved joiners and shipwrights despite continuous efforts to arrange a satisfactory division of work. Early in 1890 Thomas Burt M.P., was called in as umpire to try to settle the allocation of 168 jobs. * After six months' exhaustive enquiries, he decided that 96 of the jobs should be tackled by joiners and 72 by shipwrights.

The joiners refused to accept Burt's decisions, however, much to the annoyance of other local trade unionists.** Almost 1,000 men from Tyne yards went on strike for three months from August, to November 1890 and only agreed to return to work when a new conciliation board, on which two technical assessors were represented, started work. Their main argument against Burt's awards was that he had no expert knowledge of the trade. A temporary peace was achieved but a lot of bitterness remained. The Tyne Joint Committee of Shipwrights and Joiners did not stop disputes but it reduced their duration.

Another bitter conflict involved engineers and plumbers, who disputed work on iron pipes. The engineers claimed that it was their work because the pipes were iron, while the plumbers replied that pipes, especially those for sanitary purposes, were within their province.***

The engineers refused to accept an agreement reached after a number of meetings and 8,000 of them on the Tyne went on strike from April to June 1891. But the issue continued to fester even after the men resumed work and they went on strike again from January to March 1892.****

* J.F. Clarke.p.416. ** . *** Ibid. **** Ibid. **** Ibid.

Thus the Federation of Engineering and Shipbuilding Trades, which had been established in 1890 partly to solve inter-union disputes and partly to act as a counterweight to the shipbuilding Employers' Federation formed in 1889, was by no means successful in solving all disputes.* The Federation did lead, however, to regular negotiations with employers on the Tyne, Wear and Tees. It led, too, to an agreement signed on 4th July, 1894 between the boilermakers and employers, which laid down a procedure for wage changes.

This was mainly the inspiration of Robert Knight, the Autocratic yet legal-minded general secretary of the United Society of Boilermakers and Iron Shipbuilders. He believed, above all, in industrial peace and in negotiation. Once an agreement was signed, he believed that it should be adhered to until a new agreement came into force. He even fined his own members for the non-performance of their duties or for bad workmanship. The Webb's claimed that the Boilermakers Society, whose strength increased from 30,000 in 1889 to 48,000, was "one of the most powerful and best-conducted of English trade societies". **

Certainly the 1894 agreement, largely put through by Knight's efforts, was a most constructive document.*** It applied to all employers in the North East and laid down a minimum period of six months between general wage changes and a maximum change of five per cent at any one time. Any change required a month's notice and had to be referred to a joint conference, as had all disputes. There were to be no stoppages, the agreement was to last for five years and could be terminated only after six months' notice. This was clearly a major step forward in trying to eliminate those disruptive claims which the men could advance in busy times or reductions which employers could call for when

* H.A. Clegg & Others, p.130. ** "Industrial Democracy", p.82.
*** H.A. Clegg, p.150.

things were slack. For this reason both employers and his own union members were not initially enthusiastic about Knight's plan. In fact the North East branches of the Boilermakers Society voted overwhelmingly against the agreement (by 7,300 votes to 21,100) but it was approved by a majority vote of the whole society (by 16,000 to 12,000).

Despite the general approval by the society's members, no other part of the country followed the North East's lead. The joint committees of boilermakers and employers on Tyne, Wear and Tees did useful work in settling disputes. Thus by 1895 there were a number of conciliation boards in the North East shipbuilding industry for, as we have seen, the Wear Conciliation Board had been in existence since 1885 and the Tyneside and Tees-side boards for shipwrights and joiners since 1890 and 1895 respectively. In 1898 three trade unions, the shipwrights boilermakers and blacksmiths formed a joint committee between themselves and employers on the Tyne and Blyth to handle demarcation disputes. By 1900 there were 11 conciliation boards in North East shipbuilding and engineering, well ahead of the rest of the country. In fact, "the North East coast was the only region where conciliation and arbitration machinery was developed to any extent."* One estimate has shown that of 558 cases considered by conciliation boards in the North East between 1897 and 1906 only 10 resulted in strike action.** Altogether there were 87 strikes in the period, so "the role of these boards in minimising the effects of demarcation disputes was outstandingly important." ***

Unfortunately, both the Wear conciliation Board and the procedural agreement between boilermakers and employers came to an abrupt end. In 1906 an authorised strike on the

* Dr. I.G. Sharp, "Industrial Conciliation & Arbitration in Great Britain."

** J.F. Clarke, Newcastle University M.A. Thesis, p.500.

*** Ibid.

Clyde to secure a wage increase already granted in the North East lost 600,000 working days and led North East employers to terminate the 1894 agreement in order to bring in a more effective national agreement.* This produced the less satisfactory Edinburgh Agreement of 1907, a temporary settlement which the boilermakers declared later was "forced upon us at the point of the bayonet."

The agreement pledged the Society "not to interfere with the alternatives of yard customs, although these,.... meant the withdrawal of previous privileges and the reduction of wages..... to admit to our membership, without penalty, apprentices who had gone from yard to yard during trade disputes, blacklegging our members..... and to work unlimited overtime at the discretion of the employers".**

In 1907, as depression continued, shipbuilding employers called for the usual wage reductions. About three quarters of the men were prepared to accept. The shipwrights and other wood-working unions refused, however, and 5,000 of them stopped work in January 1908.

The Shipbuilding Employers' Federation proposed a general lock-out of the unions involved - a threat that resulted in the men calling for arbitration. The employers refused and in April 1908, they locked out 13,000 men in Scotland and the North East, thereby putting another 22,000 out of work as a result.***

The unions not directly involved, especially the Boilermakers, were incensed at their own impotence and called for compulsory arbitrations.

Meetings between the President of the Board of Trade and the contesting parties finally achieved agreement. The

* H.A. Clegg & Others, p.435.
** Monthly report, April, 1909.
*** H.A. Clegg, p.436.

strikers were to accept the reduction and a conference was to be called to consider setting up a permanent procedure for settling disputes. The stoppage had lost 1,700,000 working days.*

The new procedure was ratified in March, 1909. It established that general wage movements were to be negotiated nationally by the Federation and the unions. A minimum period of six months must elapse between wage changes which must not exceed at any one time five per cent for piece-work rates and one shilling a week for time rates.

By and large, the branches and districts did not welcome the national regulation of wages. The new general secretary, of the Boilermakers commented: "While they say it might be quite easy to get a national reduction, it would be exceedingly difficult to organise a national advance."**The North East continued to be a trouble spot, an area of no compromises. Elsewhere reductions were accepted but in this area they were thrown out by a strong unofficial movement basing itself upon the principles of the 'living wage' and local union autonomy.

Despite the constant fluctuations in wages, dependent upon the state of trade, the general trend was naturally upwards. But shipbuilding workers lagged behind the national average. Between 1886 and 1906 their average earnings in a full week went up by 22 per cent, while the average increase for all groups was 26 per cent.*** The less than average increase resulted, however, from a higher starting point. In both 1886 and 1906 engineering and shipyard workers were the second highest paid in the country.

There were wide variations within the shipbuilding wage pattern, however, While the average figure for men in 1906 was 35s. 11d. general labourers averaged just over £1 a week.

* H.A. Clegg, p.436.

** D.C. Cummings.

*** From Board of Trade census as analysed by A.L. Bowley in "Wages and Incomes in the U.K. since 1860".

Platers, riveters and caulkers on piecework formed a labour aristocracy. Caulkers on the Tyne, Wear or Tees averaged 54s. 8d. riveters 55s. 7d. and platers between 77s. 3d. and 82s. Nevertheless a fifth of the men in the shipyards received less than 25s. a week in 1906. This was less than some of the skilled men were receiving in the 1850's when 6s. or more a day was by no means an uncommon wage.

The following table shows the way that wages moved for three important grades over the period:*

	1871 60-hr week	1882 54-hr week	1885	1906
Platers	54s. 6d	77s. 6d	57s. 1d	76s.
Riveters	34s. 5d	51s. 2d	37s. 3d	55s. 7d
Caulkers	38s. 6d	45s. 9d	40s. 7d	54s. 8d

Such figures do not indicate the full story, however, because the work was so precarious. In 1908, for example, a yard that was employing 960 men one day in March was employing 1,586 men on a day in June. What is more, this see-saw effect, from month to month as well as from year to year, had an important multiplier effect on the local economy, particularly on Tyneside where one in every six or seven men was connected with shipbuilding, or on Wearside where the proportion was even higher.

Direct employment alone absorbed over 20,000 men, but to this figure we have to add another 20,000 in marine engineering and perhaps the same figure again for those in ancillary trades. If we take the average payments for these men as being 35s. 11d a week, shipbuilding was responsible for pumping over £100,000 a week into the Tyneside economy through wages or about £5½ m. a year.

* The figures for the first 3 columns are earnings of Boilermakers at Palmers, Jarrow, quoted to the Royal Commission on Depression, 1886, 3rd Report p. 299.

On Wearside about 10,000 people were employed directly in the industry - an even larger proportion of the available work force than on Tyneside - and the overall figure of those dependent on the industry in one way or another was about 30,000. A slightly higher figure was to be found on Tees-side. Altogether in the first decade of this century the North East employed over 40,000 directly in shipbuilding, an equal number in marine engineering and an equal number again in ancillary trades, a total of 120,000. The wages bill exceeded £11 m. a year, half of it, as we have seen, paid on Tyneside.

"Shipbuilding and ship repairing together constitute the greatest industry on Tyneside, its chief pride and the source of livelihood for a large part of its population."*

And the fortunes of the area - and the smiles on the faces of its people - went up and down with the success of its ships. Despite the fluctuations, success had obviously been very great but now was to come a much more testing period.

The North East had grown very fast on the back of the Industrial Revolution. The engineering industry is the area had expanded tenfold within 50 years and shipbuilding had expanded five-fold. The region's population, despite its very high birth rate, had not been able to keep up and about 150,000 migrants had been sucked in, mainly from Scotland and Ireland, to man the booming industries.

But now the years of greatness, the years when industrial enterprise of the highest order had been allied to inventiveness of an unsurpassed degree, were nearly over. From now on an almost unshiftable decline set in. The industrial treasure house was seen to have too narrow a base. When fast-moving

* "Industrial Tyneside", by Dr. Henry Mess.

changes arrived, the area which had prided itself in always being in the van of change was unable to cope. But, of course, the problem was no longer a local one. Like other parts of the country and indeed of the world, the North East was under the grip of much greater forces than it itself could tackle. How it tried to tackle them, however, we must now turn to examine.

CHAPTER 5

1914 - 1930
FIRST SIGN OF TROUBLE

A sudden and savage decline now hit British shipbuilding. In 1920 the industry produced an all-time record of two million tons of shipping. Three years later it did not produce a third of that figure. And with the dreadful drop in output prices, wages, employment and profits all went tumbling down too.

But Britain did not stand alone. World shipbuilding output plummetted from five million tons in 1920 - or seven million tons in 1919 - to one and a half million by 1923. The unprecedented drop was bad enough in itself but within the next few years, the industry underwent a strong recovery, fell substantially again, recovered again and then fell away into the seemingly bottomless pit of the 1930's. Any attempt at rational actions and decisions was thus impossible.

Nowhere did this series of cyclical surges cause more industrial heartsearching and more personal suffering than in the North East, which was still the greatest shipbuilding centre in the world, although that claim became increasingly meaningless.

THE WAR

The total output of ships from the Tyne, Wear and Tees during the war amounted to 1,130 vessels of all sizes and descriptions with an aggregate tonnage of 3,324,912.* This tremendous output - an average of five ships a week throughout the whole of the war - was well above anything the North East had ever achieved before. And it was achieved despite a heavy drain on shipyard labour to the armed forces and despite the big increase in repair work. **

* N.E. Shipbuilding during the War by A. H. J. Cochrane, N.E. Coast Institution of Engineers and Shipbuilders, July 1919.

** Ibid.

"In common with many other British industries, that of ship repairing had unprecedented demands made upon it as the result of the exigencies of war. It is now common knowledge that these demands increased and became more and more pressing as the war went on until the enemy submarine campaign brought this country to the most dangerous crisis it has ever had to face. The call for ships was insistent and imperative and the whole resources of the ship repairing industry were taxed to the utmost .... War requirements and its close proximity to the war zone made the district perhaps the most important naval repair centre in the world as well as the principal region for merchant vessel repairs."* There were 40 separate repair establishments carrying out the work with 46 dry docks, seven pontoons and eight slipways. Even the Government's pontoon dock which was normally located in the Medway was successfully towed round to Jarrow Slake in 1915 so that Tyneside firms could repair and refit battleships and the largest cruisers. More than 145 vessels were in fact repaired at the pontoon. Altogether 7,856 war vessels and merchant ships were dry docked in the area during the war and in addition 20,245 ships were repaired afloat. **

Despite the heavy pressure and the high output, the quality of workmanship did not seem to suffer. A high standard of accuracy was achieved, for example, in the design, construction and installation of turbine machinery. This meant that the Admiralty could dispense with the exhaustive preliminary trials which hitherto had been thought essential.

Yet, at the time, the efforts of the industry were felt not to be good enough. Towards the end of 1917 there was a growing demand for more and more ships, both naval and merchant, to counter the German submarine offensive. In fact on the 14th December, the Prime Minister, Lloyd George, went so far as to say: "Victory is now a question of tonnage and tonnage is victory. Nothing else can now defeat us but a shortage of tonnage." ***

* Ship repairing on N.E. Coast during the war by M.C. James & L.E. Smith, N.E. Coast Institution of Engineers and Shipbuilders, July 1919.

** Ibid.

*** "Shipbuilder", January 1918.

The beginning of the war had naturally seen a sharp drop in merchant shipbuilding, both because of the sudden fall in demand and because of the concentration of the industry on warships. The North East output of 854,697 gross tons of merchant shipping in 1914 fell to 352,825 gross tons the following year and stayed at almost the same figure in 1916. In 1917 output doubled to over 600,000 and went even higher in the following two years.

And so by late 1916 merchant ship construction was beginning to pick up strongly to produce the much bigger launch figures of 1917. At Middlesbrough and Stockton mercantile work in hand jumped from 51,670 gross tons at the end of June 1916 to 76,480 at the end of September, while on the Tyne comparable figures soared from 310,577 gross tons to 401,926 gross tons.

By 1917, in fact, the industry had picked up so much that it was beginning to suffer from a shortage of steel. Yet the need for more tonnage still became so pressing that the Shipbuilding Advisory Committee was set up to boost output. * Its main recommendation was that ships should be standardised into five types to reduce costs and time. The idea was taken a stage further with the proposal for fabricated ships. The preparation of the structural parts would be undertaken to a great extent in steel works and then the prepared parts would be delivered to a shipyard for assembly and erection.

Even concrete shipbuilding was examined more thoroughly than ever before as a way around the steel shortage. The first concrete ship had been built about 1850.** By the end of 1917 about 200 concrete vessels had been built, mainly small ships such as barges and lighters. The first significant venture into the field was the formation of the Ferro-Concrete Ship Construction Co. Limited, an offshoot of Vickers at Barrow. A number of others followed including the Wear Concrete Building Co. Limited, founded by Swan, Hunter & Wigham Richardson Limited, the Amble Ferro-Concrete Co.

** See article by W. Noble Twelvetrees, Vol. 20, "Shipbuilder".

* "Shipbuilder", January 1918.

Limited, in which Palmers had a large interest and a yard at Whitby which was the property of the Whitehall Dockyard Company.

Almost all the work in the concrete shipbuilding yards was done near the slipways. The concrete mixers were on the berths and discharged into trucks running on narrow gauge lines to any part of the gantries. And the exterior shuttering and the reinforcements for the hull were also assembled on the slipways ready for the final operation of concreting.

But concrete shipbuilding never really proved a commercial possibility. An observer commented: "It would appear that the economic disadvantage of this material so far as weight is concerned is so great that in most types of ship only a lack of steel would warrant its adoption."* France, Spain, Italy, Norway and the United States were all building concrete ships but gradually the idea petered out as steel supplies improved.

An impatient Government tried to boost production in another way - by setting up three national shipyards.** Indeed, it wanted to set up four but it came under such heavy pressure from the industry that it abandoned the fourth. Only one of the yards contained manufacturing plant. The other two could only be used for erecting the vessels. None of them produced a single ton of shipping because the war ended before they could come into use. But even at the time the industry seemed to be on good ground in arguing that the investment of £3,887,000 in these yards was high. ***

And it was on even stronger ground when it argued that physical capacity was not the crucial factor. The bottle-neck was the shortage of steel and of labour, particularly willing labour. Sir Eric Geddes, First Lord of the Admiralty, remarked in March 1918 that January's output was little more than a third of the monthly averages in 1917. He blamed the workmen and to a lesser extent the employers. The industry agreed with the first point. Ironsmiths, in particular, had done less than a normal week's work, according to some employers.

* Editorial in Shipbuilder, January 1919.

** "Shipbuilder", January 1918.

*** Ibid.

The timekeeping of a large section of the iron trades had been bad and their willingness to strike "distressing".* But the employers retaliated on the second point by blaming the Admiralty. They felt that Government departments had been weak in dealing with labour problems and that this had done "incalculable harm". Wage rates had risen as follows:

TYPICAL WEEKLY WAGES FOR TIME WORK **

	July 1914		Jan. 1919		War Bonus	
	s.	d.	s.	d.	s.	d.
Shipwrights	41.	6.	78.	9.	37.	3.
Plumbers	41.	6.	78.	9.	37.	3.
Joiners	40.	6.	77.	7.	37.	1.
Blacksmiths	39.	0.	75.	11.	36.	11.
Painters	38.	0.	74.	10.	36.	10.
Riveters	37.	0.	73.	8.	36.	8.
Holders up	31.	6.	67.	6.	36.	0.
Drillers	31.	4.	67.	4.	36.	0.

Not only were the increases too great according to the employers but the largest increases went to those earning the most in pre-war days. "This is manifestly unfair and is a serious indictment against the Committee on Production and the Ministry of Munitions as well as against their technical advisers," said one commentator.*** Why it was so unfair, he does not say. It would have seemed, on the contrary, to be entirely fair that the old differentials should have been maintained. What is more, when one relates the increases to what was received previously, the poorer workers can be seen to have benefitted much more than their better-off colleagues. The increase for drillers, for example, amounted to more than 100 per cent.

* Shipbuilder, Vols. 18-20.
** Shipbuilder, January 1919.
*** Ibid.

Shipwrights, on the other hand, had a 70 per cent improvement in their wages.

But the employers complained that the Government's controls generally were too stifling. John Meade Falkner, who had become chairman of Armstrong Whitworth in 1915, remarked: "We have become a Government arsenal under Government control." *

The Government set the level of prices after studying the costs of production and this almost invariably meant pitching them well below the firms' own estimates. Profits were also controlled. The criterion was that they should bear the same ratio to ouput as in the last few years of peace.

Nevertheless, many firms did well out of the war. Swan, Hunter & Wigham Richardson saw net profits rise from £218,000 in 1914 to £374,000 in 1918.** Armstrong, Whitworth pushed up average net profits from £800,000 a year to £1m. a year, while Jos. T. Eltringham & Co. Limited turned a net profit of £8,000 in 1914 into £134,000 in 1918.

Nowhere was the effect of the war greater than at Palmers. The company had reached the point of jeopardy in 1908. It made a loss of £58,000 in that hear. To try to save it, a mortgage was raised and it was agreed that no dividend should be issued until the mortgage was paid off.

For three years the debt was slowly reduced, but in 1912 events started to turn against the company again and the deficit reached £128,413. Then the war came and with it great activity. By 1915 Palmers had turned the deficit into a credit of £42,772. Throughout the war the company continued to make handsome profits but unfortunately so much of it had to go to pay off earlier debts. This was the first cause of the financial trouble which toppled the company a few years later.

The problem at Palmer's was not unlike that facing the industry generally as a result of the war. New capacity was brought into operation for which, once the war was over, there would be no need;***new firms, often subsidised, were set up in other countries; and new customer-supplier

** Net profits - i.e. after providing for tax, depreciation and debenture interest, but before dividend payments.

*** 45 extra berths were authorised in private firms.

* J.D. Scott, "Vickers - A History", p. 126.

relationships were established.

In 1914 there were 45m. gross tons of shipping in the world. By 1919 there were 47m. gross tons, even though 13m. gross tons had been lost in the war. The U.S.A., in particular, became in the space of four years a major contender. Indeed, from 1914-21 it was responsible for 86 per cent of the net increase in the world tonnage. American firms even reverted to wooden shipbuilding at one stage when steel supplies failed to match the soaring demand. This may seem odd considering that the spearhead of the American effort was the Bethlehem Shipbuilding Company, which was expressly set up to form a vertically integrated outlet for the Bethlehem Steel Corporation.*

British tramp shipping never recovered from its almost complete extinction during the war. Between 1913 and 1933 the number and tonnage of tramp ships fell by a half. Largely, this reflected the loss of the coal trade for during the war our overseas markets were taken over by non-combatant nations. And this in itself had a crippling effect upon British shipping and shipbuilding for the tramp ships - the all-purpose cargo vessels - were the backbone of the industry and, since the launching of the "John Bowes", the North East had been their birth-place.

THE OUTPUT PICTURE

Despite the disorganising effect of peace, the first two years after the First World War were on the whole very good for North East shipbuilding. The sudden reduction in naval work allowed yards to get ahead with the backlog of mercantile orders. The Norwegians, in particular, had been placing orders throughout 1917 for an estimated aggregate of over 500,000 tons of shipping to be commenced as soon as the war was over.** The prices agreed ranged between £25 - £30 per deadweight ton compared with about £5 - £6 per deadweight ton just before the war. In 1920 over 40 per cent of British launchings were for foreign account.

* "Shipbuilder", January 1918.

** Ibid.

That was the year when the industry reached its peak merchant shipbuilding performance. Over two million gross tons of shipping were launched, 35 per cent of the world total. The North East alone produced 948,000 gross tons, which was 16.5 per cent of world output.

The strong demand and the hopeful view of the future brought new yards into existence. On the Tyne, Messrs. Renwick and Dalgleish, well known shipowners, had decided to enter the building business and they were followed by the Newcastle Shipbuilding Company.* The latter was incorporated on 30th August 1919 under the chairmanship of John Crass of Newcastle. It took over the small slipway and ship-repairing business of the Huntley Shipbuilding Company at Hebburn. Originally, the intention was to build small ships but later in the year a more adventurous scheme was put forward. About 16 acres of land were bought to give a river frontage of 1,500 feet - one of the longest in the North East, There were to be ten building berths of up to 530 ft.

The keel of the first vessel was laid down in February 1920.** A year later the company had to lay off all its staff and call a meeting of creditors after it had launched only two ships.

At Blyth, Ritsons' Shipbuilding & Engineering Company laid down three berths while on the Wear the highly successful Hartlepool builder Sir William Gray was building a new yard. This was the Egis yard at Pallion, named after its main sponsors: Sir John Ellerman, Sir William Gray, Lord Inchcape and Mr. F. C. Strick. On 1st January 1919, the Egis company was absorbed by the reconstructed company of William Gray & Co. (1918) Limited. ***

The new yard on the South bank of the river covered 15 acres, contained 4 building berths up to 440 ft. long and employed 1,000 men. It had been a pasture for many years although in the seventies and eighties Oswald and Company, and later Kish, Boolds and Sharer had built small ships there. The first vessel was launched on 12th June 1919 - an 8,200 d.w. ton standard cargo steamer for the British India Steam Navigation Company.

* "Shipbuilder", April 1922.
** Ibid.
*** "Shipbuilder", August 1919.

But the most important new yard was that created out of former marshland at Haverton Hill, near Billingham, County Durham, by the second Lord Furness.

He decided to build it at Haverton Hill, even though the site was so low lying that a million tons of slag, sand and ashes had to be deposited over its 85 acres.* But this was no great handicap to Lord Furness and he ordered that 10,000 tons d.w. ships should be built even while construction work was being carried out. Indeed the first keel was laid only three months after the beginning of the construction of the yard and the ship was launched early in 1919.

Furness had to provide accommodation for the gangs of workmen being brought into an undeveloped district just like Andrew Leslie, Charles Palmer and many others had had to do in the mid-nineteenth centry. He built Belasis Village, consisting of 531 houses in 438 days.**

The layout of the yard was said at the time to be unique in its size and spaciousness. There were eight berths with a capacity for building ships of from 450 ft. to 750 ft. and ample space was provided between the berths for the latest tower cranes with a lifting capacity of four and six tons. "The Furness Shipbuilding Company, which is second to none in Great Britain as regards layout and equipment, is a fitting testimony to the courage and enterprise of Viscount Furness", said one observer.* **

Furness was also a director of the Northumberland Shipbuilding Company of Howdon, which was the nucleus of a determined effort by a group of London financiers, including Clarence Hatry, to gain control of a number of shipyards. The group was known as the Sperline Combine and within four years it was the biggest combine of its kind in the shipbuilding world. By 1921 it owned all the share capital of William Doxford's, 85 per cent of the capital of Fairfields, the whole of the capital of the Monmouth Shipbuilding Company and of Workman, Clark at Belfast, as well as the controlling interest in Blythswood. It also secured control of the Lancashire Iron & Steel Company.

* ** Shipbuilder, Vol. 22, June 1920.
* Billingham Press, 25th April 1947.
** Ibid.

The combine's usual practice was to gain control by share exchanges, to obtain advances from the new subsidiaries, to pledge the assets and use these funds to extend the interests even further. The financial links became overstrained, however, in the depressed inter-war years and in 1924 the Northumberland Shipbuilding Company collapsed.

For shipping generally, the bubble burst spectacularly in the summer of 1920. Freight rates suddenly fell and, as usual, orders for new shipping were cancelled. In June alone 76 orders were withdrawn. *

Shipbuilders countered by trying to reduce costs. North East steel makers made two reductions in the cost of plates and angles at the begining of 1921 so that the basic prices came down to £21 and £19.10s.0d. per ton respectively - a reduction of £3.10.0d. for plates and £4.10.0d. for angles in two months. As we shall see, the employers also asked the men to contribute by accepting a reduction in wages. There was still a feeling that this was just part of the normal fluctuations and that "lower prices for new ships would promote the demand for them as there are many special trades at present in which vessels could be employed profitably or without loss if the cost of construction were less."**

By 1921 output at Sunderland was less than half what it had been the year before and this was also true of Whitby and Hartlepools. But Middlesbrough, Stockton and Newcastle managed to hold up well in 1921. But then in the autumn, a dramatic drop occurred everywhere. Merchant work in hand on the Tyne fell from 603,000 gross tons on 30th September to 516,000 three months later. At Sunderland there was a fall from 291,000 to 203,000 gross tons. Sunderland was further affected by a very long strike of joiners (see section on labour relations).

The costs of construction and the market value of ships were completely out of proportion. Two ships which had been bought in 1919 for £344,000 were resold in 1921, when the owner went into liquidation, for only £80,000. Another ship had cost £145,000 to repair but realised only £20,000 when it was sold.

** Shipbuilder, April 1921.

* Shipbuilder, July 1920.

New orders were now almost impossible to obtain. Between May 1920 and May 1921 over 300 contracts had been cancelled. About a third of all shipbuilding berths were now vacant. Four Sunderland yards closed down in May 1921: John Blumer and Company, John Priestman & Company, Swan, Hunter & Wigham Richardson, and Robert Thompson & Sons Limited. On the Tees two yards had also closed.

By March 1922, the Shipbuilding Employers' Federation was reporting that 56 per cent of all building berths in the country were idle and another 16 per cent contained cancelled or suspended work.* In June and again in October steelmakers in the North East reduced their prices so that plates could be had for £10.10.0d. a ton, angles for £10 a ton and boiler plates for £16 a ton.** British steel prices had fallen by a half in just over a year but still were unable to attract orders or to match Continental prices. A few months later the steelmakers went so far as to abandon their policy of quoting uniform prices.

The cost of shipping itself fell. At the beginning of 1922 ships were costing over twice their pre-war prices. By the end of the year they were only half as much as pre-war. Some builders were unable to absorb the reduction and went into liquidation. This was true of Sir Raylton Dixon & Company, of the Cleveland Dockyard, Middlesbrough, which normally employed 1,800 men.*** The yard was sold to a new private company, the Cleveland Shipbuilding Company, which also acquired the adjoining yard formerly owned by W. Harkess & Son. The chairman of the new company was the Hon. Sir Charles Parsons.

The slump continued into 1923. At the annual meeting of Swan, Hunter & Wigham Richardson in April, Sir George Hunter, the Chairman, said he thought the industry had done as much as it could to help itself.θ Costs had been pared right down and were only 50 per cent more than pre-war. Contracts, such as were available, were being taken without profit. By the autumn 1,400 shipyard workers were unemployed in Sunderland, and 6,000 at Jarrow. Of the 15 yards in Sunderland, five had no launches at all and another five had only one.

* "Shipbuilder", January 1921.
** Ibid. *** Ibid.
θ "Shipbuilder, May 1923.

Swan Hunters, who had launched over 170,000 gross tons of shipping from all their yards in 1920, produced only 41,000 tons in 1923.

And so it went on in 1924 and 1925 and 1926. John Blumer & Company and the Sunderland Shipbuilding Company passed quietly out of existence, reducing the number of building berths on the Wear to 53. By the end of 1925 about 19,000 shipyard workers were unemployed in Sunderland. But then the Silver Line placed an order for six motor cargo liners of about 9,000 d.w. tons - three to be built by Laings and three by J. L. Thompson, and all to be engined by Doxford's. It was the biggest single order ever placed on the river - over £1m. - and presented some cheering news for Christmas.

But overall, things were still extremely gloomy. A special conference of employers and trade unions was called to see why Continental yards were continuing to win orders. Furness Withy had recently placed a contract for five 10,000 ton motorships with a German firm because the contract price for each ship was £60,000 less than the lowest British tender - £170,000 against £230,000.* Lawrence Holt, a member of the well-known Liverpool shipowners, gave his reasons for German success after a visit to that country: **

1. Lower wages
2. Widespread piece-work operation
3. Longer hours of work
4. No restrictions on labour saving machinery
5. No demarcation obstacles between trades
6. No redundant labour in the yards

By July 1925 the position in the North East was extremely depressing. The Wear had only four of its berths occupied. In August nine of the river's fifteen establishments were without work of any kind - and others were at the point of being closed. Osborne, Graham & Company had closed their works at Hylton and Sir William Gray and Company had also closed their Wear yard.

* "Shipbuilder", January 1925.
** ibid.

In October the plant and machinery of the Newcastle Shipbuilding Company was sold and the only two yards at Blyth, both of which were in the hands of the receiver, were also to be sold: The Blyth Shipbuilding and Dry Docks Company Limited, and Ritson's Shipbuilding and Engineering Company Limited, which had done no more than repair work in its short life. *

In April 1926 a receiver was appointed for Irvine's Shipbuilding and Dry Docks Co. Limited of West Hartlepool, which had been founded in 1860. Its directors included Clarence Hatry. The company's trading loss in 1925 had amounted to £19,500 increasing the debt balance to £59,175. The first-mortgage debenture stock outstanding amounted to £110,626. It was also decided that the Sunderland Shipbuilding Company should go into voluntary liquidation. An auction was called and bidding started at £5,000. When it did not go beyond £12,000 the property was withdrawn. **

At about this time the Joint Committee of Enquiry, set up by the employers and trade unions in March 1925, produced its 50-page report. It dealt in particular with foreign competition and enquired into costs arising within the industry and those outside its control. The report found that the prices for some articles were 100 per cent and sometimes 200 per cent more than pre-war and sometimes this was caused by trade associations forcing them up. The report also complained that the burden of local rates and taxes was often three times as heavy as pre-war and that it fell especially on the depressed areas where most of the shipyards were situated. ***

By the end of 1926 the slump was over and a mini-boom followed. Between December 1926 and March 1927 work in hand on the Tyne rose from 160,000 gross tons to 250,000 while Sunderland had an even more spectacular leap - from 37,000 gross tons to 114,000 gross tons. Swan, Hunters were able to re-open their Sunderland yard and so were Bartrams. The Blyth Shipbuilding and Dry Docks Company's yard, taken over by the Cowpen company,****

**** The Cowpen Dry Docks & Shipbuilding Company was formed in 1926 to acquire the premises and equipment of the Blyth Shipbuilding & Dry Docks Company and Ritson's Shipbuilding & Engineering Company. It was formed by R. S. Dalgleish, a Newcastle shipowner.

* "Shipbuilder", January 1926.

** " May 1926.

*** " July 1926.

was also in operation again and a little later William Gray's reopened their Sunderland yard. During the next few months, Craig, Taylor & Company reopened their yard at Thornaby, William Doxford's reopened their Sunderland yard and the Northumberland Shipbuilding Company was reconstituted and reopened the yard at Howdon. North East output in 1927 went up to 567,000 gross tons from 198,000 gross tons in 1926. In the following two years it rose first to 641,000 and then to 679,000 gross tons in 1929. And, with a marginal exception, that was to be the highest point it ever reached again, even though that figure was only two thirds of what it had been capable of in the immediate post-war era.

But even in 1929, after three relatively good years, shipbuilding unemployment in the North East remained at over 46 per cent, the highest of any local industry in the country. In comparison to what was to come that level would seem mild, however. But when you are standing in the pit of despair, you do not think how much worse things can get. You hope they are going to get better. And, like the shipyard workers of the North East in 1929, in that belief you are often cruelly mistaken.

NAVAL WORK

The difficulties in merchant shipbuilding were heightened by the almost total ending of naval work. Neither Palmer's, nor Hawthorn, Leslie launched a single Admiralty warship from 1920 until 1928, while Armstrongs built only one - the battleship "Nelson", between 1920 and 1936.

The stoppage of orders was reinforced by the Washington Conference from November 1921 to February 1922 which agreed that no country should increase the number of its capital ships for at least ten years. But even before then naval expenditure had been cut sharply. In 1918 there were 500,000 gross tons of warships being built in private yards. In 1920 there were only 20,000 gross tons. North East warship output fell from 173,000 gross tons in 1918 to 35,000 in 1925 and only 10,000 in 1930.

The estimates for 1920-1 amounted to just over £84m. compared with the figure for the previous year of £158m. In fact the 1920's programme included no new building at all - only the completion of ships already in hand.

In the following year, when the estimates fell slightly to £81m., it was decided that four new vessels, Super-Hood battle cruisers - should be built to replace the four oldest capital ships still on the effective list. The keels were to be laid within the next 12 months. *

But before they were laid down, the Government was smitten by a desire for more economies. The orders for the battle cruisers were withdrawn. And a dozen capital ships were to be scrapped, leaving only 15 in full commission compared with 38 in March 1914.** There was to be a further reduction in the destroyer flotilla, another 27 submarines were to be scrapped and over 10,000 men were to be discharged from the Royal Dockyards. In the circumstances, there was no surprise that the estimates should fall another £17m. to £64m. for the year 1922-3. Indeed they continued to slip steadily, year by year, until 1932. The programme for that year was costed at only £50m., a figure which finally brought expenditure below its pre-war level.

In March 1922, a deputation of mayors from the North East, from Glasgow, from Sheffield and Barrow - all areas suffering acutely from the lack of naval work - met the First Lord of the Admiralty and the Chancellor of the Exchequer.*** They asked that the orders for the two capital ships, to be built in place of the four battle cruisers originally proposed, should be given out as soon as possible and that any reconditioning of existing warships should be expedited.

Bonar Law, the Prime Minister, announced in the House of Commons in December that the Government had decided to go ahead at once with the two capital ships of 35,000 displacement tons each to be built under the terms of the Washington Naval Limitation Treaty. ****

* "Shipbuilder", April 1921.
** " April 1922.
*** " April 1922.
**** " January 1923.

The hull of one of the vessels was to be made by Armstrong Whitworth and engined by the Wallsend Slipway and Engineering Company, while the hull and machinery of the other one were to be built by Cammell, Laird of Birkenhead. The guns were to be made at Newcastle andDarlington and the mountings at Newcastle and Barrow. *

It was expected that the work would take three years at a total cost of £12m., of which £10m. would go in wages. Later, Mr. Leo Amery, the First Lord of the Admiralty, announced a programme of construction for eight light cruisers, each of the 10,000 displacement tons size permitted under the Washington Treaty, to be laid down immediately, together with three submarines, a submarine depot ship, two destroyers, a destroyer depot ship, two gunboats, an aircraft carrier and a mine layer.

Mr. Amery added that all British cruisers would become obsolete within ten years and replacements should be laid down at the rate of five a year. **

But then the General Election of January 1924 returned a Labour Government, whose intentions towards shipbuilding were at first not clear. The Labour Government was replaced within ten months by the Conservatives and the programme went through.

Even with this programme there was still a slump in naval work, which intensified problems for the whole industry but especially for Vickers of Barrow and Armstrong Whitworth of Newcastle, who were geared to warship production. Both firms rested on a fundamental contradiction - they were armament makers, in one form or another, in a country at peace and following a policy of disarmament.

Meade Falkner, the chairman of Armstrong Whitworth, declared as early as 1919: "We have anxious times before us." The following year, he had to retire and "a noble wreck of a once powerful man returned to a world of romance, of music, of book collecting and of mediaeval scholarship."*** He was succeeded by Sir Glyn West.

*** Sir Edmund Craster in a biographical introduction to the World Classic Editions of Falkner's novels.

* "Shipbuilder", January 1923.

** Ibid.

The company thought it could solve its problems through the Newfoundland Paper Mills scheme. This envisaged the development of a large paper mill, fed from the company's own forest on the West cost of Newfoundland, powered by a hydro-electric station and served by a new port at Cornerbrook. The company issued £3m. debenture shares through the Bank of England to pay for the scheme.*

Unfortunately nothing went right. The winter was savage, the labour situation difficult and the resident engineer extravagant. The result was that construction work cost £8,500,000 with interest charges of £500,000. Other debts brought the financial burden to over £11m.

As evidence of disaster grew, Sir Glyn West became more and more unapproachable. In the end the Bank of England appointed a James Taylor to investigate the company. Surprises were expected but his report was still a shock. He estimated that another £1,500,000 would be needed to bring the Newfoundland scheme to successful completion. He also estimated that the company had £10m. invested in "undertakings foreign to their original business, on which no return is being made or is likely to be made for some time to come." The Economist commented: "Even when all allowances have been made, it seems clear that Armstrong's risks have not been wisely chosen." **

Sir Glyn West and three other directors resigned. Lord Southborough, the former head of the Board of Trade, became chairman. His first act was to declare a five-year moratorium on debentures and to stop all dividends except on first preference shares. The ordinary share prices slumped to 2s.6d. in December 1926 against £3 before the war.

The Bank of England felt that the only solution lay in a merger with Vickers. Eventually after months of negotiation, the Bank, acting as a sort of matrimonial agency, brought off the wedding in October 1927. But both the Bank of England and the Government refused to act as guarantors.

* J.D. Scott, "Vickers - A History", p. 153-5 & 161-6.
** Quoted in above.

All armament and shipbuilding works were amalgamated and transferred to a new company - Vickers Armstrong Limited, with a share capital of £21m. But about a quarter of each company's interests remained outside the merger and Armstrongs were to build these up into a large and successful business. *

Even the merger could not help very much, however, in a country where no naval work was being ordered. The Naval Yard at Walker, Armstrong's Tyneside base, was closed down in April 1928. It re-opened to build "Monarch of Bermuda" from March 1930 to March 1931 but then closed again until May 1934 when it reopened to build H.M.S. "Newcastle". That was the beginning of a period of cautious re-armament after 14 long years in which Government policy aggravated and reinforced, rather than countered, the vagaries of the market.

PRICES AND PROFITS

The prices of ships matched the fluctuations in orders. Immediately after the war one North East builder was quoting prices three times as high as the 1914 figure. The following year, 1920, he was able to raise them even further to £26. a ton for simple cargo vessels of about 8,000 d.w. tons.**

But as the market became sticky and then heavily depressed, prices started to fall away. By the end of 1920 the same builder was already accepting £22.7 a ton and a few months later he had reduced his price to £20. In 1922, when this builder launched only two vessels for an aggregate tonnage of 9,000 gross tons - just over a third of his 1920 output - he received only £10 a ton.***

Prices wilted even further. A vessel completed in 1925 was priced at £9.9.0d. a ton and another for the following year at only £7.8.0d. a ton. Then as the orders started to flow again, prices crept up until a ship ordered in 1928 for delivery the following year was contracted at £12 a ton.

* J.D. Scott.
** See Appendix.
*** Ibid.

The effect on profits was mixed. Some companies fared much better than others, although naturally all of them suffered in a period when orders could only be won by the most competitive of tenders. Swan, Hunter & Wigham Richardson saw net profits fall from £433,000 in 1918 to a quarter of that figure, £126,000, in 1927. Armstrong, Whitworth, however, saw a fall from about £1m. in 1918 to a deficit of £500,000 by 1927 - a state of affairs that prompted the union with Vickers.*

Other companies had to think equally carefully about their future. Palmers, for example, got into desperate straits although the end of the war and the first years of peace saw the company doing well. The report for 1918-19 showed a profit of £276,000.

On the assumption that profits would continue at this level, the company increased its mortgage stock by £1m. with interest at five per cent.** The new money paid for improvements to the steel works and minor improvements to the shipyard. The following year net profit was still nearly as high and the directors paid a 12 per cent dividend. A spirit of euphoria and of limitless expansion overcame them and they rushed to buy up subsidiary companies. They bought a shipyard at Amble in north Northumberland to build small vessels. They bought the South Pelaw colliery in County Durham to provide new coal supplies for the blast furnaces.*** They bought shares in the Ransome Machinery Company, a Midlands Engineering firm, and they bought shares in Spanish iron-ore mining companies to guarantee future supplies. To buy so often and so recklessly when the market was in boom conditions was hardly the mark of wise management however. And these profligate decisions made the company even more vulnerable to the cruel blows that were about to fall. In 1920-21 profits fell to £85,000 and in the next two years there was an aggregate deficit of £109,000.

The company was hit hard, not only through shipbuilding but through its iron and steel interests. The Jarrow iron and steel works closed early in 1921 and apart from three months in 1923 remained closed until 1927.

* See Appendix.
** "The Town That Was Murdered". p.130.
*** Ibid.

Trading itself was not the cause of the trouble. In fact in both 1922 and 1923 the company made a trading profit. The difficulty lay in the debenture and loan charges. They amounted to £159,000 in 1923 alone and other debt services called for £39,000. *

By 1925 total debt had increased to £462,000 and in the following year it rose by £211,000. In addition there were capital losses of £482,000 which had to be written off. There were clearly only two alternatives now left to the company - to go into bankruptcy or to effect a financial re-organisation.

The shareholders agreed to another chance. The capital of the company was written down by reducing the nominal value of the £1 shares to 5s.0d., the arrears of preference interest were cancelled, interest rates were revised and further debentures issued. The chairman of the company, Mr. G. Mure Ritchie, resigned and two new directors were appointed.

But this did not end the troubles. Trade was still so bad in 1929 that the Company decided to extend the moratorium granted under the 1926 re-arrangement scheme. Under this, payment of interest on the consolidated mortgage debenture stock had been deferred until December 1929. Now it was deferred again for another three years. No interest on the ordinary shares had been paid since 1921 - or was ever to be paid again.

Palmer's was not alone. The 1920's, which had begun so triumphantly, brought terrible shocks for everyone. There was not a company that did not see its profits dive. Many firms went into the red and others disappeared altogether.

On the Tyne five firms closed between 1918 and 1931: J. P. Rennoldson & Sons Limited, Charles Rennoldson & Co. Limited, the Newcastle Shipbuilding Co. Limited, Renwick & Dalgleish Limited and the Northumberland Shipbuilding Company. The Amble Shipbuilding Company also closed during this period and so did four firms at Sunderland - J. Blumer & Company, the Sunderland Shipbuilding Co. Limited, Osbourne, Graham & Co. Limited, and Robert Thompson

* "The Town That Was Murdered". p.137.

& Sons Limited - and another four on the Tees - Richardson, Duck & Co. Limited, Ropner Shipbuilding & Repairing Company, Craig, Taylor & Company and Smith's Dock. The result was that by the end of 1931 there were 83 berths on the Blyth and Tyne, 37 on the Wear, 22 on the Tees and 12 at Hartlepools, making 154 for the North East.

The disastrous drop in demand was only part of the cause. The other part was the sharp increase in foreign competition. Late in 1926, for example, Italy launched the three largest motor liners in the world, which would "dispel any doubt in regard to the high quality of facilities and the technical efficiency to which this remarkable country can now lay claim".* Holland had recently won orders for eight out of the twelve large oil tankers placed by the Anglo-Saxon Petroleum Co. Limited. And Japanese naval architects and marine engineers, trained on the Clyde, on the Tyne and at British Technical Institutes, were now helping to improve their country's performance.

At the same time, despite the recession, Britain was finding difficulty in keeping costs under control. The long strike in the mining industry in 1926 had completely stopped steelmaking and had seriously handicapped shipbuilding for seven months. It was indeed costs outside the control of the shipbuilding industry that were its greatest worry, since however efficient it became it was nevertheless only responsible for about 30 per cent of the cost of the ship. The rest was composed of bought-in materials or services and these had risen alarmingly, as Mr. John McGovern showed. He estimated that between 1913 and mid-1927, the costs of steam propelling machinery had gone up 35 per cent, that steel and iron had gone up 30 per cent, timber 100 per cent, national insurance 215 per cent, outfits 60 per cent and taxation between 100 and 125 per cent.**

* Shipbuilder, Vol. 34, February 1927.

** In a paper to the N.E. Coast Institution of Engineers & Shipbuilders, June 1927.

TECHNICAL CHANGE

The most important technical development of these years was the growing emergence of the internal combustion engine. By September 1921 there were 50 motorships building in the United Kingdom of 229,325 gross tons and 104 motorships of 176,616 tons building abroad.* Two years later Lloyds Register was reporting that 460,868 gross tons of shipping throughout the world were being fitted with internal combustion engines - about a quarter of the tonnage then under construction.

Motor tonnage continued to increase in a spectacular way even when total world tonnage was falling by a third as the following table illustrates. **

Period	Gross Tons Total Steam & Motor Tonnage Classed	Types of Engine: Steam Reciprocity	Steam Turbines	Motors
1918-19	3,760,806	2,633,570	1,051,302	75,934
1919-20	4,186,882	2,821,031	1,286,046	79,805
1920-21	3,229,188	2,373,067	754,513	101,608
1921-22	2,517,513	1,420,924	870,037	226,552

The rise of the marine oil engine was thus extremely rapid. The first marine diesel engine was not fitted until 1904. The achievement went to Nobel, a Russian firm, who built this engine for a small tank ship with two four-cylinder, four-stroke cycle engines, each of 180 B.H.P. at 240 r.p.m. This was not fitted with direct-reversing gear and Nobel and Sulzer Brothers of Switzerland did not solve this problem for another two years.

But the first chapter for the marine heavy-oil engine really opened in 1910 when the East Asiatic Company decided to build three motorships of about 7,400 tons deadweight each. Two of the vessels were built and engined in Denmark while the hull and machinery of the third - the "Jutlandia" - was built by the Clyde Company of Barclay, Curle which became part of the Swan, Hunter group in 1912. ***

* "Shipbuilder", January 1922.
** Lloyd's Register 1923.
*** "Shipbuilder", July 1929.

"The engines for these three vessels were designed by Messrs. Burmeister and Wain Limited of Copenhagen, a firm who had hitherto played an inconspicuous part in the development of the marine oil engine but who, by the soundness of their designs and by their energy and confidence, allied later with those of their principal licensees - Harland and Wolff - were destined to become the greatest champions in the world of the marine oil engine in general and of the four stroke cycle type in particular."*

The introduction of oil engines had far-reaching effects upon the design and economics of shipbuilding and operating. Oil fuel was only about a quarter of the weight of its coal equivalent. There was easier bunkering, reduced engine room staff and an increase of cubic space and of deadweight for cargo-carrying.

But it was still not clear which type of marine diesel engine was the best and progress was developing along at least a dozen paths with each builder claiming that his type was the best. With some exceptions, most of the important development work was done abroad and British firms became increasingly little more than licensees. One of the exceptions was Richardson Westgarth of Hartlepool, who in 1929 perfected the first all-British, double-acting, two-stroke cycle, airless-injection marine heavy-oil engine. "Decidedly novel and courageous" it was called.**

There were no push rods or valve levers. All fuel and starting air valves worked automatically while the camshaft, fuel pumps, starting air mechanism and controls were all concentrated in a single compact unit at floor level.

* Shipbuilder, Vol. 34, page 364-6.

** Shipbuilder, March 1929.

Tha main exception, however, was Doxfords of Sunderland. Their engine became "the only high-power main propelling engine of all-British design to survive the intense competitive efforts of Continental constructors".* Between 1924 and 1927 several new cylinder sizes were introduced so that the 1,250 brake horse power per cylinder obtained from the larger engines represented the highest power output from a single cylinder of any engine in marine service at that time. Several sets of these engines were installed in twin-screw motorships for the Commonwealth and Dominion Line.**

An important advance in the Doxford engine was made in 1926 when the balanced type of engine was introduced. The main spur was the loss of a valuable contract because of some criticism of engine balance. Doxford's were able to overcome the problem so effectively that in the same year their new engine was chosen for powering the quadruple-screw luxury liner "Bermuda", in a contract that laid emphasis on freedom from vibration. Each of the four main engines of the "Bermuda" developed 2,800 b.h.p. at 110 r.p.m. By 1928 the company had about 60 engines in service.

Despite the rapid introduction of motor engines, there was still no clear indication as to which was the best type or as to where exactly they excelled over steam engines.

One authority, who compared steam and diesel machinery for a 400 ft. cargo ship of 10½ knots and for a larger vessel of 14 knots, came to the conclusion that there was a range in the price of oil within which the diesel engine was the best. Above this range, the coal-burning steamship was superior, while below the range the advantage lay with an oil-burning steamship. So the diesel engine had a serious rival where oil was very cheap as well as where oil was dear and coal cheap.***

* Development of Doxford Marine Oil Engine, by Dr. W. Ker Wilson in "Engineering", January, February and March 1943. ** Ibid.

*** W. G. Cleghorn in a paper to the Institution of Engineers and Shipbuilders in Scotland, October 1926.

Thus the steam turbine was by no means finished. And in 1926 Sir Charles Parsons made the third great advance in the marine history of his invention - the completion of the first high-pressure turbine-driven steamship. Not only had Parsons invented steam turbine generation and applied it to marine use but he had also already designed the geared turbine in 1910. Now high-pressure turbines widened yet further the application of his genius.

His latest development was applied to the Clyde passenger ship, "King George V", which had a total power of 3,500 s.h.p. Steam was generated at a pressure of 550 lbs. per sq. in ch and then superheated to the very high temperature of 750°F and thus reached the extra high-pressure turbine at a pressure of about 500 lbs. per sq. inch. It then left the high pressure turbine at about 200 lbs. per sq. inch to serve the other turbine units working at the usual pressure.

The trials of the "King George V" confirmed that a most remarkable advance had been made.* With the turbines working at full power, steam consumption was no more than eight lbs. per shaft horse power per hour and for all purposes the consumption was 9.67 lbs. The classical comparison tests between the turbine and reciprocating engine for marine work which had been carried out in 1904 had been won handsomely by the turbine with a consumption of 14.6 lbs. per shaft horse power per hour. Now 22 years later Parsons was almost halving that figure, so bringing turbines back into the fight again.

In 1926 Canadian Pacific Steamships Limited placed orders for several vessels in which steam at a boiler pressure of 350 lbs. per sq. inch would be used. Although this was only half way towards true high pressure installation, it was an important trend for the future.

* Sir Charles Parsons in a paper to N.E. Coast Institution of Engineers and Shipbuilders, January 1927.

In hull construction, developments were also in hand. By 1916 several yards had overhead gantries on which ran electric travelling cranes. Palmers', for example, had gigantic wire-rope transporters over several of their building berths. Swan, Hunters had four of their berths covered by lofty glass-roofed sheds amply served by overhead electric travelling cranes, while Armstrong Whitworth's new naval yard contained perhaps the most modern equipment of all.

Electricity was in almost universal use in the yards by war-time thus outdating the dangerous tallow candles and naptha lamps which could so easily start a fire during construction work on board.

Hydraulic and compressed air plants were in use and made a big improvement to the heavy rivetting of ships' keels or double bottoms which no longer needed to be done by hand. The caulking of seams which even as late as 1890 was being done by hand was everywhere in 1916 being done by pneumatic tools. And gas-fired furnaces to heat the frames before being bent to shape had largely replaced the coal furnaces of earlier days. By 1920 electric welding was making gradual progress, particularly with parts not directly connected with the main structure. *

LABOUR RELATIONS

The intense fluctuations of the period provoked great difficulties in the relationships between management and men. In 1919 there was "unparalleled prosperity for the workers in the industry". ** By 1923 61 per cent of them in the North East were unemployed. The figure dropped to 26 per cent in 1929 but shot up to 70 per cent only two years later.

Late in 1918 the employers had signed an agreement with the unions for the 47 hour week. *** This represented a reduction of seven hours or about 12½ per cent. Despite the important improvement contained in the agreement and despite its acceptance by the majority of the workers in a

* "Shipbuilder", January 1920.
** " "
*** " January 1919.

ballot, it was not enough for some of the men. The boilermakers, shipwrights and blacksmiths in the North East, with the exception of the men on the Wear, did not resume work after the New Year holidays. The stoppage took place without the authority of the unions or without notifying the employers and going through the proper disputes procedure. The North East strike was followed by similar action on the Clyde and at Belfast in favour of the 44 hours week. The attempt failed.*

In 1919, however, the men received a general increase in wages. This was awarded from 26th November and amounted to an extra 5s.0d. a week for time workers plus 12½ per cent for a cost of living increase, making 5s.7½d. Piece workers received the 5s.0d. increase, plus 7½ per cent.

Many employers now held the view that wages were in urgent need of revision. They wanted to create a national wages list with only small variations from district to district. "There is far too much lattitude now being practised, especially in certain districts, which leads to discontent among the men and is detrimental to the best interests of the employer."**

Typical weekly wages for time workers at this period were as follows:

	July 1914		January 1920		Amount War Incr.	
	s.	d.	s.	d.	s.	d.
Shipwrights, Plumbers	41.	6.	84.	4.	42.	10.
Joiners	40.	6.	83.	3.	42.	9.
Frame Turners, Platers, Blacksmiths, Fitters	39.	0.	81.	6.	42.	6.
Angle Ironsmiths, Painters	38.	0.	80.	5.	42.	5.
Drillers	31.	4.	79.	8.	35.	4.
Caulkers, Rivetters	37.	0.	79.	4.	42.	4.
Helpers	35.	0.	77.	1.	42.	1.
Helpers (outside)	32.	0.	73.	8.	41.	8.
Holders up	31.	6.	73.	1.	41.	7.

* "Shipbuilder", Jan. 1919.

** Shipbuilder, Vol. 22, January 1920.

As the boom of 1919-20 continued, labour costs continued to rise. By June 1920 the Federation of Shipbuilding and Engineering Trades had decided to apply for another 6d. an hour or 23.6d. a week. * At the same time the demand for a 44-hour week was still being pressed. Rising wage costs were affecting not only shipbuilding but also repairing and this was leading to a loss of contracts, particularly against Dutch competition.

There were many stoppages during 1920.** On the Wear, fitters and plumbers at Doxfords went on strike in June over a demarcation dispute. After six weeks, the 400 men returned to work and the dispute went to arbitration. "The stoppage was one which cannot be described as other than utterly foolish and did not place the intelligence of the men concerned on an enviable level", was one comment.***

And there was a strike of platers at Ropner's Shipbuilding Company on the Tees. They wanted a guarantee that piecework earnings would be made up to the average weekly earnings of the squad when they fell below average. The men returned to work defeated.****

And there was a strike of joiners in Sunderland starting in December against the employers' call for wage reductions to offset declining demand. *****

By April 1921 the industry's new difficulties were beginning to emerge clearly. So, too, were the employers' demands that the workmen should play their part in trying to retrieve the position. They asked for a 6s.0d. a week reduction in time rates and for a 15 per cent reduction in piece rates to take effect from the end of April.

The unions agreed as long as the reductions could take effect in two instalments on 7th May and 4th June. It was not until August, however, that the shipyard joiners returned to work after a strike of about nine months. They accepted an immediate reduction of 6s.0d. a week and a further reduction of 3s.0d. a week on 1st October.

* Shipbuilder, January 1921.
** Ibid.
*** ibid.
**** ibid.
***** ibid.

But in the face of an almost total absence of orders employers gave notice that they were going to abolish the Ministry of Munitions war bonuses of 12½ per cent to time workers and 7½ per cent to piece workers in three instalments from November 1921 to January 1922. Harsh though these measures must have seemed, the men agreed to accept them in a ballot.

But when the employers called for more reductions in the spring of 1922, the men rejected them. After a stoppage of six weeks they had to return to work on substantially the same terms as they had rejected in March: an immediate reduction of 10s.6d. a week to be followed by a reduction of 3s.0d. in May and another 3s.0d. in June. Towards the end of the year, when so many of them were unemployed in any case, they relatively meekly accepted the abolition of the final 10s.0d. of their war bonus - to be abolished in four instalments from November 1922 to February 1923.

Typical weekly wages for time workers were now as follows: *

	July 1914		January 1923	
	s.	d.	s.	d.
Shipwrights	41.	6.	48.	6.
Plumbers	41.	6.	48.	6.
Joiners	41.	0.	48.	0.
Frame Turners	39.	0.	46.	0.
Platers	39.	0.	46.	0.
Blacksmiths	39.	0.	46.	0.
Fitters	39.	0.	56.	0.
Angle ironsmiths	39.	0.	46.	0.
Painters	38.	0.	45.	0.
Helpers (inside)	35.	0.	42.	6.
Helpers (outside)	32.	0.	41.	6.
Holders up	31.	6.	41.	2.
General labourers	24.	0.	38.	10.

* "Shipbuilder", January 1923.

In 1923 labour matters became even more difficult to handle. An agreement on overtime working, agreed between the Employers Federation and Federation of Shipbuilding and Engineering Trades, was turned down by a ballot of members of the Boilermakers Society. They went on strike and this led to a lock-out being imposed from 30th April. *

The dispute had a paralysing effect. Many ship repair contracts were sent abroad. In shipbuilding, however, the stoppage of work met with equanimity from shipowners since freights were so low. The Boilermakers' Society was expelled from the Federation of Shipbuilding & Engineering Trades for its refusal to accept the terms of the overtime agreement. From this point the Employers would have to deal directly with the Boilermakers' Society but they could not re-negotiate the agreement without reopening the question with other trades.

By September 1923 the effect of the lock-out was being called devastating. Not only shipyards but also engine works had to close. Even those yards struggling on with apprentices were working short-time or had to dispense with many other tradesmen. **

The Shipbuilding Employers Federation and the Federation of Shipbuilding and Engineering Trades met in Carlisle in September. The Trades Federation refused both an enquiry and arbitration. They felt that the Boilermakers had been a party to the overtime agreement and that if they now refused to accept it then their expulsion as from May was justified. This attitude did not help to resolve the matter, however, and it was not until November that the employers reached agreement with the Boilermakers' Society.

In February 1924, despite the heavy depression in the industry, the Federation of Shipbuilding and Engineering Trades asked for an advance of 10s.0d. a week.*** The timing of the claim may have seemed extraordinarily inappropriate but the unions argued that wages were now below a civilised standard and that engineers had not given up the last 10s.0d. of the 26s.6d.

* Shipbuilder, January 1924.
** Ibid.
*** Shipbuilder, March 1924.

war bonus as all other trades had. The employers showed sympathy but nothing else. At a time when contracts were being taken at small or non-existent profit, they argued that they had no room for manoeuvre.

But the unions refused to accept this argument, and in June a Board of Arbitration was set up to discuss the matter. In their evidence to the Board, the employers threw some interesting light on the effect of competition duringthe previous two years.* On 59 contracts for new work taken between June 1922 and June 1924 an aggregate of £233,000 had been lost. And on a further 83 contracts for new work not then completed, they estimated that a total loss of £785,000 would be made even with wages at the existing level.**

The Board, however, took into account other factors. Between August 1923 and June 1924 freight rates over the whole world had risen by about 22 per cent. New work laid down in yards belonging to the Employers' Federation had gone up from 403,000 in 1922 to 952,000 in 1923. In 1922 only a quarter of the berths in the country had been occupied. In June 1924 this was up to a half.

It was for these reasons that the Board granted seven shillings of the claim. The new wages structure was now as follows:***

	Rates for Full Week						Percentage Increase Over Pre-War Rates at	
	Aug. 1914		Dec. 1920		March 1926		Dec. 1920	March 1926
	s.	d.	s.	d.	s.	d.		
Shipbuilding								
Shipwrights	41.	4.	91.	3.	55.	7.	121	35
Ship joiners	40.	0.	101.	4.	57.	9.	153	44
Labourers	22.	10.	70.	5.	38.	5.	208	68
Baking								
Fore hands	37.	6.	88.	2.	70.	9.	135	88
Transport								
Railway drivers	40.	6.	103.	6.	87.	5.	155	116

* Shipbuilder, July 1924. ** ibid.

*** Joint Enquiry Committee's final report, Published June 1926.

In June 1926 all the shipyard unions were again applying for increased wages.* The demands were for an extra 10s.0d. a week with proportionate increases for pieceworkers. The unions justified the claim by arguing that employment was now better and prospects more favourable. The employers, naturally, still countered that competition remained stiff and prices depressed. They rejected the claim on 5th August 1926 and again called on the unions to compile with them an index for the automatic regulation of wages in accordance with the industry's ability to pay. Such a system, they argued, would remove the constant friction that affected wage discussions. Nothing was achieved.

The employers and most of the unions did sign in 1926 the formal agreement dealing with disputes procedure that still stands today.** All the other unions in the industry, apart from the Boilermakers' Society and the Amalgamated Engineering Union, signed similar agreements with the Employers' Federation in 1927.

Apart from questions relating to piecework and piecework prices, the following procedure was agreed:

1. The matter was first to be discussed at yard level between the employer and a deputation of the men concerned.

2. Further meetings at the yard attended by local officials of the employers' association and of the union directly concerned.

3. A formal local conference between the local employers' association and the union.

4. A central conference attended by national officers of the employers' federation and the union.

If the central conference fails to reach agreement, the matter may be referred to arbitration by mutual consent. Where general questions that were raised locally were common to two or more unions, the Confederation of

** Industrial Relations in Shipbuilding - Ministry of Labour Handbook, 1961.
* Shipbuilder, January 1927.

Shipbuilding and Engineering Unions could represent the workers at local or national level, but the unions concerned and not the Confederation had to accept the responsibility for any settlement.

There has been criticism about the time required to go through all the stages outlined above. But in fact only one per cent of all questions reach the national tribunal. About ten per cent are settled at a central conference and the other 89 per cent are settled in the yards or districts.*

The 1926 Agreement made a special reference to piecework and piecework prices. If there was no agreement at yard level, the question would go to a joint committee consisting of three employers and three representatives of the union or unions concerned, none of whom should have any connection with the yard where the dispute had arisen. If they failed to agree, a local or national conference could be called.

Throughout 1927 discussions were held but it was not until February 1928 that agreement was reached on the wage claim. The employers agreed to increase the restored bonus of 7s.0d. a week to 10s.0d. in the case of time workers. Pieceworkers were not included.

Their offer was conditional, however, upon the unions agreeing to join a committee to discuss the setting up of a wages index. **The unions would not accept this bargaining initially but then in June changed their minds. But this was only a partial solution to the wages problem for the majority of workers belonged to six craft unions (boilermakers, shipwrights, woodworkers, electricians, plumbers and painters) that were outside the Federation. Representatives of these unions asked for an improved offer or for arbitration, both of which were turned down by the employers. The unions then moderated their demands and by July 1928 were happy to accept the 3s.0d. offer.

* "Labour Relations in Shipbuilding" by Maurice Ormston, Trans N.E. Coast Institution of Engineers & Shipbuilders, Vol. 65, page 263.

** Shipbuilder, March 1928.

The increase coincided with a steady fall in shipbuilding unemployment. But even so there was still an unemployment rate of 46.7 per cent in December 1928, *the highest figure for any local industry in Great Britain. Instead of the figure continuing to drop, it was soon to become much, much worse - to produce the terrible years of the 1930's.

Although they could not appreciate it, the shipyard workers of the North East - once the makers of almost half the world's navies and merchant fleets - were about to become the symbols, and the worst sufferers, from the world-wide depression. Jarrow summed it up and Jarrow, as we have seen, was Palmer's.

No wonder the men felt they were living through terrible and tumultuous times. Even a middle-aged man would have remembered that once they were kings of the world. Then there had been the cruellest war, followed by the cruellest peace - peace intermixed with prosperity and pitiless despair. And instead of getting better the cruelty of the times got worse.

The result was that the proportion of the total population of England and Wales living in the North East, which had been going up for a century, now started to drop. In 1921 this was by 6.5 per cent. By 1931 the figure was 6.25 per cent. The main reason was undoubtedly the decline of the basic industries of coal, iron and steel, shipbuilding and engineering. In 1924 they employed two thirds of North East workers, a total of 437,460. By 1931 they employed only half of a much smaller total, 218,000.

As one commentator put it: "It is easy now, in the light of what has happened since, to realise that the pre-war position of Tyneside was precarious. Precarious, because it was so largely based upon a few great industries; precarious, also, because it depended to such an extent upon the demands of foreign countries, which might begin to supply themselves; and precarious because so much of the industry was due to the race in armaments which could not continue indefinitely".**

It did not continue indefinitely as we shall see in the next chapter.

* Ministry of Labour Gazette, 18th January 1929.
** Industrial Tyneside by Dr. Henry Mess, director of The Tyneside Bureau of Social Research.

TERRIBLE TIMES

CHAPTER 6

1930 - 1939

The world-wide depression of the 1930's affected shipbuilding probably more than any other industry. Completely open to the harsh economic winds, many firms did not build a single ship for years on end. Some of them went out of existence. Others managed to hang on, despite losses, by living off the profits of previous years. There came a time when four out of every five workers at Jarrow were on the dole; when Sunderland, which was capable of launching a third of a million tons of shipping a year, launched only 2,628 gross tons; when only two of the 77 building berths on the Tyne were occupied; and when over 13m. tons of shipping was laid up throughout the world.

Yet although these years wasted the industry, the industry did not waste them. Tremendous innovations and improvements were made in the technical aspects of shipbuilding so that within a few years savings of up to a half were possible to counter the effects of the depression and to provide the shipowners with a reason for re-ordering.

Slowly the international crisis passed, to be replaced by a new one based on the age-old conflict of arms. At last the Admiralty could start re-ordering and the warship producers of the Tyne could come alive again, but for some, as we shall see, it was too late.

THE OUTPUT PICTURE

The shock was even greater than it had been in the nineteen twenties. Then launchings had dropped by a third from one year to the next. Now they were to plummet into a new scale altogether. In 1930 the North East launched just over 600,000 gross tons, slightly down on the 679,000 of 1929. But in 1931 the figure was only 168,000 gross tons. Hartlepool did not produce a single ship and Sunderland, the "greatest shipbuilding town in the world", produced only 8,800 gross tons.

Work in hand at Sunderland fell from 149,000 gross tons in March 1930 to 21,000 gross tons a year later. At Hartlepool where only one firm was still in existence there was no work in hand at all for the first six months of 1931.

The decline was largely due to the complete cessation in orders for oil tankers which had accounted for more than a third of the total output in 1930. The impact was naturally greatest in the North East, which between 1924-1930 had built two thirds of Britain's tanker output and a third of the world's.

In January 1930, for example, Vickers Armstrong had 14 oil tankers under various stages of construction, bringing the total number of these vessels built or building by the company up to 173. On 24th July, 1930, Palmers launched their 1,000th vessel - a motor-driven oil tanker "Peter Hurll" and three months later Tyne yards launched seven oil tankers within thirty days. The oil tanker, therefore, was one of the backbones of the industry. In 1931 even this failed.

The president of the Shipbuilding Employers' Federation declared: "The year 1931 will stand in the annals of shipbuilding as the most tragic in its history."* It did not in fact although there was an almost entire absence of orders. About 60 per cent ofthe work people were unemployed, by far the highest percentage of any basic industry. In the North East the figure was as high as 70 per cent. And these appalling figures were recorded at a time when there had been a large reduction

* In Lloyds List's Annual Review, 31st 1931.

in the numbers of insured workers in the industry. The number nationally had fallen from 358,790 in November 1921 to 195,390 in November 1931, nearly all of the decline taking place from 1929.

Mr. A.L. Ayre, the President of the Federation, called upon the Government to place orders for Admiralty work, as the U.S.A., France, and Italy were all doing.* "It is not too much to say", Mr. Ayre affirmed, "that the maintenance of a skilful and efficient shipbuilding industry is to this island nation a matter of first importance, not only to its essential maritime trade outlook but also to its defence. The Government, public authorities and merchant shipowners, wherever the outlook will in any way justify the action, can perform a great national service by placing orders for any type of vessel at this moment, thereby relieving the existing severity of unemployment and assisting in the maintenance of the skilled craftsmen required for the production of ships."

Palmer's launched only one ship in 1931. By June, there were 6,700 unemployed in Jarrow, double the number of the year before. By late summer 7,000 were on the dole - 80 per cent of the town's insured population.

The company was now fast running downhill. Its last rush of orders had been in 1929 when output had exceeded 65,000 gross tons, the second highest on the Tyne. The trading account had shown a profit of £25,000 a quarter of which went to the directors in fees.** Since then there had been little new work and the receiver drew nearer every day.

For some companies that day had already arrived through the activities of the National Shipbuilders Security Limited. This was the organisation specifically set up by the industry itself to reduce its own capacity. By the 1930's the fact

* In Lloyd's Lists Annual Review, 31st December 1931.

** "Fiery "Ellen" Wilkinson" was quick to point out this fact in "The Town that was Murdered". She also counted the number of other directorships held.

could no longer be overlooked that although demand was unnaturally, low, capacity was also unnaturally high. Even the most wildly optimistic could see no need for a large proportion of the berths available. The companies that ran them were not only in jeopardy themselves, they also threatened the future of other yards which were more efficient or had more resources.

Total British capacity had risen from 580 berths in 1914 to 686 in 1925. By 1930 it was overwhelmingly clear that neither the unaided play of competition nor a succession of mergers could remove this excess capacity.* The National Shipbuilders Security Limited was set up to tackle the problem.

The main inspiration had come from Sir James Lithgow the Clydeside shipbuilder, and he was made chairman of the company.** Directors were chosen from yards on the Clyde, Tyne, Tees, Wear and the Forth and from Belfast and Barrow. It was backed by the Bankers' Industrial Development Company, set up by the Bank of England, but its principal source of finance came from the shipbuilders themselves. They agreed to pay a levy of one per cent on the price of the new vessels laid down.

The company had a share capital of £10,000 in £ shares, with borrowing powers of up to £2½ m.*** Its task was to buy redundant or obsolete shipyards and to resell the sites for any other industrial purpose except shipbuilding. In doing so it had to try to keep a balance between districts and between the class of work. This was not easy. For example, more cargo-building than liner-building yards were taken over, against an outcry from the North East. But it was in this field that excess capacity lay.

By March 1932 National Shipbuilders Security Limited had purchased nine yards in the North East. They were:- ****

* L. Jones, "Shipbuilding in Britain", Cardiff 1957. p.133-7.
** ibid. *** ibid. **** ibid.

1. Cleveland Dockyard Co. Ltd., Middlesbrough.
2. Craig, Taylor and Company, Stockton.
3. Northumberland Shipbuilding Co., Howdon on Tyne.
4. Smith's Dock Co. Ltd., Stockton.
5. Charles Rennoldson & Co. Ltd., South Shields.
6. Renwick and Dalgleish, Hebburn.
7. Robert Thompson & Son, Sunderland.
8. Whitby Shipbuilding Co., Whitby.
9. Osborne, Graham & Co., Sunderland.

Other yards were bought up later as the depression grew even worse, but first earnest efforts were made to find another solution. On 24th April, 1931 the Shipbuilding Employers' Federation called a meeting with the trade unions. The employers affirmed what the unions knew only too well, that over two and a half million in all industries were unemployed in Britain but that shipbuilding was faring worse than any other. In marine engineering, unemployment was about 30 per cent and in shipbuilding almost 50 per-cent. Over 100,000 were unemployed in the industry.

The Newcastle Employment Committee reported that Tyneside had 78,452 unemployed in March 1931. Over 60 per cent of those normally employed in shipbuilding on the river were out of work while in marine engineering the numbers of unemployed had trebled since 1930.

The following year, 1932, was even worse. The North East launched only 79,439 gross tons, just over a third of the United Kingdom output and ten per cent of the world figure. The situation was worst in the two main rivers of the Tyne and the Wear. The Tyne, which as recently as 1928 had launched over 300,000 gross tons, produced only 24,000 gross tons. And the Wear, which in 1929 launched 245,000 gross tons, produced only 2,628 gross tons - a nadir for which there was no precedent, even if one goes back a hundred years.

A creditors' meeting of Palmers was held in London on 19th February, at which the company was given more time to allow negotiations to be completed on an important contract which, it was hoped, would provide work for some years ahead. There was also some difficulty in obtaining payment of a considerable sum owing to the company and deposited with a foreign government. The moratorium, however, was to have little effect. On the 19th July 1932 the company launched what was to be its last ship, "H.M.S. Duchess". *

Swan, Hunters, which so often had held the Blue Riband for the greatest shipbuilding firm in the world, received between April, 1931 and April 1932 only six orders - for 16,000 tons of shipping.

Hawthorn Leslie, like almost every other company, tried to make every economy it could. Directors, officials and staff all accepted a ten per cent reduction in salary, which was not restored until 1936. The total number of employees fell from 5,004 in June 1931 to 1,049 in June 1933.

As affairs deteriorated, the call for Government subsidies grew louder. Traditionally, the industry had been opposed to any form of interference. But now it could no longer ignore the fact that the U.S. Government had poured out $1,400,000,000 to help home shipbuilders since 1915: that Italian owners were not allowed to place orders abroad; and that in Germany about three million tons of modern shipping had been built virtually without cost to the owners.

As a consequence, the supremacy of the seas was passing from British hands. France now had the fastest service on the South American run and was building the "Ile de France", of 70,000 deadweight tons entirely on Government capital. Germany with the "Bremen" and the "Europa" had the two fastest Atlantic

* "The Town That Was Murdered", p.157.

liners afloat while Italy was about to place in service two express liners "Rex" and "Conte de Savoia" of about 50,000 tons each.

In Britain, Cunard's new challenger for the Atlantic, Ship no. 534, which was on the stocks at John Brown's yard on Clydeside, was being held up because of the difficulty of raising money at attractive rates. The Government was called upon to help the company,* and indeed to help the whole industry.**

"Is it not time that we paid something in subsidies to our vital but depressed trades and so increased employment and wages and reduced our expenditure on unemployment relief? We are paying too much for idleness and not enough for productive work."*** Since the war £500 m. had been paid out in unemployment relief.

Shipbuilders themselves still remained unconvinced, however. Dr. G.B. Hunter, Chairman of Swan, Hunter commented: "I do not advocate subsidies for British industries: I am not aware that British shipowners or shipbuilders desire them. But they do ask for fair play. Should we allow subsidised foreign products and ships into our ports?" ****

The Government also remained unconvinced, at least until 1935 when a "scrap and build" scheme was introduced. By then the industry had come through the worst, which occurred in 1933. In that year the U.K. launched only 133,000 gross tons and the N.E. only 37,000 gross tons. Hartlepools again had no launchings at all and the Tyne and the Wear produced just 11,000 tons each. Middlesbrough and Stockton on the Tees gained the unprecedented distinction of having the highest output in the area, with, 14,000 gross tons. But for some there was at least the taste of hope. During the year the Furness Shipbuilding Company received three contracts and decided to re-open their

* Shipbuilder, May 1932.

** Glasgow Weekly Herald, October 1932, article by E.T. Good.

*** Ibid.

**** Ibid.

yard and Smith's Dock followed suit with their South Bank yard when they won an order for a diesel-engined trawler from French owners.

On the Tyne, three yards were fading away. The Tyne Iron Shipyard at Willington Quay, which had been in business since 1876, was sold to the National Shipbuilders Security Ltd., in March for dismantling. Eltringham's, with an annual capacity of 18,000 tons, was put up for sale as a going concern. And, saddest of all, Palmer's finally gave up the long fight at the end of June and appointed a receiver.

The industry had reached its lowest point and the effects among the unemployed were there for all to see. J.B. Priestley in his "English Journey 1933" wrote of Jarrow: "Wherever we went there were men hanging about, not scores of them but hundreds and thousands of them."

Another writer commented : "As the years passed, the unemployed man turned grey.* Everyone commented on the greyness of the hard-core unemployed - grey hair, grey stubble, even grey skin. He seemed to be looking at the gound all the time. He wore incongruous clothes, perhaps pin-striped trousers cast off and given to charity by a bank manager. He felt he had no dignity. He knew he had no hope."

He was not given to hope by others, Neville Chamberlain, the Chancellor of the Exchequer at the time, declared: "I do not think that we can look forward with any confidence to the reduction of unemployment to a comparatively small figure within, say, the next ten years."

Some, however, were incapable of despair. Sir Frederick Pyman, a director of William Gray's Yard at West Hartlepool, made a remarkable speech at about this time, in which he said:**

* The Jarrow March by Colin Cross, Observer, 6th Feb. 1966.

** West Hartlepool Rotary Club Speech, October, 1933.

"Shipbuilders die hard. They hang on in the hope that competitors may go under and that things will get better. In the privately owned yards, which must constitute a substantial proportion of the capacity of the industry, it is common to find the 3rd, 4th or 5th generation at the helm. Family pride and prestige are at stake..... So there are forces at work which are pulling in the opposite direction from the economic forces. For nearly a decade, the old shibboleth of laisez-faire reigned and what happened? A mere handful of yards went into liquidation and of these the best were picked up at scrap prices and reconditioned."

There was one sign of improvement. The merchant tonnage ordered during the year - 300,000 gross tons - was three times higher than in 1932 and tonnage commenced - about 275,000 gross tons - was nearly four times higher. "The industry has just enough work on hand to keep it alive - no more," commented Mr. C.S. Swan, senior vice-president of the Shipbuilding Employers' Federation.*

But 1934 turned out to be a much better year, with production in the North East almost twice as good as it had been in 1933. In the country as a whole the jump was even more spectacular - rising from 133,000 gross tons to 459,000 gross tons, taking the U.K. back to 47 per cent of the world output.

Why was the North East recovery much slower than for the country as a whole? Mainly because new orders for tramp steamers, cargo liners or oil tankers picked up far more slowly than other types of work. Belfast, for example which had almost no work at all in 1932, now had near-record figures for work under construcion or coming forward. The outlook there, in fact, was much brighter than it had been for a long time. It was becoming brighter, too, on the Clyde. But it was not until 1936 that the North East figures approached a "normal" **

* L. Jones, "Shipbuilding in Britain", Cardiff 1957, p.106-7.
* Shipping World, 10th January 1934.

level, though even then they were still historically low and were to remain so until the outbreak of war. The scale of the problem can be judged from the fact that in June 1934, Swan Hunters received the biggest order in the North East for some considerable time - a twin-screw passenger liner of just 10,000 gross tons.

In the early summer of 1934, Palmer's was sold to National Shipbuilders Security Limited. As Miss Ellen Wilkinson put it: "The death warrant of Palmer's was signed.* The reason for Jarrow's existence had vanished overnight..... The great shipyard of Jarrow was dead..... killed because it was a powerful competitor,..... rooted out, not because it was inefficient but because it stood in the way of big financial interests, who wished to consolidate their grip on the shipping industry and get control of shipping prices. In the doing of this.... this group have crippled the British shipbuilding industry."

Miss Wilkinson did not explain how the reduction of excess and burdensome capacity would cripple the industry. Nor that the management had offered the company for sale voluntarily. Another view was put by the biographer of the architect of National Shipbuilders Security Limited:

"The yard was workless and without any promise of work when it was shut down.** The firm that owned it had been unable to meet its debts for years past. It was legally bankrupt and there was no prospect that it could be revived. Its end was inevitable but it was a local disaster."

"To be politically effective such a story as Ellen Wilkinson's needs something more than an institutional villain. There must be a personal devil too. In her book the organiser of Jarrow's murder was Sir James Lithgow. He was so little known, even by

* The Town that was Murdered, p.172.

** "James Lithgow, Master of Work" by J.M. Reid, London 1964, page 134.

name, to the general public, outside the west of Scotland, that it was easy, by a skilful use of his own forth-right pronouncements, to make him seem a mysteriously threatening capitalist bogey who cared for nothing but his profits.

"This was the price that had to be paid for leadership in one of the least rewarding tasks of his life..... He suffered long and intensely, though usually silently, from the sort of criticism and misrepresentation which grew out of N.S.S., For him the closing of shipyards had in itself been a painful process. As intensely as any of his critics, he believed in the value of work, in the need of human beings for employment that could occupy, interest and reward them..... No duty could have been more unwelcome than that of ending for thousands the hope of work in his own industry. This was done because it seemed a duty to those who might still find a place in fewer yards."

There seems little doubt that Palmer's collapsed because of inefficient management. In preceding chapters we have shown that it ran into financial difficulties on a number of occasions and indeed for the last forty years of its life was seldom free of a financial sword hanging over its head. In the early 1920's as the previous chapter has shown, a period of excessive demand resulted not in the piling up of profits and reserves which could have helped to cushion the effects of the depression, but to acquire at a high price new capacity. Equally the management failed to scrutinise the internal activities of the Company sufficiently rigorously. The unprofitable iron works, once a vital part in the process of vertical integration, should have been scrapped so that the Company could concentrate on its main function-obtaining its steel much more cheaply in a buyer's market. When all these factors are taken into account, there can be no surprise that Palmers should fail to withstand a long war of economic attrition.

The National Shipbuilders Security Limited had now reduced the industry's capacity by a million tons but the remaining capacity could still deal with three timesthe present work. The numbers of people in shipbuilding had fallen from 358,000 in 1923 to 157,000 in 1935 but 64,000 of them were still unemployed.

During 1935, the most important piece of Government interference so far in the affairs of shipbuilding took place with the British Shipping (Assistance) Act.* This measure provided that the Treasury could advance a sum not exceeding £10 m. in loans at three per cent or less, repayable in twelve years, to British owners. There was a vital condition, however. This was that the owners scrapped two tons of shipping for every ton built. It was estimated that the sum set aside would finance the building of about 600,000 gross tons of shipping, thus requiring the scrapping of 1,200,000 gross tons.** The vessels were mainly to be general cargo ships, so that the measure was designed almost specifically for the North East. It was not surprising, therefore, that of the eight shipbuilding centres that benefitted the most from this measure, five were in that area - Sunderland gained most of the business, with 24 vessels of 98,000 tons.

The measure, on the whole, "failed in many respects to live up to the hopes pinned upon it. There is no abatement of the crippling effects on British shipbuilding and ship repairing of intense subsidised foreign competition."* **

Theoretically, there should have been no difficulty in finding 1,200,000 tons to be scrapped but owners were reluctant to take action so long as there was the possibility of higher freight rates. They felt that if full scrapping did take place, freights would inevitably improve, thereby providing an income

*** C.S. Swan in Lloyds Annual Review, 31st Dec. 1935.
* L. Jones, "Shipbuilding in Britain", p.110.
** ibid.

for even the oldest vessels. Everyone waited for everyone else to scrap first.

Shipbuilders, who had hoped for a lot of work, were therefore disappointed. Only 37 applications, relating to the construction of 50 ships of about 186,000 gross tons, were approved. The total advances to owners came to just over £3,500,000.

Despite this failure, the trend in shipbuilding was now firmly upwards again. Sir Maurice Denny, President of the Employers' Federation, was able to report that there was a rapid and substantial improvement in 1936. * There were about five times as many merchant ships being built as during the black period of 1932-3. In fact, tonnage under construction was approaching a million. "At long last, the dark clouds have rolled away," Sir Maurice commented, "the barometer registers 'Fair' and is rising."

But such feelings were only relative to the period of depression. There was no question of the industry regaining its pre-war size. Not only had the British percentage of the world tonnage fallen from 44 in 1914 to 28 in 1936. But there had also been a big drop, particularly noticeable since 1930, in the volume of tonnage built in Great Britain for foreign account. The N.E. alone, which at one time had built more than a third of the world tonnage, was now building only about 12 per cent.

Foreign yards were taking the place of this country. A third of all the work in these yards was for foreign account. Half of German shipbuilding in 1936 was for foreign countries, including Great Britain. In Sweden, the proportion was over 80 per cent. In the late autumn of 1938 there came a month when not a single merchant ship contract was booked by British Builders. During one week in the same month, Scandinavian

* Lloyd's Annual Review 31st December, 1938.

shipbuilders landed orders for 19 ships. Lloyds Register for September 1938 showed that new tonnage begun in British yards was only 87,463 gross tons compared with a figure six times as great in foreign yards - "a condition for which we cannot recall any precedent." *

This led to a launching figure of just over 600,000 gross tons in 1939 and 842,000 gross tons in 1940. After the traumatic experience the industry had been through in the mid-thirties, however, such figures were relatively good. And indeed in 1938 launchings had exceeded a million tons for the first time in eight years.

The upsurge was powered, in part, by the new Government aid scheme which came into effect in March 1939.** Under this, the Government granted a subsidy of £2.75 m. a year for five years to tramp shipping, a capital of £500,000 a year for five years to owners of tramp and cargo lines placing immediate orders in British yards and £10 m. for loans to owners on low interest terms for two years to build tramps and cargo liners.

The tramp shipping subsidy was to be determined by an index number of freight rates. An important innovation was that no scrapping of old tonnage was now required before loans would be given. Instead, there was to be a careful laying up programme of "care and maintenance" under which these ships were not to be brought out for trading except in an emergency.

The new measures had an immediate effect. Within six weeks shipowners had placed orders for 144 tramp and cargo liners with an aggregate of over 700,000 gross tons. ***

It was the nearest thing to a boom that the industry had seen for ten years. Besides, the full-scale resumption of naval building was giving the industry that extra support that it needed. Towards the end of the thirties it was almost like old times again, although no one could ever forget the experience they had lived through.

* Shipbuilder, January 1939.
** L. Jones, p.156.
*** Ibid.

NAVAL WORK

The difficulties in merchant shipbuilding were compounded by the Government's naval policy in the early and mid-thirties. Long and eventually vain attempts to achieve a lasting world-wide agreement on disarmament had disastrous repercussions on the industry. Palmer's, which had been one of the greatest suppliers of warships, went out of business altogether, while the Naval Yard of Vickers-Armstrong was closed for seven years (although a passenger liner, "Monarch of Bermuda" was built there during this time).

The 1931 naval programme, which included the building of three cruisers, nine destroyers and three submarines, was very much subject to the Disarmament Conference then taking place. Indeed £4 m. was lopped off the estimates for 1931-2 to prove the Government's good intentions.*

In the following year the estimates fell lower still. They were the lowest since 1913, being just over the £50 m.** The Rt. Hon. Sir Bolton-Eyres-Mansell, the First Lord of the Admiralty, in a printed statement accompanying the estimates, remarked: "The total of £50,476,300 has been fixed with strict reference to the needs of the financial situation and must not be regarded as an adequate provision for the needs of the Navy. On the contrary, I am satisfied that, on the basis of considering actual requirements, not even the most rigid scrutiny could have justified the restriction of the Navy Estimates to such a figure."***

The worst feature was the postponement by six months of the 1931 programme which would not now start until September 1932. There were to be 28 new vessels, 20 of them built in private yards. Contracts were won by Hawthorn, Leslie for

* Shipbuilder, April 1931.
** " April 1932.
*** Ibid.

hulls and machinery for two destroyers and by Swan, Hunter and Wigham Richardson for the hulls of two destroyers, with machinery by the Wallsend Slipway and Engineering Co. Ltd., a subsidiary company.

Hawthorn Leslie fared better than any other N.E. firm for naval work during the depression years of 1930's. Betweem 1930 and 1934 it launched nine warships, four torpedo-boat destroyers for the Admiralty and four sloops for the Portugese Government and one for India. The foreign orders were achieved by vigorous efforts by Mr. Robin Rowell who became managing director of the company in 1936. They helped to keep the average annual loss on shipbuilding to £8,000 for the years 1931-6 inclusive. *

The St. Peter's engine works was the only profitable part of the company and kept the other departments afloat. In three of the depressed years alone it had built machinery for nine naval vessels and five sets of diesel engines.

In February 1933 Swan, Hunter secured the contract to build the hull of the 7,000 ton cruiser "Phaeton" while the Wallsend slipway was to supply the 72,000 S.H.P. propelling machinery. Parsons Marine Steam Turbine Company was to be the main contractor for two destroyers - H.M.S. "Fame" and H.M.S. "Firedrake" - whose hulls were built by Vickers, Armstrongs at Barrow. Palmers were without success in either the 1931 or 1932 programmes and this failure hastened the death of the company.

The estimates for 1933-4, although still curtailed by financial considerations, showed an increase over the previous year. They went up by £3 m. to over £53 m.** New construction, which had been deliberately retarded since 1931, now played an important part in the increase in expenditure. New ships

* Private History of R. & W. Hawthorn, Leslie, by J. Bulman.
** Shipbuilder, April 1933.

included four cruisers, nine destroyers and three submarines.

The increase was the beginning of a new trend, although the Government would not have admitted it at the time. Hopes of a successful outcome to the Disarmament Talks were still lingering and the disastrous effects upon shipbuilding were still a major source of annoyance to shipbuilders. One of them wrote: "Before the slump, the contribution of British shipping to the national trade was estimated to be £150 m. a year and of British shipbuilding £80 m, the two industries thus accounting for £230 m. Need it be argued that it is the Government's duty to support industries which are capable of contributing this vast sum annually to our national trade."*

During 1934 and 1935 there was a gentle increase in Admiralty expenditure up to a level of £60 m. But in 1936 the expiry of the London Naval Treaty prohibiting the building of new capital ships coincided with a worsening of the international situation. Accordingly the Navy Estimates for 1936 foresaw a big increase in naval building. **

Two new battleships were to be laid down in 1937, together with five cruisers, and there was to be a steady replacement programme for destroyers and submarines. Nine new destroyers were to be laid down immediately, four of them in the North East.

The total net estimates of £69 m. exceeded by £9 m. those for 1935. But even so a supplementary estimate of £1 m. was issued in July allowing for a start to be made on another two cruisers, nine destroyers, one aircraft carrier and four submarines.

One of the two battleships - "King George V" - was to be built by Vickers-Armstrong at Walker and one of the cruisers by Swan, Hunter and Wigham Richardson.*** By September 1936 there were 17 warships under construction or on order in the Tyne.

* C.S. Swan, senior vice-president, Shipbuilding Employers' Febderation, in ShippingWorld 10th Jan. 1934.

** Shipbuilder, April 1936. *** Ibid.

Vickers, who had re-opened their Walker Naval Yard in 1935 had received contracts for the battleship mentioned above, for the 9,000 displacement tons cruisers "Newcastle" and "Sheffield" (both of which were afloat by September 1936) and for six destroyers (two of which were afloat and being fitted out).

Hawthorn Leslie had the 9,000 displacement ton City-class cruiser "Manchester" - probably the finest warship ever delivered by the yard - and two destroyers "Imogen" and "Imperial", Swan, Hunter, and Wigham Richardson were building the 9,000 ton cruiser just ordered and four destroyers (two of which "Hunter" and "Hyperion" were afloat).

In January 1937 the Admiralty announced that Vickers-Armstrong were to be given orders to build two aircraft carriers - the "Victorious" and the "Illustrious". The former was to be built at Walker with machinery supplied by the Wallsend Slipway and Engineering Company. The latter was built at Barrow.

Two months later the new Navy Estimates showed that the increase in activity was well-founded.* They came to £105 m., £23 m. more than the total estimates for 1936-7, even including the supplement. Of the increase £14 m. was due to new construction. There were to be three battleships, two aircraft carriers, five cruisers of about 8,000 tons, two cruisers of about 5,000 tons, sixteen destroyers and seven submarines and many supporting ships. Altogether 98 new vessels were to be laid down under the 1937 programme, 88 of them by private companies, rather than by the Royal Dockyards. One of the three battleships - the 35,000 displacement ton "Jellicoe" - went to Swan, Hunter,

The gathering war clouds lifted expenditure even higher in 1938 when the Naval Estimates were £123 m. and a supplementary estimate in July added another £2.5 m.**

* Shipbuilder, April 1937.
** " April 1938.

This was the year when Hawthorn, Leslie launched the destroyers "Jervis" and "Kelly". The latter became the most publicised of all Hebburn vessels. Her exploits under her captain, Lord Mountbatten, made her world-famous and her sinking during the evacuation of Crete served to add further to her fame.

From being a depressed industry, only a few years previously shipbuilding and especially warship building was now rising to full pressure. It started to experience the difficulties that many had foreseen when so many able men were allowed to drift away during the depression, an extreme shortage of skilled labour. Between 1929 and 1935 the total labour force in the industry had declined from 350,000 to 157,000. By 1938 it had climbed up to 175,000.

The pressure of activity became even greater, however, on 21st February 1939, "King George V" was launched from Vickers' Walker Naval Yard by the reigning King, George VI. The first of a new class of battleship the "George" had a displacement of 35,000 tons. It had a main armament of ten 14 inch guns located in three turrets and a secondary armament of 16 five inch guns in eight turrets.*

It was appreciably faster than its predecessors "Rodney" and "Nelson", which had been launched in 1925, it could carry aircraft which were flown off by means of a catapult and had special protection against gunfire, aerial bombs and mines.

Almost as soon as the launch had taken place, Vickers-Armstrong received an order for another battleship, one of two placed under the 1938 programme. Besides the b·ttleship, the Tyne then had an aircraft carrier, five cruisers and eight destroyers being constructed or fitted out. Naval launchings in the North East increased from 10,000 displacement tons in 1930 to over 20,000 displacement tons in 1938.

* Shipbuilder March 1939.

But far more work was yet to come under the 1939 programme of £147 m., £60 m. of which was to be spent on new vessels. The empty years were now a thing of the past. For the next five years - and indeed for the first fifteen years of peace - the yards were to ring again with the clamour of intense activity. The N.E. had returned in full measure to its traditional role of making weapons of destruction with all the skill and energy at its command. In so doing, it underlined yet again the old axiom that it is busiest and most prosperous in times of war.

TECHNICAL DEVELOPMENTS

The years of depression were not years of idleness in technical developments. Indeed some of the most important changes in the history of shipbuilding were being made during these years over the whole range of technical knowledge. One writer summed up the position in January 1932: *

"..... It is almost a truism that, whenever trade depression is severe, technical development flourishes. For the longest period in record, the industry has experienced a severe depression and in that time marine engineering progress of outstanding importance has been recorded..... Glancing back over the past ten years, one is reminded of the spectacular triumph of the motorship; the introduction and brilliant vindication of the high-pressure, high temperature, marine steam-turbine installation of the late Sir Charles A. Parsons the coming of the double-acting marine diesel engine, the super-charging of diesel engines, the gradual change-over (Not yet completed) to airless injection in marine oil engines; the astonishing popularity in the Bauer-Wach and similar exhaust steam turbines of a discarded idea modernised, the success of the 'unsuitable' water-tube boiler for mercantile vessels; the progress in this country of electric drive for marine propulsion;

* Shipbuilder, Jan. 1932.

the development of the exhaust turbo-electric system: the advent of motor ships approaching and even exceeding the tonnage of the "Mauretania," the diesel-driven warship with geared machinery, having welded framing and weighing less per h.p. than many light-weight, high-speed oil engines: the immediate success, practically and technically, of the high speed heavy-oil engine; "one lb. of coal per i.h.p. per hour" in the marine steam engine; specific consumptions of little in excess of ½ lb. of oil per s.h.p. per hour with geared-turbine plants; the construction of a great Atlantic liner with turbo-electric machinery (for the Compagnie Générale Transatlantique); and the building of the Cunard Steamship Company's Blue Riband Challenger, with geared turbine machinery of a power believed to be considerably in excess of that ofthe existing joint holders of the Atlantic record or of any of the contenders now being constructed."

The use of electric drive for marine propulsion, one of the many points mentioned in the quotation above, became a serious proposition with the "Viceroy of India" built in 1928 That ship proved so successful that the Penninsular and Oriental Steam Navigation Company decided to order another two, both to be built by Vickers-Armstrong at Barrow.*

But the North East played its part in the developments of "electric" ships too. In 1930 Vickers-Armstrong received another notable contract for an electrically-propelled liner and decided to build it at Walker. This was for "Mid-Ocean" to operate on the Bermuda-New York service. The turbo-electric equipment was supplied by the General Electric Company of Birmingham.**

The Furness Shipbuilding Company on the Tees also built an interesting "electric" ship in 1930.*** This was the "Cementkarrier" for use on the Great Lakes. It was equipped

* Shipbuilder, January 1931.
** Ibid. *** Ibid.

with two Polar single-acting, two-stroke cycle, airless-injection engines, each coupled to a direct current generator. The two units supplied current to a single propulsion motor rated at 775 s.h.p.

Electric propulsion had had a slow start from its early advocacy by Mr. H.A. Mavor in 1911.* During the following 17 years only 38,800 turbo-electric horse-power was installed for propulsion of merchant ships. But then in 1928 34,000 turbo-electric h.p. was added to the world's fleets.**At the end of 1930 there was 161,500 turbo-electric h.p. on order. By March of the following year electric propulsion had been installed in 170 ships throughout the world, about 20 of them being Naval vessels belonging to the U.S. Navy.

Despite these advances, electric propulsion still contained two important disadvantages; the loss that occurred in transforming mechanical into electrical energy; and the slightly greater first cost.***

Electric ships remained therefore an interesting novelty. But the main interest in these years was still the intensifying competition between steam and oil.. The North East had now become the country's main centre for motorship construction and this was true in 1930, despite the decline in output. Tyne shipbuilders had in hand 21 motorships of 150,930 gross tons as compared with 19 vessels at 125,900 gross tons on the Clyde and seven of 99,300 at Belfast.

By 1933 there was a fairly even balance between steam and diesel, coal and oil. Gradually, diesel engines pulled ahead.****

In steam, developments were taking place which a few years previously would have been regarded as impossible. Superheat, tried and abandoned once, had returned with amazing vigour and, in association with poppet valves and balanced slide valves, was being used in large numbers of new and

* Shipbuilder, March 1931. ** Ibid. *** Ibid. **** Shipbuilder, Jan. 1934.

converted reciprocating engine sets with outstanding success.

Maurice Gibb, of the Central Marine Engine Works at West Hartlepool, had designed the "Quadropod" engine to achieve higher economy.* It was a quadruple expansion engine which developed 2,100 i.h.p. at 80 r.p.m. and used steam at a pressure of 260 lbs per sq. inch superheated to 590 degrees F. A special characteristic was that it needed only one steam receiver thus reducing the losses which were inevitable in the normal multi-receiver type of engine. The Central Marine Engine Works forecast that consumption would be about 1lb. of good coal per i.h.p. per hour.

Another superheat engine was designed about this time by Albert White, the managing director of White's Marine Engineering Company of Hebburn.** It was a combination type, consisting of a high-speed reciprocating steam-engine and an exhaust turbine, both geared to the propeller shaft. Steam was taken at 220 lbs. per sq. inch and superheated to 160° F. White estimated that steam consumption would be only 9.4 lbs per b.h.p. compared with 15.2 lbs. for a normal engine of this type.

But it was the motor engine that seemed to make the most spectacular progress. Recently with the "Prince Baudouin", diesel engines had broken into the steam engine monopoly in cross-channel work. This break-through was considered to be of great technical significance.

Doxford's had been able to make big improvements to their engine, making it 50 tons lighter, seven feet shorter and with a lower fuel consumption than before. This had been made possible by using electrically-welded construction for the engine-framing. ***

* Shipbuilder, Jan. 1932.
** Ibid.
*** Dr. Ker Wilson.

These improvements led to Doxford's gaining the contract for the installation of the main propelling engines in the quadruple-screw passenger liner "Dominion Monarch" built for the Shaw, Savill and Albion Co. in 1939. According to Dr. Ker Wilson, this was "probably the most important Doxford achievement up to date."*

At that time the "Dominion Monarch" built by Swan, Hunter and Wigham Richardson, was the highest-powered motor vessel in the mercantile marine. Each of its four main engines developed 6,500 brakes h.p. and 123 r.p.m. These figures compared with 2,700 brakes h.p. and 77 r.p.m. in the prototype Doxford engine of 1919.

The "Dominion Monarch" helped to make 1938 a year of "almost unprecedented activity" in diesel-engine construction and to emphasize the dominance of the motorship. For by the end of the 1930's diesel engines had won the battle to propel the world's fleets. In September 1939 Lloyd's Register showed that only ten per cent of new shipping was being fitted with steam turbines and 60 per cent with diesel engines.

In Great Britain alone, however, diesel engines were not as popular. Steam was still being installed in 51 per cent of new vessel and internal combustion engines in 49 per cent. Nevertheless, this country was the biggest producer of diesel engines, turning out 21.4 per cent of the world total, substantially more than any other country. The total output of propelling machinery in this country was 29 per cent of the world total, followed by Germany with 16 per cent, Japan with nine per cent and Italy with eight per cent.

Sir Joseph Isherwood, one of the most fecund N.E. inventors brought out a new hull design in 1933.** He called it "Arcform" and the primary object was to give a much lower fuel consumption than had ever been achieved up to that time. Sir Joseph did

* Development of the Doxford Marine Oil Engine from "Engineering" March 5 and 12th, 1943.

** Shipbuilder, Jan. 1934.

this by reversing the traditional practice of keeping a ship as narrow in the base as possible. It was thought to be difficult to drive a ship at economic speed if her length was not at least seven times the breadth. But Sir Joseph's new design had proportions of $6\frac{1}{4}$:1 It was the widest design in proportion to length put forward for many a year.*

Sir Joseph ordered the first three vessels himself. The first "Arcwear" was built by Short Brothers of Sunderland and engined by the North East Marine Engineering Company. The sea trials surpassed expectations. Her speed, calculated for design purposes as $11\frac{1}{2}$ knots, was actually over 12 knots. "The results already obtained are exceedingly satisfactory and will revolutionise tramp shipping," said Sir Joseph at the time. **

An observer commented "Sir Joseph Isherwood, in his recently-patented Arcform full design, has broken new ground with that courage and originality which have always characterised his work."***

On her maiden trip to Buenos Aires, the "Arcwear" made a little over 11 knots on a daily average coal consumption of 19 tons. That was 15-20 per cent less than in any comparable vessel afloat. But Sir Joseph felt it could still be reduced by another third. He was so confident, in fact, that he ordered another ten vessels to the Arcform design himself.

It was technical innovations of this kind, many of them unfortunately being made abroad, that almost alone provided a sign of health and of hope in the barren 1930's. Without such efforts, these years would have been wasteful indeed, But economic forces could not stop the inventiveness of man or kill his optimism. It was these two factors that helped to restore demand from about 1935-6 onwards. For by producing more efficient ships, the builders gave the owners a justification

* Shipbuilder, January 1934.
** Ibid. *** Ibid.

for placing orders, earlier than would previously have been the case in a world of unfavourable freight rates.

PRICES AND PROFITS

These were desperate years for the financial health of the shipbuilding companies. All of them saw their profits heavily reduced and only the strongest managed to avoid losses. Until 1936-7 when resurgent demand could allow a flexibility in costs and prices again, firms could only obtain the small amount of work that was available by tendering to the tightest of profit margins. Some firms even tendered at a loss in order to maintain employment or to retain contact with a regular customer.

From 1930 to 1934 prices remained virtually stable. The "Fairplay" guide to prices listed a cargo vessel of 7,500 tons deadweight with plain specification as £63,500 in 1931. The price was still the same in 1934. A N.E. builder - John Readhead and Sons of South Shields - was quoting a final cost of £9.4 a deadweight ton in 1930 and the same figure in 1934. In between the firm had cut its price even further, to £8.8 per deadweight ton in 1931.*

It was not until 1935 that prices began to edge upwards. The "Fairplay" quotation on the same bases as above was £71,700 By 1937, rising demand and a shortage of men and materials, was producing a substantial increase. The "Fairplay" quotation went up to £108,000. Between 1937 and 1938 John Readhead's of South Shields lifted their prices by a third - from £9.6 a deadweight ton to £12.2. In 1939 the price went even higher, to £14.6 a deadweight ton.

By this time, the companies were beginning to make satisfactory profits again. But for a number of years, life had been very thin.

* See Appendix.

S.P. Austin, the Sunderland shipbuilding firm, made a loss every year from 1923 to 1936 with the exception of 1929. In these years, its aggregate losses came to £118,364. By 1936 it was able to make the tiny profit of £415 but the following year had boosted this to £17,300.

To a varying degree this was the experience of all companies. Swan, Hunter and Wigham Richardson managed to avoid losses. But they did see their net profits fall from over £150,000 in 1931 to £18,956 in 1933. From that year, they picked up strongly again. In 1935 net profits were over £190,000 and in 1939 were over £490,000.

Despite the average loss of £8,000 a year on shipbuilding, Hawthorn Leslie and Company suffered only one, small overall loss in 1932-3 when they produced a deficit of £1,193. The engine works at St. Peters was keeping the company afloat with average profits of £23,000. By 1938-9 the company was making profits of over £160,000.

Smith's Dock of North Shields had a poor time between 1931 and 1933 when their aggregate losses came to about £94,000. But towards the end of the decade they were making profits of £100,000 a year again.

Some firms as we have seem - such as Palmers and a handful of others - could not sustain the losses and went out of business. Others, such as Vickers, could only do so by closing down one or more yards completely until better times returned. All of them, in the mid-thirties, needed a good deal of faith in the future. For those who had the faith, and the resources, to hang on, however, the late thirties and then the war brought them their rewards.

THE HUMAN ASPECT

This period opened with the two most important advances ever made in the wages structure of the industry - a scheme for national uniform time rates, followed by a similar scheme for piece-rate workers. An expert called the first scheme: "The most important wages development in the history of British shipbuilding."* But the second scheme was even more important.

The first scheme, which had been signed by the Employers' Federation and the unions in 1929 and came into effect in 1930, was designed to simplify the wages structure and thereby reduce the many points where friction between groups of workmen could arise.** There were to be three broad categories of payment. Fully skilled plain time workers of 21 or over, apart from drillers and other iron workers, would receive £3 a week, made up of a 50s. basic rate and a 10s. bonus. Unskilled plain-time workers over 21 would receive £2. 1s. 0d, made up of a 31s. basic rate and a 10s. bonus. The semi-skilled would receive an advance in each district that would maintain the district margins. Thus each group had a similar payment system and also had its wages increased by between 1s. and 5s. each week.

The principle of equality was accepted unanimously by the unions, who called it couregeous and constructive.***They felt it would remove a deep-seated potential for jealousy and friction.

The wages of piece-workers were not affected by this agreement.θ Their average earnings in 1930 were £4. 10s 0d a week for a typical 41 hours week. Had there been enough demand to call on their services for a full-time 47-hours week, their earnings would have been over £5.

* Shipbuilder, January. 1930.
** Ibid. *** Ibid. θ Ibid.

An attempt to grapple with the problems of piecework payments was made during 1931 and resulted in a General Wages Agreement being signed in October.*

The scheme was designed to reduce labour costs and to sweep away anomalies, a constant source of discontent, e.g. skilled men on plain time were receiving £3 a week for 47 hours while certain classes of pieceworkers were regularly receiving £7 - £8 for 40 hours.**

Negotiations lasted from April to August 1931 with no serious disagreements. A.L. Ayre acted as chairman of the Employers' side and Will Sherwood represented the unions.

With orders for the year representing only 1/10th of the industry's capacity, with only 17% of building berths occupied and with 25 yards closed for lack of work and 60 per cent unemployed in the North East and on Clydeside, the employers urged the need for reductions in labour costs. Reductions in the prices of materials had been obtained and redundant capacity tackled through rationalisation.***

Investigations into progress since 1929 had shown that an average time worker earned about £5 for a full week of 47 hours. The average earnings for pieceworkers ranged from 2s.6d to 5s. 10d an hour.

The employers also called for a new look at over-time and the need for greater union co-operation when new machines were introduced. After several national conferences and a reference to local districts on local excesses affecting time workers, agreement was reached in August.

Some of the union representatives made no secret of their view that they expected the proposals to be harsher, involving general reductions from time workers and a general overhead reduction from all pieceworkers. The scheme was introduced in two stages: October 1931 and January 1932.****

* Shipbuilder, Jan. 1932. ** Ibid. *** Ibid. **** Ibid.

Because of an increase of 11s. 6d in weekly wages since the bottom of the previous depression in 1923-4 and because of a fall of 30 points in the cost of living index since the same time, the purchasing power of the wages of skilled shipyard time workers was 50 per cent more than that of the wages they received in 1923-4. The increase in the purchasing power of labourers' wages was not quite so high because their wages did not suffer the same drop as the skilled men in 1923-4.*

In the case of men working on piecework or on other than plain time rates, the scheme involved withdrawal of time work bonus of 7s. a week granted in 1924 as "amelioration" money to meet the high cost of living in two equal instalments of 3s. 6d a week in October and January. Squads of riveters on piecework were specially treated by the introduction of a scheme consolidating and simplifying their basis of payment. In their case the whole of the 7s time-work bonus was withdrawn in October, along with a special payment of 2½%, which had been made to the holders-up since 1913 and instead a compensating percentage payment, amounting in practically all districts to 10 per cent on earnings was paid from the same date.**

The scheme also withdrew from October certain wartime payments, calculated as percentages on piecework prices which applied in some districts but not all.

There was an important provision for consideration to be given locally or even nationally to cases of extreme hardship.

The most important feature of the scheme, apart from removing anomalies and cutting labour costs, was that it proposed to investigate establishing a general index for automatic regulation of wages when prosperity returned to the industry. "The task is one of considerable magnitude, but its solution would be a lasting contribution to the cause of peace in the industry."***

* Shipbuilder, Jan. 1932. ** Ibid. *** Ibid.

GROSS WEEKLY WAGES TIME RATES*

ime Workers lass or Grade 1 years and over	July 1914 54-hrs week	1923-4 47-hour week Wage	Increase over 1914	Jan. 1932 47-hour week Wage	increase over 1914	1928
. Fully skilled	41s.	48s 6d	18%	60s.	46%	24%
. Riveters & Caulkers	37s.	44s.	19%	57s6d	55%	31%
. Holders-up	31s6d	41s2d	31%	55s	75%	34%
. Drillers	27s6d	39s10d	45%	55s	100%	38%
. Semi-skilled (according to experience, ability & job)	24s0d to 31s6d	38s10d to 41s2d	62% to 31%	41s6d to 50s	73% to 59%	to 21%
. General Labourers	23s6d	38s6d	64%	41s.	74%	

Ministry of Labour Cost of living index (increase over July, 1914)	Nov. 1923	Nov. 1931
	+ 77%	+ 46%

Unfortunately, the enormous depression meant that the benefits of these two schemes were not immediately noticeable. The dominant fact on the labour side was unemployment, when the dole was the only income. But even this was hedged around with humiliating restrictions, in particular the "means test". Every applicant had to be before his town council's public assistance committee at intervals of six months to answer detailed questions about his resources and to justify every sixpence that the State could give him.

There were stories of Lancashire committees making a point of asking the mother of a new-born baby whether she fed it from the breast; if she said she did, the baby's allowance was refused."**

*   Shipbuilder, Jan. 1932.
** Colin Cross in the Observer Article quoted above.

There were stories, too, of officials using cameras to 'spy' on men receiving unemployment benefit to see if they were genuinely looking for work. If the camera found them idling on street corners or, worse still, digging in their gardens, they would have some hard explaining to do.

It was experiences like these and the years of wasted manhood that finally erupted in the Jarrow March, when 200 unemployed shipyard workers decided to march to London to expose the cruelty of their plight.*

There were skilled men at Jarrow who were unemployed for 12 years at a time. Many boys left school, reached manhood married and had children without ever having a job.**

"The men became cowed - that's the only word for it. They saw no chance of a job, no chance of earning money and the experience broke many of them."***

Eventually and with much heart-searching, there arose the idea of a march on London, a march to shock the complacency of Whitehall. Both the national Labour Party and the T.U.C. were against such a venture. They felt it would achieve nothing and would be regarded as just another protest march. In fact, it has become one of the symbolic marches of all time, affirming man's right to work.****

There were fears that the men would not be physically fit to endure such an ordeal. All those taking part were medically examined before and during the event. And as a matter of fact they ate better during the march than they had done for many a year. There was not one out of the 200 that did not put on weight and look and feel healthier at the end of the journey than at the beginning.*****

* "The Town That was Murdered". ** Ibid. p.198.
*** Ald. J.W. Thomspson, Mayor of Jarrow at the time of the March, in conversation with the author.
**** Ibid. ***** Ibid.

The March was expensive. It was estimated that the cost of feeding each man was £4, while another £150 was needed to hire a train to bring them back.

The Mayor of Jarrow, Mr. J.W. Thompson, decided to launch an appeal, which brought in £1,567 altogether. The money came, not surprisingly, from trade unions; more surprisingly from women's organisations: and most surprising of all, £183 came from the people of Jarrow themselves.

The marchers set off on Monday, 5th October 1936. "Practically the whole town turned out to witness the start... A few women, overcome with emotion, wept," said a local newspaper, but commented: * "We have no liking for this effort. At the present season it involves a risk to those taking part that might well have been avoided... it can only be hoped that the appeal they bear will receive the consideration it undoubtedly deserves."

The men reached London on 31st October, Their march, so disciplined and so sincere, did arouse the attention the men hoped for. But by 1936 the worst of the depression was over. Demand was rising again and a shortage of men and materials was now being felt, although ships were never to be built in Jarrow again.

The industry as a whole granted three wage advances between February, 1936 and February 1938, amounting in all to 8s. a week for time workers and to 16 per cent for piece workers.

This was but small reward for the humiliations of the 1930's during which so many men and their families had suffered the miseries of almost permanent unemployment. Their world had changed very rapidly. Only a few years before this had been one of the greatest industrial centres of the world. Now it was the most depressed and depressing.

* The Newcastle Journal.

The reasons were manifold and complex. The international trade depression had a more than proportionate impact upon shipbuilding for not only had demand for ships collapsed following the dramatic drop in freight rates but also this still remained one of the very few basic industries open to the full play of the world-wide competition. With the 1935 and 1939 Shipping Acts an attempt was made to tease owners into placing orders. No protection was given against the subsidised foreign competitor.

It must be admitted that so often the management of North East companies was poor. The main example described in full above was Palmer's. But there were other firms too that over-expanded at the first sign of prosperity or were not ruthless enough in chopping off unprofitable activites.

But above all, from the regional point of view, specialisation was too great. Success - in coal, iron and steel engineering, shipbuilding - eventually spelled failure. For when these products fell out of demand, there was no other cushion against unemployment. As one writer put it: "In the degree of concentration of its urban population and their dependence upon a narrow range of industrial occupations, the North East coast has probably been unique in Britain."*

In the early years when the industrial giant was growing faster than the local population, people were sucked into the region. The population increased from less than 350,000 in 1801 to almost 2 million in 1901 and then levelled off at about two and a half million.

But then the tide began to flow back again. "After the first world war, the outflow became a flood and continued without a break to almost 1939."**

* N.E. England Population Movements, by J.W. House, (Newcastle University 1954).

** Supra.

N.E. ENGLAND POPULATION CHANGE *

	TOTAL	% INCREASE	NET MIGRATION
1801	349,619		
1821	443,225	16.1	+ 7,251
1841	617,648	20.0	+ 47,502
1861	942,063	24.2	+ 39,416
1881	1,458,918	24.2	+33, 885
1901	1,995,283	17.0	+ 7,131
1921	2,452,551	6.3	- 141,638
1931	2,515, 685	2.5	- 191,178
1951	2,556,276	1.6	

Shipbuilding employment grew and then declined in the same way as can be seen from the following figures:-

EMPLOYMENT IN N. EAST SHIPYARDS **

	persons		
1851	4,980	1891	28,603
1861	7,228	1901	42,773
1871	11,518	1911	46,832
1881	15,722	1923	59,810
		1931	51,100
		1951	45,200

Direct employment in the shipbuilding yards does not represent the full influence of the industry. One can add the same number of people again for those employed in marine engineering and an equal number for those in ancillary trades.

If one sees shipbuilding as part of the coal - iron and steel - engineering complex of industries, the precarious position of the region becomes apparent. As Mr. House wrote:-

* Census Figures.

** Ibid.

"The industrial structure of the North East for the past hundred years has been almost exclusively concerned with the coal export and coasting trade, together with the vast manufacturing developments arising from the output of iron and steel..... Whilst Britain was acheving industrial supremacy in the 19th century such specialisation was a distinct advantage. Capital accumulated and firms amalgamated for greater efficiency, often embracing several industries as in the case of shipbuilding and engineering. Labour became skilled and the metal working and manufacturing industries could absorb generations of workers without serious competition from other forms of employment. With economic depressions, starting with the late 1870's, recurring in the early years of the 20th century and culminating finally in the catastrophic depression of the early 1930's, it was all too clear that the marked specialisation of the regional industries left the local economy very vulnerable to the vacillating trend of world events."*

The sad fact was that the specialities of the N.E. were the basic industries that any industrialised nation would need. Coal extraction and iron and steel making were particularly vulnerable, shipbuilding and engineering less so as long as the region kept ahead in terms of products and techniques. This unfortunately was not always the case. As we saw at the beginning of this chapter, technical changes often occur most rapidly at times of economic depression when producers feel they have to tempt buyers back into the marketplace.

But if the depression is too severe, as that of the 1930's undoubtedly was, it erodes to an almost intolerable extent the confidence of producers and their financial reserves.. There has

* Supra.

got to be a fundamental optimism that things will quickly improve and that innovations will bring a reward. Such a feeling was difficult to maintain in the 1930's.

As we shall see, this depression was then followed by a period of high demand, lasting almost 20 years. During such a time, the producer feels there is little need to innovate. The work is flowing in; he doesn't need to offer more than conventional models, processes and techniques. In the case of the N.E., this basic feeling was heightened as a result of the experiences of the 1930's. Firms felt a need to refill their reserves. They also felt a basic uncertainty about providing fresh capacity. The industry had with such heartache been reduced in size. They were in no mood to expand it again.

Had the industry world-wide experienced its normal cycle, this policy might have succeeded. Instead a new trend of almost constant expansion of demand set in after the war. As we shall see, this allowed Japan and Germany to re-enter the market with yards modernised by aid from the Allies. The former, in particular, was able to expand with world demand and chose to specialise in the dominant growth market, oil tankers.

For these reasons, as we shall see in the next chapter, the N.E. began to lose the dominance it had held since the 1840's . By the 1960's in fact, it was over-shadowed by Japan and was no more than an equal partner with Sweden and West Germany.

Thus specialisation is a dangerous policy. It can succeed only if it is allied to progressive management, an expanding market, and, when needed, a measure of protection from international competition.

CHAPTER 7

POST WAR CHALLENGE

The years of depression turned into years of intense activity. For two decades the industry was busier than it had ever been before. The cynics continually warned that the end was nigh but the boom went on and on.

The war and its aftermath created an enormous demand for shipping of all kinds. And the military defeat of Britain's two main shipbuilding rivals, Germany and Japan, left this country as the main supplier of that demand. Then, just as orders were beginning to ease, the Korean War stoked the fires again and five years later the Suez Crisis did the same.

During this period, the North East regularly launched more than half a million tons of shipping and in 1958 launched 688,000 g.r.t., its highest output since 1920. Net profits of half a million pounds were not uncommon for medium-sized firms and the biggest companies, like Swan, Hunter and Wigham Richardson, achieved net profits of over a million pounds.

But, although it lasted a surprisingly long time, the boom did eventually break at the end of the 1950's and left British shipbuilding facing the most intense foreign competition it had ever known. The huge tanker programme born of the Suez Crisis sent Japan's output soaring ahead. From 1956 that country replaced Britain as the world's major shipbuilding nation.

The cynics were now joined by the critics. In a country that seemed to wallow in self-criticism, shipbuilding became a favourite target. Hadn't it failed the nation ? Weren't its managers old-fashioned members of family dynasties ? And what about the unions ? Weren't they the most ill-disciplined and strike-prone in the country ?

Most of the criticisms were not only unfair but also failed to understand the nature of shipbuilding's problems.

For the industry reflected more accurately than any other the state of the British economy as a whole. Firstly, it was primarily an assembly industry, two-thirds of whose costs represented bought-in materials.* If shipbuilding was inefficient and subject to inflation, it was largely because large sectors of the economy were inefficient and subject to inflation. Secondly, the true position could not be masked as it could be in other industries because shipbuilding was essentially an international business competing without the aid of subsidies or protection in the markets of the world. **

Within this general framework, the pattern of demand favoured Japan rather than Britain. The biggest growth was in tankers, followed by bulk carriers. The construction of these large but essentially simple ships suited Japan's method of production, which was based on a comparatively high level of capital investment, on specialisation and strong management teams.*** Britain's fundamental characteristic, on the other hand, remained its versatility not only within the industry as a whole but even within many of the individual companies. Numerous yards in the North East were - and still are - capable of building virtually any type of ship that may be contemplated, from a luxury passenger liner or highly sophisticated Admiralty ship, to a bulk carrier or huge oil tanker.

This versatility itself increased the cost of overheads and meant that the basis of successful operations remained a highly-skilled (and highly paid) labour force. And the cost of versatility became even more onerous with the shortage of orders for the sophisticated ships. Only five per cent of the world's merchant marine now consists of passenger ships, for example, and the increasing popularity of air travel will further reduce the demand for these most beautiful and complicated examples of a shipbuilder's craft.

* J.R. Parkinson, "The Economics of Shipbuilding in the U.K.". Cambridge 1960. p.198-9.

** Ibid.

*** "Structural Changes in Shipbuilding". Papers prepared by International Metal Federation Secretariat for a Shipbuilding Conference in Newcastle, May 1967.

In addition, the highly-skilled craftsmen, who form the basis of any successful shipbuilding company in this country, were frequently poached by other industries, thus creating a manpower shortage. And the high place given to skilled men and the fierce pride in craft that that produced, resulted in some difficult labour problems. No other industry was so bedevilled by demarcation disputes. But in the past two years great improvements have been made.

The international nature of shipbuilding has made companies intensely aware of operating conditions among their rivals. Few matters have caused more controversy than subsidies of one form or another which have been granted much more widely abroad than at home.* Of course, subsidies are not always effective. The experience of U.S. shipbuilding illustrates the point. But where a country is more or less on a par with its rivals and where there is intense competition for orders, then subsidies can play - and without doubt have played - a vital part in securing orders. For a number of years British shipbuilders even had to suffer from the farcical position of being able to offer foreign buyers Government-assisted credit schemes while British owners, unable to benefit from these schemes, continued to place their orders abroad.

Finally, one must consider the growth in the merchant marine of various countries. The British fleet alone of all the major fleets has been virtually static since the war, at around 20 million tons. In contrast, the fleets belonging to Panama and Liberia, to Norway, Japan, the U.S.S.R., and Greece have all shown spectacular increases. This contrast has not been helpful to British builders. For any industry, successful exports must be based on buoyant home demand. British shipbuilders have not been able to lean on that support.

* J.R. Parkinson. p.85-6.

In the light of this interpretation of events, has the industry failed the nation ? It has not. Considering all the difficulties, it has in fact shown remarkable signs of resilience and has tried to overcome these difficulties in a much more determined way than the critics would allow. The pity is that the industry was not given the help it so badly needed and deserved until it was almost too late, as the story of these past 25 years demonstrates very clearly.

THE WAR YEARS

At the beginning of the war, Admiralty strategy was still based on the big ship.* Five "King George V" type battleships of 35,000 displacement tons each, with 14 in. guns had been laid down in 1937. By September 1939, four "Lion" battleships of 40,000 tons, with 16 in. guns had been authorised. In addition, six fleet carriers of the "Illustrated" class were under construction, together with 20 cruisers. At the Naval yard of Vickers-Armstrong on the Tyne, the keel had been laid for "Lion" herself; the cruiser "Uganda" was on the berths; while "King George V", the carrier "Victorious" and the cruiser "Nigeria" were fitting out. **

But the big ship programme was revised not so much by intention as by events.*** The success of the German submarines led to an increased demand for anti-submarine vessels and for another 100 escorts. Thus in the new list of priorities, the big ships were forced to give way to smaller vessels.

In the spring of 1940, the Naval Yard was told to suspend work on "Lion" and "Uganda" and concentrate all efforts on completing "King George V". The "Uganda" was launched in August 1941 and although it was replaced by a cruiser, the programme for the rest of the war was mainly for smaller ships.

* J.D. Scott, "Vickers - A History". p.291.

** Ibid.

*** Ibid.

In the spring of 1940, the Naval Yard was employing 4,250.* The Elswick and Scotswood works of the company in Newcastle, which were responsible for naval armament work as well as for a heavy land programme, were together employing another 18,500. These numbers increased as the war effort intensified. The same was true in every other yard. The Hebburn firm of Hawthorn Leslie, for example, increased its workforce by more than half, from 4,000 to 6,600.

Even so, the numbers employed remained smaller for the industry as a whole than in the First World War, yet the output was much greater. But the demand for more and more tonnage was very pressing and raised the possibility of re-opening some of the yards that were closed but not dismantled by the National Shipbuilders Security Limited. **

On the Tees, the old yard of the Cleveland Shipbuilding Company (formerly occupied by Sir Raylton Dixon) was still intact. Two yards - those of Messrs. Craig, Taylor and Messrs. Richardson, Duck - could easily be restored to shipbuilding. Only one, that of Ropner and Sons, had been completely demolished. ***

At Hartlepool, there was talk for some years of re-opening Irvine's Shipbuilding and Dry Dock Company and similar schemes were put forward for the four yards that had been closed on the Wear. On the Tyne, there were efforts to re-open the Northumberland Shipbuilding Company's premises at Howdon and those of the Tyne Iron Shipbuilding Company at Willington Quay. Most of these attempts ended fruitlessly. The shortage was not of capacity but of labour. It was easier and more effective to absorb any available labour into existing yards than to re-open old establishments.

Three yards were re-opened, however. The Shipbuilding Corporation, a Government agency, opened the Southwick yard at Sunderland at a cost of £350,000, the old Low Walker yard of Armstrong, Mitchell and another yard on the Tees.

* J.D. Scott. p.292.
** "Shipbuilder", Jan. 1940.
*** Ibid.

In the first year of the war, Britain lost 396 ships of 1,561,000 gross tons and throughout the conflict as a whole, well over four million tons. Over half of this figure was replaced by the North East. The Wear alone produced 240 merchant ships of 1,500,000 gross tons, "greater than any other shipbuilding centre of comparable size in the world."*

The Tyne launched 74 merchant ships of 535,800 gross tons, but it was largely occupied by naval work. ** Swan, Hunter, for example, at their Tyne and Clyde yards built 83 warships of all types, with a total displacement of over 250,000 tons and 75 merchant ships of nearly 500,000 gross tons. Yards on the Tees and at Hartlepool were responsible for 125 merchant ships of 597,000 gross tons.

THE BOOM GOES ON

For the first 15 years after the war the North East produced well over half a milliontons of merchant shipping annually, about 40% of the British total. But like the British total, the North East output showed no strong sign of growth. The result was that its percentage of world output fell from 24% in 1946 to 7% in 1960.

The reason was two-fold. First, there was a very serious shortage of both men and materials. Steel was in particularly short supply. Many firms could have raised their output considerably had they been able to obtain all the steel they wanted. They would even have been willing to pay a higher price to gain supplies but were not allowed to do so.

Secondly, and more important, the over capacity of the 1930's was still a very lively memory. Companies were reluctant to extent their capacity beyond a certain limit and, unlike the situation at the end of the first World War, virtually no new firms came into the industry. Order books grew extremely long. Those who placed the orders had not only to accept long-term delivery, but also "time and line" contracts under which the price of the ship rose with the rising costs of production.

* Rear Admiral Sir Wellwood Maxwell, Officer commanding the Tyne Station, "Shipbuilder" magazine, April 1945.

** Ibid.

It would not be true to say that the industry did not spent money on modernisation schemes. It did, in very large amounts, but most of these schemes were intended to meet the new pattern of demand (by increasing the length of berths) or to increase efficiency rather than to extend capacity.

There were three main problems facing the industry at the end of the war: the shortage of men and materials; the rapid rise in prices; and the re-adjustment from naval to merchant building. In the six months from V.E. Day to March 1946 the Admiralty cancelled orders for 727 naval vessels with a net saving to the Treasury of £125 m. *

The cancellations caused some temporary unemployment, but the spirit of the industry was high. In the same six months, North East yards alone booked orders for 150 merchant vessels and the outlook was regarded as excellent. Even the increased prices - and vessels were costing between 70% - 100% more than in 1938 - were not deterring orders. The shortage of shipping had to be made good and there was a feeling that prices were never likely to come down.

By September 1946 there were 464 ships of 1,875,000 gross tons under construction in the country, more than in the rest of the world taken together. In the North East, the figure was 700,000 gross tons, of which the Tyne was responsible for 358,000 tons.

Despite this large amount of work in hand, especially for foreign countries, yards were now beginning to be seriously handicapped by a shortage of basic materials and delays in the delivery of vital components. "The result is that the yards open a year of encouraging promise largely on paper... but in practice they face difficulties possibly more disheartening and certainly more vexatious than some of those experienced during the war."**

* "Shipbuilder", April 1946.

* "Shipbuilder", January 1947.

There was a shortage of everything, of steel particularly but also of paint, of timber, of hardware, even of sanitary and electrical equipment. In consequence numerous launches had to be postponed and a great deal of capacity lay idle. Vickers-Armstrong claimed that the Naval Yard was only 60% occupied even though "owners were gasping for ships." *

These shortages were raising anxieties for the middle and long-term future of the industry. The North East Development Association forecast that although yards were likely to be busy for three years, "a decline may then set in and it seems probable that the industry will be faced with a marked contraction within a few years." ** Sunderland, and Hartlepools were especially picked out by the survey as likely to suffer again from high unemployment.

The Government's Economic Survey for 1947 took an equally gloomy view. It warned of the economic dangers ahead and called for greater productivity. It wanted to see a 25% increase in shipbuilding output. The industry would have been willing to oblige. It was not pleased with its 1946 launchings figure of just over a million tons when it had set itself a target of one and three quarter million tons but the shortages of materials were not its fault.

The harsh winter of 1947 aggravated the general problem and steel supplies were limited to 60% of requirements. Mr. R. Cyril Thompson of J.L. Thompson & Co. Ltd., of Sunderland, warned: "The situation will inevitably lead to wholesale unemployment unless it is quickly remedied." θ His company's programme was badly retarded and complete disorganisation might follow. A neighbouring firm on the river Wear, Doxfords, was able to complete only five ships a year instead of an average of ten. Even a lack of door knobs had held up completion of a 9,000 ton passenger ship, "Rio Chico", being built by Bartrams, also on the Wear.

* J.D. Scott - "Vickers - a history". p.314.

** "Shipbuilder", January 1947.

θ "Shipbuilder", April 1947.

The shortage and the delays, allied to the heavy pressure of demand were making prices rise alarmingly. * Ships were costing over three times what they had done 15 years before and over twice as much as in 1938. When ships were finally delivered the prices had often risen by 15-20% above the estimates.

In January 1948 Sir Stafford Cripps, the Chancellor of the Exchequer, announced that the allocation of steel to the shipbuilding industry would be a fifth less than it had been in 1947. This was bitter news for the shipbuilders and they reacted strongly. "That an industry, whose contribution to victory was so massive and which has since contributed handsomely to the nation's economy and to its export programme, should find its resourcefulness, ingenuity, energy and enterprise rewarded by this further strait-jacketing, is surely an ill-conceived and unwarranted affront."** The builders in the North East estimated that a third of the vessels in their yards would have been delivered had materials been available.

There was a sign at this time that orders were beginning to wane and some were even cancelled, but it was not very serious. The demand for oil tankers remained high. About twenty tankers were on order or under construction on the Tyne alone. Swan, Hunter had an order for a giant 28,000 ton tanker for the Anglo-Saxon Petroleum Company Ltd. Even John Crown & Sons Ltd., a subsidiary of J.L. Thompson, had an order for a 23,000 d.w. ton tanker, although they had never previously built anything bigger than 4,000 tons.

In 1949 the Government agreed to increase shipbuilding's allocation of steel by 5% - "a grudging acknowledgement of the industry's important role in the national economy."*** The increase was followed a few months later by a rise in price for steel. Steel plates went up by £2. 18. 0d to £20. 14. 6d a ton.

It was not until the end of 1949 that steel deliveries began to match requirements but that was because of a lessening demand rather than an increasing supply. Within a few months, the position was as bad as ever when the Korean War sparked a new boom.

* "Shipbuilder", January 1948.
** "Shipbuilder", February 1948.

*** "Shipbuilder, February 1949.

By the end of September 1950 British yards had under construction for the first time in their history over a million tons of tankers. They represented half of the total order book. The New Year began with Vickers-Armstrong gaining an order for a 31,000 ton tanker, the second of two such ships to be built by the yard.* Within months, the company had over £45 m. worth of orders, half of them to be built on the Tyne. In February 1951 the British Tanker Company Ltd., placed orders for eight tankers with North East yards to a value of £7 m. Later in the month an order for another five tankers was placed in the area.

The month of March 1951 saw even more spectacular ordering. A total of 24 ships was booked by North East yards. Every firm in the area now had very full order books indeed. Swan, Hunters alone had orders for tankers totalling 400,000 d.w. tons. Full employment was assured until 1954.

In April, the Dutch Royal Shell Group placed contracts for 46 tankers, 31 to be built in the U.K., and 15 in Holland. It was the largest programme of ship construction ever undertaken by one company. The total cost was £45 m. and the programme added 900,000 d.w. tons of capacity to the company's fleet. Swan, Hunters built five of the tankers; Hawthorn-Leslie five; Smith's Dock 3 and J.L. Thompson 1.

By August, North East shipbuilding had "rarely, if ever, been in a stronger position in terms of potential employment, than it is today, Delivery dates now extend well into 1955."**

The prospect was not entirely pleasant, however. Not only did the shortage of materials persist but in that year's budget the Chancellor withdrew the 40% tax allowance on the cost of new plant. The justification was that the modernisation of industrial plant had now largely taken place. Yet many shipbuilders were still in the throes of modernisation schemes.

* "Shipbuilder", February 1951.

** "Shipbuilder", September 1951.

Doxfords were increasing their marine engine and shipbuilding output by 50%. J.L. Thompson were enlarging their berth capacity to handle fewer but bigger ships. Swan, Hunter were spending £1 m. a year. Vickers-Armstrong had spent about the same at the Naval Yard to introduce prefabrication techniques. Flame-cutting tables replaced shearing machines and bulk liquid oxygen replaced gas cylinders.

Tanker orders dominated the headlines but occasionally shipbuilders were called upon to exercise the full extent of their craft and build a luxury passenger ship. In August 1950 Swan, Hunter launched the turbine-driven passenger and cargo liner "Provence", a ship in the traditions of the elegant floating palaces of the past, as the official description shows.

"The lounge, is remarkable for the nobility of its proportions. Square columns, in green bronze lacquer sprinkled with gold, support the plaster ceiling with its luminous recesses.... In a recess covered in gold leaf, the doors of which are covered inside with religious subjects in the style of the early French, a gilded altar is arranged under a round stained glass window in the manner of the master glassmakers of the cathedrals... Four green bronze statues sculptured by Poisson give indirect lighting... The whole place gives an impression of refined elegance and luxury of the highest quality." *

The designer was M. André Arbus of Paris and the design work was carried out by Société Rousseau, also of Paris.

As 1952 opened the British shipbuilding industry had orders for 1,100 ships of about 6½ m. gross tons, representing four years work.** The demand reflected the very high level of freight markets which the North of England Shipowners Association claimed were the highest in its 80-year history. θ The cost of new ships was continuing to rise. Between 1950-52 large tramp ships rose from £40 to £60 a ton - "a staggering and unprecedented rise". Even 15 years old motorships were realising four times their original contract price.

* "Shipbuilder", Sept. 1950.
** " January 1952.
θ Ibid.

By 1953 the spate of new ordering had subsided. In the first quarter of the year there were hardly any new orders for N.E. yards but the situation was masked by the very full order books. They also masked the challenge from the air. "The sea, so glamorous and adventurous in the past, is in danger of losing its crown to the air in this age of jet propulsion".* And they masked the growing challenge from Japan and Germany, which between them were now equal to Britain in ship launchings.

The main threat was felt to be Japan, whose output was growing at a rapid rate. In March 1953 it had had 450,000 gross tons under construction. By December 1955 this had jumped to 832,000 gross tons. "The significance of this advance in Japanese shipbuilding lies, perhaps, not so much in the present as in future potential output and its ultimate competitive strength in world markets." **

This foreboding was realised in the third quarter of 1956, when Japan established itself as the world's leading shipbuilding nation with the completion of 80 ships of 416,689 gross tons, compared with Britain's total of 61 ships of 244,786 gross tons.

In the year as a whole Japan launched 1,735,472 gross tons, double her 1955 figure, and in excess of Britain's 1,379,308 tons. But shipbuilders in this country refused to be pessimistic. "While Japan's picture is impressive, it nevertheless lacks the balance of Britain's canvas... The major half of Britain's programme was well-balanced with a commendable variety of tonnage, from trans-Atlantic liners of the finest type being built anywhere in the world, to specialised bulk carriers, cargo liners and, among smaller craft, trawlers of advanced design."***

* "Shipbuilder", February 1953.

** "Shipbuilder", Jan. 1956.

*** "Shipbuilder", March 1957.

The claim to variety and sophistication was borne out by the launch during 1956 of the "Empress of England" from Vickers-Armstrong's Naval Yard. Capable of carrying a thousand passengers, it was the biggest liner yet built at the yard.* It had also been borne out a year earlier by the launch of the Norwegian-American Line's 18,000-ton passenger ship "Bergensfjord". This was the most important ship Swan, Hunter had so far built for the Norwegian mercantile marine. It was the first ship to have all-welded aluminium superstructure.

The Suez Crisis revived the freight markets and the orders for ships. Every month brought new contracts. In the first half of 1956 the Wear booked 19 new orders, keeping the outlook "buoyant". In June, the Furness Shipbuilding Company, which had been bought five years before by a syndicate headed by the London financier Charles Clore, booked orders for six new tankers worth £13 m. In August it booked orders for another ten tankers worth £20 m. By the end of the year the Wear had 140 ships on order or under construction worth about £120 m. and guaranteeing work for four to five years ahead. "It was a period of almost unexampled prosperity." **

It was a period, too, of almost unexampled activity for many yards were involved in re-organisation schemes as well as in carrying out the very heavy programme of work. Hawthorn-Leslie were spending a million pounds on an expansion programme. J.L. Thompson were installing new berths and fabricating sheds. A couple of years earlier the company had taken part in a large amalgamation involving Sir James Laing & Sons, T.W. Greenwell & Company, the ship-repairers, the Sunderland Forge & Engineering Company, John Lynn and Company, and the Wolsingham Steel Company. The new company was called the Sunderland Shipbuilding, Dry Docks and Engineering Co. Ltd., but each constituent member kept its own identity.

* "Shipbuilder", June 1956.

** "N.E. Industrialist ", December 1956.

It was not only the big firms that were striding ahead. The small Sunderland family firm of Bartram & Sons launched the cargo motor ship "Costis" only 18 weeks after keel-laying. With twenty similar ships on order, the company hoped to reduce that time to 14 weeks. A shipowner called the firm "not only one of the fastest but the fastest of British shipbuilders."

In February 1957 another Sunderland firm, Austin & Pickersgill, came under the joint control of London & Overseas Freighters Ltd., Philip Hill, Higginson & Company, the bankers; and Lambert Brothers, the shipping and insurance organisation.

During 1957 the orders continued to flow in despite the general shipyard strike, the credit squeeze, Bank Rate at 7%, the decline in commodity market prices and the steep fall in freight rates. On the Tyne 25 new vessels were booked in the first half of the year, including almost half a million tons of tankers. By the end of 1957 Tyneside yards had orders for 78 ships of 1.8 m. tons.

But the orders could not - and did not - continue. Through 1958 and 1959 the search for new work grew more and more difficult. Cancellations increased. Dr. Ramsay Gebbie, Chairman of Doxfords, said that half a dozen contracts with his firm had been cancelled by October 1958 and others had been deferred. Some talked of the need to look ahead with a "stout heart".*

But everyone realised that, for the smaller yards at least, orders were getting perilously low. In 1958 Britain fell to third place in the table of world launchings, just behind Germany but well behind Japan, which launched 50% more shipping. And in the North East the numbers of unemployed people exceeded 50,000 for the first time in 12 years.

* "Shipbuilder", January 1959.

The boom which had lasted for so long and which had masked, even to some of those within the industry, the new factors in world competition, was over. British shipbuilding now entered upon a struggle to survive. In the face of a rapid rise in world shipbuilding output, her own production remained static and thus her share of the market dwindled.

Some firms went out of the business. Others plunged into the red. The period had a ring of the 1920's and 1930's about it. The region had been there before. Yet the theme had an important variation. Then, every country had been in the same situation. Now Britain, once the shipyard of the world, saw Japan moving further and further ahead. How manfully the industry tried to regain its former position we must now turn to see, for in the long and epic story of British shipbuilding, the past five years have been as enthralling as any that have gone before.

THE STRUGGLE TO SURVIVE

In the five years from 1961-5 inclusive, North East output averaged less than half a million tons and the share of world launchings fell to an average of 5%. Meanwhile world output was increasing at a staggering rate, from 8 m. tons in 1961 to 12 m. tons in 1965 - and Japan was responsible for nearly all the increase.

Yards in the North East had remained generally very busy in 1960 but that was with contracts booked several years previously. There were very few new orders and 1961 opened on a "gloomy" prospect. * William Gray's at West Hartlepool had only two ships to complete and four barges to build. By mid-summer all its berths were empty. The company had had the country's fourth biggest output of ships and marine engines during the 1939-45 war and at other times had topped the world launching list, but now its future seemed very uncertain. The Furness Company on the Tees had only one vessel on order.

* "Shipbuilder", January 1961.

With the risk of the gloom turning into pessimism, Mr. John Hunter, the chairman of Swan, Hunter and Wigham Richardson found it necessary to give this warning: "Unless we are so foolish as to envisage a contraction of our merchant fleet, shipbuilding will continue to thrive in the long-term as a vital part of our national economy. I do not think it is always realised by the people of this country how vital our shipping is to their welfare.. ... If we are not to decline as a nation we must not only maintain but progressively increase the size of our merchant navy. Failure to do so will leave us increasingly at the mercy of foreign carriers, our freedom of action will be lost, our economy undermined and our standard of living, and indeed our very existence, threatened."*

At this time when the industry needed encouragement, a further blow was delivered by a report on research problems in the industry produced by the Department of Scientific and Industrial Research. This claimed that shipbuilding was not doing enough research, a charge which the industry thought was unfair.

Yet despite the discouragements there were many signs of health. J.L. Thompson & Co. Ltd., had just spent millions of pounds in re-organising their facilities to allow the construction of much bigger ships. With a few additional alterations, they would be able to construct vessels of up to 100,000 tons. Vickers-Armstrong were to spent £4 m. at their Hebburn works to build the largest dry-dock on the North East coast.**Swan, Hunter were preparing to install at their Wallsend yard the world's first fully-automatic machine for cutting steel plates. It had also just introduced the first slag-welding machines in Britain.

The British Productivity Council in a survey of Swan, Hunter found that over the previous three years the company had reduced the time taken to build an average ship by a third. The survey felt this had been achieved because there was a management able and willing to adopt new methods and a work force ready to co-operate.θ And there was also at this time a notable run of passenger liner launches. In 1960 Vickers Armstrong had launched the "Empress of Canada", the biggest passenger ship build on the Tyne since the "Mauretania".

* Speech at the launch of the "Clan Forbes" in March 1961.

** "Shipbuilder", June 1960.

θ "Target" Br. Productivity Council Bulletin, June 1961.

It was 650 ft. long, had a service speed of 21 knots and could accommodate over a thousand passengers. She was completed in March 1961, a few months before Swan, Hunters launched "Principe Perfeito".

This was the largest ship ever built in its Neptune yard and was also capable of carrying over a thousand passengers. In July Vickers-Armstrong launched the 22,000 ton "Northern Star", for the Shaw Savil Line. Like its sister ship "Southern Cross", it was unusual in having its engines aft and in being reserved exclusively for passengers.

But the most talked-about ship of this period was never built. This was to have been a new Cunarder to replace the "Queen Mary" and the "Queen Elizabeth". Popularly known as the "Q.3", it attracted a great deal of speculation. When tenders were called for, Swan, Hunter and Vickers decided to form a new company to make a joint bid. Swan, Hunter would build the hull and Vickers-Armstrong would be responsible for the fitting out. In the event the project was withdrawn because of the sharp fall in passenger traffic and in profits. But the Cunard Company revealed that had the project gone ahead, the Tyne consortium would have won the order.* As if in compensation, the two companies later in the year received orders for the first 100,000 ton tankers to be built in Britain. Vickers-Armstrong decided to build its vessel at Barrow, but Swan, Hunter naturally chose the Tyne.

J.L. Thompson of Sunderland also received an order for a very large tanker at this time. It was for an 80,000 ton vessel worth £4 m. And the Furness Company on the Tees announced it had gained an order for a 53,000 ton bulk carrier, the largest in the world.

The overall position, however, remained gloomy. The industry's total order book stood at 346 ships of 2.5 m. tons, representing just two years work. The most disquietening feature was the lack of new orders for large passenger liners, symbolised by the postponement of the "Q.3". In fact only one passenger ship was being built in the whole country, the "Northern Star" which was fitting out in the Naval Yard.

* "Shipbuilder", November 1961.

Mr. Allan Marr, the managing director of Sir James Laing and Company Ltd., said that in 1961 his firm had received a lot of enquiries but no orders. Only a fifth of the enquiries had come from British owners, whereas at one time four fifths of the firm's orders had been for the home market.

Throughout 1962 the situation remained unchanged. In fact in the whole 12 months, new orders represented only half a year's work for the industry. By the autumn William Gray and Company of West Hartlepool had decided to give up the fight. The reason, according to the chairman, Sir William Gray, was: "The absence of a sufficient volume of profitable orders." About 1,400 employees were thrown out of work.

By mid-1963 the situation was worse. The launch of the giant 53,000 ton bulk carrier "Essi Gina" for Norwegian owners meant that the Furness Company had no work in hand for the first time in 30 years. It was forced to pay off 700 of its 1,800 employees.

Mr. Reginald Ibison, managing director of Hawthorn Leslie of Hebburn, wrote at this time: "Sufficient capacity exists to renew the present active world fleet every ten years and shipbuilding will remain a hazardous and unrewarding business until a very large part of the facilities now available for construction have been closed down or turned over to other activities."*

A few months later in1964 another North East company, Short Brothers of Sunderland, closed. It had been in existence since 1849 and was an interesting example of the family firms that characterise the industry. All nine grandsons of the founder were connected with the business.

As an atmosphere of crisis continued to spread, the Government agreed to finance a £75 m. credit scheme to encourage British owners to place orders at home. The North East did well from the scheme, winning about two thirds of all the orders placed.

* "Shipbuilder", January 1963.

And the success continued in 1965. In one week, the Furness Company had its immediate problems solved by winning some of the largest foreign orders ever placed in this country: four 65,000 ton bulk carriers for Israel worth more than £11 m., and a 46,000 ton bulk carrier for Norway worth £2 m.* By August the North East had received orders for 47 ships of 1.5 m. tons valued at £80 m. But these successes did not prevent Hawthorn-Leslie from making a loss of £200,000 and Swan, Hunter a loss of over £1 m.**

To counter the difficulties in shipbuilding, some companies began to look for other outlets. Swan, Hunter took over a long-established Newcastle firm of building contractors. Hawthorn, Leslie, on the other hand, decided to enter the new field of industrialised housing. However, while Swan, Hunter found their new venture a profitable adjunct, Hawthorn Leslie lost over £3.5 m. on theirs by mid-1967.***

All companies continued a constant search for new markets and greater efficiency. In 1962 Swan, Hunter made a determined effort to persuade owners to accept standard ships. The company produced three basic designs: for a 10,000 ton dry cargo ship; for a 20,000 ton bulk carrier and for a 50,000 ton tanker. The designs incorporated the latest features of ship management and the vessels themselves would be built to the highest standards. But by allowing batch production, costs would be reduced by 10%. Few owners showed any great interest.

Four years later, in 1966, the company announced that it had discovered a new technique for shipbuilding which would enable it to build vessels of up to a million tons. The announcement gained headlines in newspapers all over the world but no owners hurried forward to place orders.

* Company records.

** Company's annual statements.

*** Ibid.

Meanwhile, Austin & Pickersgill of Sunderland was concentrating on another part of the market. During the war, 2,700 tramp cargo vessels called "Liberty" ships had been constructed, mainly in America. In 1966 700 of them were still in service but clearly coming to the end of their useful life. Austin & Pickersgill felt there was a very good market to go for and designed a standard 14,000 ton shelter-deck vessel as a replacement. Within a few months of announcing its design, it had received four orders, with the prospect of more to come. *

Hawthorn, Leslie saw growth prospects in the carriage of liquefied gases. The firm started research work on this new type of vessel in 1961 and by 1966 had solved the problems sufficiently well to be able to launch its first purpose-built liquefied petroleum gas tanker "Clerk Maxwell". This was built for Ocean Gas Transport Company Ltd. **

This vessel could carry propane, butane, butadiene or anhydrous ammonia in three insulated cargo tanks at sub-zero temperatures. The low temperatures were the key to the solution of carrying these gases. The main problem was to reduce the bulk. Hawthorn, Leslie's answer was to cool the gases down so that they turned liquid and shrank in volume.

The success with the "Clerk Maxwell" led to the firm gaining orders for two Mexican gas carriers, worth about £2.25 m., and a British order from Bibby Brothers.*** By 1967 the Company had worked out design specifications for carrying all the petro-chemicals. It was thus among the world leaders for this specialised type of vessel and stood a good chance of gaining many more orders. In 1967 about 170 l.p.g. carriers were in commission or on order throughout the world.

The smallest shipbuilding company in the region, Clelands of Wallsend, were also making vigorous efforts to extend its range of activities. This in fact was already very wide. For although its output was generally less than 5,000 gross tons a year, it could produce at least 15 different types of small craft from coasters and barges to lifting vessels and deep-freeze trawlers.

* Company's own records & booklets.
** Company's own pamphlets.
*** Company records.

In October 1960 it launched its first yacht, the "Suvretta", for the Suvretta Shipping Company, an associate company of the shipyard.* It was an attempt to break into the charter cruising market with a special eye on America.

Four years later, the company acquired the sole U.K. building rights for a new type of hopper barge. An American invention, the new hopper barge differed radically from the conventional model. Where the usual method was to have bottom doors for dumping purposes, the new barge had a hull built in two halves and hinged at the ends on deck level. The entire hull therefore swung open to allow dumping to take place.**

The small company of Clelands had probably had more success with their attempts to sell a standard ship design than any other yard in Europe. The first design, the "Excelship 2600", had brought in nine orders by 1966.

All this activity meant that the company continued to expand. In 1957 it constructed an extra shipyard on an adjoining site with two broadside launching berths, each 120 ft. long and 40 ft. wide. The first ship from the new yard, "Queensgate", was launched in 1959. Although the most important, this was only one of many improvements made since the war at a cost of about £1 m. - a remarkable achievement considering that the owners, the Craggs family, bought the concern for only £3,000 in 1934. The yard could now employ up to 700 men compared with 200 who had worked there 30 years earlier.

Yet despite these initiatives and despite the modernisation programme indertaken by the industry (over £150 m. had been spent since the war), British shipbuilding was continuing to lose ground. Between 1960 and 1965 world merchant ship production went up by 42%. In the same period Japanese production increased by 210% and Swedish by 78%. British output dropped by 19%.

* Company's brochures.

** Ibid.

It was against this background that the most constructive and helpful Government investigation ever undertaken into the industry was published.* It showed that although the industry was faced by many difficulties and had been through a most trying period, there could be a good future. Changes would be needed, of which the most important were the reorganisation of the industry into larger groups and a new spirit between management and men. To help to spur those changes, the report recommended the establishment of a Board armed with generous financial incentives.

The report summed up: "Here then is the challenge to an engineering and construction industry which was a pathfinder not so long ago. It will remain a hard and challenging trade, though a ship will always justify the pride of those who build her. A fresh start is needed and the essence of our report is that success can come but can only come from the faith, skill, effort and perseverance of men who are capable of working together towards a common aim and common security."**

This most sympathetic and clear-minded report produced by a committee headed by Mr. Reay Geddes, had an immediate beneficial effect on the industry. Not only did the companies feel that their problems had been properly displayed for the first time but that the Government was committed to help. As we shall see later, a new spirit quickly emerged in the field of labour relations. And discussions soon started between the companies about re-organisation.

Just over a year after the Geddes Report was published, the four principal companies on the Tyne announced their intention to merge their interests by January 1968. The companies were the Swan, Hunter Group (Swan, Hunter and Wigham Richardson had already merged with Smith's Dock in 1966), Vickers-Armstrong, Hawthorn, Leslie and John Readhead. On the Wear, discussions started between the Doxford and Sunderland Group, Bartram and Sons andAustin & Pickersgill.

* Report of the Shipbuilding Inquiry Committee, 1965-66 (Cmnd. No. 2937, p.11).

** Ibid.

The chance for change was being quickly taken. Hope rose. Despite the closure of the Blyth Dry Docks and Shipbuilding Company (which had built Britain's first aircraft carrier "Ark Royal" in 1915) a new feeling of confidence was emerging. The road ahead would be difficult but at least the shipbuilders felt they were being given an opportunity which they had never had before.

MARINE ENGINEERING

The North East Coast was for many years the main centre in the country for marine engineering. About half of the national output came from the region. It contained the biggest firm in the industry, the Richardsons, Westgarth Group, and the only firm still carrying out original design and development work, William Doxford & Sons (Engineers) Ltd. The other marine engineering firms in the region were subsidiaries of Hawthorn Leslie and of the Swan Hunter Group.

But the difficulties in shipbuilding were reflected in marine engineering. The Central Marine Engine Works at West Hartlepool, a subsidiary of William Gray, went out of business with its parent firm in 1962. The Swan, Hunter Group announced in 1967 that it was to close its wholly-owned subsidiary, the Wallsend Slipway and Engineering Company, which had built engines of over half a million h.p. between 1960 and 1965. And a substantial run-down in the number of employees had to be made in 1967 by both Doxfords and George Clark and North East Marine Limited, subsidiaries of Richardson Westgarth.

The reason in every case was a sharp falling-off in demand. In 1951 Doxford's slow speed diesel engine was the most popular in the world. By 1964 it had only 1.3% of the world market in terms of horse power.* The steam turbine had also suffered from steeply falling demand. During the same period the slow speed diesel designs of Sulzer in Switzerland and Burmeister and Wain in Denmark had grown in popularity.

* Report of the Shipbuilding Enquiry Committee, p.64.

Yet in 1945 Britain led the world in research and development into new forms of ship propulsion. During the war two important research organisations had been established. One was the British Ship Research Association and the other the Parsons and Marine Engineering Turbine Research & Development Association (known as Pametrada). * In 1947 Doxford's set up their own Research and Development Department "to ensure that a diesel engine equal to any other will in future be available to Doxford licensees and to British marine engineering in general." **

A research station for Pametrada was built at Wallsend near Newcastle and the association began work on the preparation of 80 basic designs for steam turbines.ϴ The most exciting development at this time seemed to be offered by gas turbines which had been successfully used in aircraft during the war. With the work being carried out both by the association and by the electrical engineering firm of C.A. Parsons of Newcastle, it was felt that a gas turbine marine engine was not far away. And in 1951 the first one was fitted to the tanker "Auris" which had been built in 1948 by Hawthorn, Leslie. The new power unit replaced one of the vessel's four diesel-alternator sets.

During 1946 both North East Marine Engineering Co. Ltd., one of the three constituent members of the Richardsons, Westgarth Group, and Doxford's had developed new and more powerful versions of their engines.

Doxford's also produced a smaller version of their highly successful opposed piston engine primarily intended for trawler propulsion. The design followed the well-tried Doxford practice of all-welded framing and bed-plate, the firm's established form of common-rail airless injection and the differential stroke principle. The first of the new engines was installed in the trawler "Lammermuir" built at Aberdeen and rated at 1,100 b.h.p. at 145 r.p.m.

By 1953 the Pametrada team had run a gas turbine unit of 3,500 s.h.p. for 1,000 hourson the test bed and was confident that commercial development could now go ahead. A few months later the Anglo Saxon Petroleum Company placed an order for the first all-gas turbine ship with Cammell Laird of Birkenhead.

* "Shipbuilder", Jan. 1946. ** Company records.
ϴ " Jan. 1946.

At about this time the Doxford research team had started to think of an entirely new version of their engine. They wanted something that was shorter, lighter and cheaper. The answer was the P-type engine which could develop 10,000 h.p. in six cylinders. Construction of the new version began in 1958 and within 5 years 40 had been made or were under construction. *

The mid-fifties saw all marine engineers, like all shipbuilders, exceedingly busy. In 1956 the Wallsend works of the North East Marine Engineering Company completed 15 machinery installations aggregating the very high figure of 100,000 b.h.p. The heavy booking of orders during the year meant the works would be fully employed for five years ahead. **

In December 1956 the Richardsons, Westgarth Group acquired 100% interest in the Humber Graving Dock and Engineering Co. Ltd. Two months later it acquired the Parsons Marine Turbine Co. Ltd., which at that time had a full order book for three years ahead.

An indication of the company's success was given in June 1958 when shop trials were completed on the 100th N.E.M.-Doxford engine in the space of 12 years. Meanwhile, 50 Clark-Sulzer engines, made by George Clark & Company, another member of the Richardson, Westgarth Group, had been built in nine years.

In 1958 an agreement was signed between N.E.M. and A.B. Gotaverken of Gothenburg, Sweden, under which the North East firm could offer the Swedish engine as an alternative to the Doxford engine. The Swedish two-stroke single-acting engine had many unique features which allowed low-cost production. And the main attraction for N.E.M. was that the new line of manufacture could be introduced with a minimum of disturbance to production facilities. ***

Also in 1958 Mr. John Hunter, chairman of Swan, Hunter and Wigham Richardson, announced that his company had entered into collaboration with the Nuclear Power Plant Company for the design and construction of nuclear-powered ships. θ The United States had already launched the nuclear-powered submarine "Nautilus" and a British nuclear-powered submarine was at an advanced stage of construction.

* "The Link", magazine of Richardsons, Westgarth.
** Ibid.

p.t.o.

But nuclear power, which at this time seemed to hold a great promise, never became a commercial possibility for shipping. A Government committee that examined the subject reported that a nuclear-powered ship should be postponed indefinitely. This view was confirmed by the United States Government, which decided in 1967 to lay up the world's first - and only - nuclear powered merchant ship, the "Savannah".

The intense activity of the late 1950's gave way to thinner and thinner order books in the 1960's. By 1961 Richardsons, Westgarth Board realised they would have to move over to land work and away from the heavy dependence upon marine work if they were to have a healthy future.* But this would not be easy. The whole tradition and reason for existence of George Clark, the North East Marine Engineering Co. Ltd., the Parsons Marine Turbine Co. Ltd., and other elements of the group were to be found in marine work. Atomic power stations which might have opened up a glittering new prospect were not going ahead fast enough to take up the slack from marine engineering.

At the same time, many organisational changes were made in an attempt to improve the efficiency of the company.** The main change was away from the relatively self-contained subsidiary company structure towards much more centralised control. By 1962 the company had plunged into a loss of £767,000 before tax, whereas three years earlier it had made a profit of over £1 m.

In 1966 the loss had grown to £831,000 although there had been some profitable years in between. In that year its subsidiary company of George Clark completed propulsion machinery for its 4,000th vessel. But by 1967 George Clark and N.E.M. decided to close down the Sunderland factory and concentrate all production at the Wallsend works.***

* "The Link".
** Ibid.
*** Ibid.

Doxford's were experiencing the same kind of difficulties. In 1963, somewhat belatedly, the company had produced a more powerful version of its P-type engine. It was called the J-type and it was able to produce up to 30,000 b.h.p. One commentator wrote: "If the advent of the Doxford high-powered engine has been tardy, the vigour applied and the pace at which the engine has been built and the design features now revealed, are all impressive."* The new 9 cylinder engine was first installed in the 65,000 ton tanker "North Sands" which held its acceptance trials at the beginning of 1966.** Even before those trials, 19 orders had been placed for the new engine and the Geddes Committee felt that the new design should help the company to regain some of its former share of the market.

But the company was running into new difficulties. In 1966 the Doxford and Sunderland Shipbuilding and Engineering Group (Doxfords had amalgamated with the Sunderland Shipbuilding Group in 1961) produced a loss of £3,250,000 before tax. A drastic pruning of operations seemed inevitable - and indeed took place.

The Geddes Report underlined the difficult future ahead for marine engineers and urged that production should be concentrated into four main works. *** They should be independent of shipbuilding operations. The committee felt that only two works would be required in the North East, one of which should be based on the Doxford design team, while the Pametrada design team should be integrated into the other.

These recommendations looked as if they could be implemented very quickly. The Swan, Hunter Group announced it was to close the Wallsend Slipway and Engineering Company. But Wallsend seemed as if it could remain an important centre. George Clark and N.E.M. were to concentrate production there, not far from the premises of Pametrada. And the British Ship Research Association had recently moved its headquarters there from London.

* The Motor Ship, May 1963.
** Ibid.
*** Report of the Shipbuilding Enquiry Committee, p.160.

Whether this concentration of brainpower can restore the North East's position, it is far too early to say. But it should help to overcome the deficiencies in organisation and resources that have witheld success in the past few years. The future will still be very uncertain but potentially the prospects are of a new and vigorous role in the world markets.

THE MEN AND THE MANAGERS

Since the war the shipbuilding industry has gained an unenviable reputation for poor labour relations. Mutual suspicion turned at times into hostility and inevitably increased costs and delayed deliveries. The employers complained of frequent demarcation disputes, lightning strikes, often just before a launch, in pursuit of a wage claim, and bad timekeeping. The men, on the other hand, said that the fault lay with the employers in refusing to listen to their grievances, in refusing to take sufficient interest in safety and welfare and in refusing to award adequate wages and conditions. In consequence the industry suffered a worse strike record than any other.

But since about 1965 and especially since the Geddes Report a new mood of co-operation has come into the industry. Important changes in union organisation and practices cleared the way. But essentially the improvement was due to a new attitude on the part of everyone concerned.

Shipbuilding, of course, by its very nature poses special problems of labour relations. The type of work, the cyclical pattern of demand and in recent years the lack of orders create a difficult framework in which to operate. Employment in theindustry has dropped considerably since the war. In 1945 about 54,000 men and women were employed in shipbuilding and repairing in the North East and a further 30,000 in marine engineering. These two figures together represented over 9% of the total insured population in the North East.

Tyneside was by far the most important centre. It employed about 30,000 in shipbuilding alone, well over half the region's total. Wearside, with 12,000 was next in importance. Teesside had 6,000 workers in shipbuilding, Hartlepool 3,000 and Blyth 2,000.

These figures had, of course, been boosted by the exigencies of wartime. There were, for example, over 3,000 building and construction workers who had been drafted into the industry. Over the next few years most of them returned to their proper trade.

But the long, post-war boom kept employment up and by 1959 there were still 64,000 workers in shipbuilding and marine engineering, 5% of the region's labour force. Then, during the 1960's, a sharp contraction set in, cutting the numbers by a third. In 1966 just over 44,000 were employed in the industry, about 3% of the region's workers.

Virtually every shipyard worker belongs to one of the 25 trade unions involved in the industry. And this high degree of union loyalty, together with the fragmented structure of the unions, has been the fundamental cause of so much of the trouble.

From 1949-59 shipbuilding was nearly always at the top of the list of working days lost through disputes, as the following table shows:-

WORKING DAYS LOST (IN THOUSANDS) *

	SHIPBUILDING		ALL INDUSTRIES
1949	125	(3rd worst)	1,807
1950	53		1,389
1951	73		1,694
1952	87		1,792
1953	206	(4th worst)	2,184
1954	521	(2nd worst)	2,457
1955	122		3,781
1956	324	(4th worst)	2,083
1957	2,328	(2nd worst)	8,412
1958	336	(3rd worst)	3,462
1959	314	(4th worst)	5,270

* Source - Ministry of Labour Handbook 1961. (Chapter on Industrial Relations in Shipbuilding).

In 1961 the Ministry of Labour started to calculate the hours lost per industry per head of the numbers in the industry. The true significance of the shipbuilding situation then became clear. In three of the four years from 1961-4, shipbuilding had the worst strike record in the country. Often the numbers involved were not so high as in other industries showing that the average length of strikes was longer. In 1964, for example, 105 shipbuilding workers per thousand of the labour force were involved in disputes compared with 255 in mining and quarrying 187 in vehicles and 146 in transport and communication. But working days lost amounted to 669 per thousand in shipbuilding compared with 464 in mining and quarrying, 526 in vehicles and 182 in vehicles and communications. *

In each of these four years the number of workers involved in the northern region was always proportionately higher than in the average for the industry as a whole. But in only one of the years was the number of working days lost proportionately higher than the industry's national average.

Considerable improvement was made in 1965 and 1966 but 1967 was another bad year for the number of working days lost.

Many of the disputes were between the unions themselves rather than between the unions and management. A frequent cause was the definition of a demarcation line between two trades, made even more difficult by the development of new techniques. For example, blacksmiths are now trained in electrical welding while in the fitting-out trades, the introduction of new materials, such as plastic, removes the need for painting.

And there were frequent disputes over wages. Despite the uniform wages agreement of 1930, many differentials still remained. There were meant to be three grades. The general labourers received in 1966 a basic gross wage of just over £10 a week for a standard 40-hour week. The fitting-out trades, such as joiners, fitters, plumbers, electricians, received about £16 and the structural workers between £18-£25.

* Ministry of Labour statistics on industrial disputes by regions.

But within this general framework, many variations have grown up through local agreements or through a shortage at one time or another of certain trades. The earnings of the welders, the kings of shipbuilding, caused particular resentment; working piece rates and receiving time and a half on Saturdays or double time on Sundays they could earn between £30 and £80 a week.

Other trades shook their heads enviously and put forward without a great deal of determination the plea for an industry-wide basic rate of, say, £20 a week. But they realised it would be impossible to ask the welders to renounce their lucrative earnings.

Union leaders themselves were aware of the impasse into which they were heading. One commented: "I think that British shipbuilding by and large is unbeatable for value and the quality of the work is as good as any in the world. Unfortunately, the work force is not alwaysproperly organised. If we can solve this problem I am sure we can bring prosperity back to the industry, increase considerably the wages and improve the conditions for the men and thereby start to attract men back to the industry... We have slowly modernised everything in shipbuilding but the human content."*

There have been important improvements, however, in union organisations and practice. By the mid-1960's the Boilermakers Society, whose headquarters are in Newcastle, had managed to persuade all the other structural workers' unions to join together in the Amalgamated Society of Boilermakers, Shipwrights, Blacksmiths and Structural Workers. This was a decisive step forward in reducing the number of demarcation disputes and in increasing harmony. The new amalgamated society is now responsible for a third of all the workers in the industry.

* Mr. Don Edwards, Secretary of the Tyneside Branch of the Confederation of Shipbuilding and Engineering Unions, in conversation with the author, 14th February 1966.

The new structure led to immediate improvements in work procedures. At the Furness Company, for example, shipwrights and platers agreed to exchange jobs when necessary on outside construction and fitting. And in August 1966, the Amalgamated Society signed with the Shipbuilding Employers' Federation the first national agreement for dealing with demarcation disputes.

But although they were ready to accept interchange schemes, the Amalgamated Society were opposed to the flexibility of operations that some managements called for. They feared that this would create non-specialised shipyard workers. But they were prepared to allow a plater, who is responsible for erecting the plates of a ship on the berth, to do some tackwelding so that he was not held up waiting for a welder. They would allow also interchange between burners, who are responsible for chipping off edges that cannot be burned.

Such interchange schemes would only be allowed in return for concessions, particularly over wages, by the management. Mr. Dan McGarvey, President of the Amalgamated Society, had defined his union policy in this way: "I believe that what is required is militancy with responsiblity.... This is a tough industry with some tough employees in it and we have got to be ready to match them. But at the same time it is an industry that has got to make progress. I believe this is what our men want and what we try to do for them."*

The mood of belligerency certainly paid short-term dividends. In 1965 North East shipbuilding employers complained of "fantastic" inflation in wages. The shortage of labour allowed the men to press their claims with vigour and certain trades secured up to 18% increases in earnings in the year.

* In conversation with the author, 18th February 1966.

Matters were getting so out of hand that the Shipbuilding Conference asked to see union leaders in February 1966 to tell them of the "parlous financial state of the industry, the heavy losses being incurred on fixed price contracts in consequence of the outstandingly high increase in costs, particularly of direct labour, the loss of control by union leaders at yard level and the resultant state of virtual anarchy in labour relations in the yards."

Since 1965 progress has been made. The Geddes Report said: "The chief requirement is the creation of an atmosphere of confidence and mutual trust... A start has already been made and we are content that the climate within the industry can be transformed in a relatively short period of time."

This view has been confirmed in the year following publication of the Report. Industrial relations are immeasurably better than they were at the beginning of the 1960's. It is this improvement more than any other factor which lends confidence to a hopeful view of the industry's future.

End

CHAPTER 8

AN ANALYSIS

In this chapter I attempt to analyse the statistical material that is available. The figures are set out in tables at the end of the chapter and cover the following aspects:-

1. Production.
   (a) merchant ship output for the world, the U.K., the N.E., the Tyne, Wear, Tees, Hartlepool and Whitby.
   (b) warship building on the Tyne, at Vickers-Armstrong, Hawthorn-Leslie, Palmer and Swan Hunter & Wigham Richardson.
2. Employment.
   (a) the numbers employed in shipbuilding in England and Wales and in the N.E. from 1861 - 1965.
   (b) average numbers employed at Wallsend Slipway & Engineering Co., 1879-1893.
   (c) industrial disputes in 1960's.
3. Earnings.
   (a) earnings at Palmer's in 1871, 1882 and 1885.
   (b) wages at the Wallsend Slipway and Engineering Co. from 1879 - 1893.
   (c) wages and earnings in Tyne shipyards in 1886, 1901 and 1904.
   (d) N.E. shipbuilding wages bill in 1906.
   (e) earnings in shipbuilding in 1906 by regions.
   (f) changes in piecework rates on Tees 1879 - 1892.
4. Profits.
   (a) company profits from 1910 - 1960.
   (b) prices charged by John Readhead & Sons including price per ton.

PRODUCTION

Figures of merchant ship production on a regional, national and international basis have been published by Lloyd's Register only since 1892. That year becomes therefore the effective starting point for a regional statistical examination, particularly one involving comparisons between the three sets of figures.

With one exception, the three sets of figures run broadly in parallel until the 1940's. The exception was the period 1918 - 1921 inclusive. In these four years world output was far and away greater than anything it had ever been before or was to be again until the early 1940's. The U.K. and N.E. outputs, although high in the years 1918 - 21, were not so exceptionally large, certainly there had been very good precedents set in the years 1905 - 7. In the case of the N.E. indeed, its all-time record output was achieved in the year 1906.

The exceptional disparity between the world figures on the one hand and the U.K. and N.E. figures on the other in the 1918 - 21 period can be attributed to the effect of the war. At first Britain was heavily involved in naval ship manufacture while merchant shipbuilding was only of secondary importance. Later, by 1916 - 17 when attention could return to merchant ships and demand picked up strongly, capacity was found to be inadequate. These difficulties provided a wonderful opportunity for other shipbuilding nations and the U.S.A. in particular made full use of them. As I have shown in Chapter 5 between 1914 and 1921, it was responsible for 86% of the net increase in world tonnage.

British exports fell to negligible proportions while allied and neutral countries which had previously had their ships built in Britain, set up their own resources as the following table shows:- *

	1918 G.R. Tons	1919 G.R. Tons	1920 G.R. Tons
Denmark	26,000	38,000	61,000
Holland	74,000	137,000	183,000
Italy	61,000	83,000	133,000
Japan	490,000	612,000	457,000
Sweden	40,000	50,000	64,000

* Source: "Shipbuilding in Britain" by L. Jones, p.63.

The same thing happened during the Second World War but after 1945 the U.K. was not able to reassert itself as it had done after 1920.

This was partly because of her inability - or, after the traumatic experience of the 1930's, one might say unwillingness - to expand output and partly because of her inability to keep to delivery dates. Mr. G.C. Allen believes that this in turn was a symptom of the mis-management of the economy as a whole.* Persistent inflation produced a shortage of workers and materials as well as rapidly increasing costs. In addition, the policy of rationing steel supplies to keep the price fixed had a detrimental effect on exports.

Mr. J.R. Parkinson has written: "Anxiety about the future, resting largely on previous setbacks, robbed the industry both of the will and the means to increase its output rapidly in an economy in which so many other industries seemed to hold out the promise of almost unlimited expansion.** In the event pessimism was shown to be ill-founded."

World figures which had fallen towards the end of the war started to rise rapidly again once the war was over. The U.K. and N.E. figures remained steady however and even to a small extent declined. The effect was that the U.K. and N.E. share of the world market fell sharply. By 1965 the U.K. was responsible for 8.8% of world output and the N.E. for 3.7%. From the early 1940's onwards, therefore, the close parallel between all three sets of figures disappears. The U.K. is no longer the principal producer of the world's shipping and therefore no longer has a dominant impact upon world shipbuilding returns.

Let us now consider other features of the output tables. One of the most noticeable characteristics of the industry's output is its extreme unevenness. It is unusual in the U.K. or N.E. figures to find four consecutive years in which output moves in one direction. Instead, there is a change of direction about every three years and sometimes less. For the world as a whole output is a little steadier but a change occurs on average every 4 - 5 years.

** "The Economics of Shipbuilding", (Parkinson), p.99.

* G.C. Allen, "British Industries & their Organisation" London, 1959, Ch. VI. p.155.

The changes, particularly before 1940, were often violent. For example, let us look at the period 1904-8. In 1904 N.E. output was on the upswing. From 1904 to 1905 production increased almost by a third. From 1905 to 1906 it increased by a further quarter. Then in the following year it dropped by a fifth and between 1907 and 1908 it fell by 60%.

For both the U.K. and the world, similar important differences between one year's output and the next occurred. Between 1907 and 1908 U.K. and world production fell by about 40%. This period of five years is not exceptional - equally severe yearly changes can be found over many other periods up to 1939.

After 1945 output became much more even from one year to the next. From 1945 - 1965 N.E. output never fell below 433,000 gross tons or rose above 688,000 gross tons. If one takes the period 1946 - 1961 inclusive, then the limits are even narrower; never falling below 474,000 gross tons or going above 688,000 gross tons. But even these relatively narrow extremities are separated by 11 years. The falls and rises from one year to another are much more gradual. In this way, production since 1945 has been much more stable than prior to 1939.

The fluctuating nature of production caused great difficulties for management in planning, in investment decisions and in its dealings with labour. The fluctuations were so strong that it was often difficult to see the underlying trend. This meant that managements felt that it was almost always the wrong time to invest in new equipment or increase capacity. When trade was depressed, few had the faith to invest; when trade was buoyant, few had the time to do so. The result was that many yards failed to adopt the best techniques and practices. In 1939 there were shipyards on Teesside using machines that were 80 years old.* Welding was late to arrive in many British yards, so was prefabrication. In his book, "Shipbuilding in Britain". L. Jones maintains in Chapter 3 that Britain failed to take the structural, financial and technical steps to maintain her former place. One of the reasons for this failure, in my view, was the fluctuating nature of output which obstructed careful investment thought.

* According to J.W. Scott and R.A. Hughes, "The Administration of War Production" (H.M.S.O.) 1955, p. 186.

Equally, these fluctuations had a shattering effect upon labour relations. Whenever orders were thin, managements would call upon workers to help to meet costs by a reduction in wages. In fact, the wage reductions could have little impact. Granted, as A.K. Cairncross and J.R. Parkinson show, the wage and salary bills in a shipyard constitute 70% of the yard's costs against 60% in all industries, but it is still true that the shipyard costs amount to only 30% of the total costs of the ship.* The other 70% is made up of bought-in materials. So while the shipyard management might have thought that the average wage reduction of 7% would play a significant part in reducing costs, it would in fact mean a drop of only 1½% - 2%. And this small financial contribution was bought at a wholly uneconomic price.

Often, these demands led to a strike. And equally, when times were good, the men would press for an increase in wages and this would upset the management.

Table X shows that piecework rates for iron ship workers on the Tees changed 14 times in the 13 years 1879-92, a situation that had neither logic nor justice in it.

The bitter resentment these changes caused far outweighed the value of any small reductions in prices that the managements could make in depressed times to try to encourage new orders. The atmosphere in shipyards became hostile, wary, unco-operative. This sullen, suspicious attitude which was bred into the men made them unwilling to accept change and unwilling, at most times, to do more than the legal minimum of work. The shipyards thus paid dearly for their wages policy and still, to some extent, continue to do so today.

The fluctuations in output, which we have been discussing, were thus severe but they conformed to a pattern so that it is possible to talk of a trade cycle.

* In a chapter on Shipbuilding in Vol. II of "The Structure of British Industry" edited by Duncan Burn, Cambridge 1958, p.119.

The full cycle generally took five years to complete and in its most usual form consisted of two downward years followed by three upward ones. This is what it looked like in tabulated form:-

North East

Peak	1891-2		1896		1901		1906		1911
Trough		1893		1897		1903		1908	

Peak		1920
Trough	1915	

U.K.

Peak		1896		1901		1906		1911		1920
Trough	1893		1897		1903		1908		1916	

World

Peak		1896		1901		1906		1913		1919
Trough	1893		1897		1904		1909		1915	

N.E. Between Wars

Peak	1920		1924		1929		1938
Trough		1923		1926		1933	

U.K.

Peak	1920		1924		1929		1938	
Trough		1923		1926		1933		1939

World

Peak	1919		1924		1930		1938	
Trough		1923		1926		1937		1940

U.K.

Peak	1942		1947		1951		1955	
Trough		1945		1948		1952		1956

Peak	1957	
Trough		1963

N.E.

Peak		1946		1951		1953		1958	
Trough	1945		1947		1952		1954		1963

<u>World</u>

Peak	1943		1958		1965 (?)
Trough		1947		1961	

What causes the cycle ? The usual explanation is that the pattern of demand reflects world trade and more particularly the shipping freight rates. When rates rise above an average level, indicating a shortage of tonnage and giving the opportunity for above-normal profits, owners place orders for more ships. Since the ships take at least a year and perhaps longer to come into service, demand becomes even more acute and freight rates rise even higher before being satisfied. As the rates rise more owners place orders for new shipping. Shipyard order books lengthen, profitsmargins widen and the workmen ask for increased wages.

As the ships begin to come into service, demand eases and the freight rates drop. But new ships still continue to come into service from the orders placed a year or more previously. Now, relatively speaking, there are more ships than required, freight rates fall even lower, owners stop placing orders, shipyards grow slack and the companies reduce the men's wages in order to try to cut production costs.

For a year or more, the shortage of orders produces thin times for the shipbuilding companies. They are forced to tender for what orders are available at narrow or non-existent profit margins. Slowly, the continuous growth in world trade produces a situation where the demand for ships rises again. The cycle then begins all over again.

But this explanation is too simple and indeed one critic feels there is no "apparent consistency between the yearly tonnage production curves and the freight rates." *

* Maxwell Ballard in a paper read to the N.E. Coast Institution of Engineers & Shipbuilders, 17th Dec. 1920.

The usual explanation overlooks the fact that there are two sources of supply: new production and a more or less permanent floating supply which is brought into operation when demand rises. It is this permanent supply which is especially sensitive to freight rates while new production, although obviously influenced by them, is less sensitive. After all, orders for new ships placed as a result of high freights cannot be completed for some time, during which the emergence of all available supply may well have reduced the rates.

Nevertheless, the most important factor in persuading businessmen to place new orders is a feeling of confidence and this confidence will clearly be higher when freight rates are rising. Similarly, orders will tend to be withheld when rates are falling even though when the ships are delivered - in 12 to 18 months or perhaps further ahead - rates may again by rising. Investors are thus clearly involved in a gamble and confidence is a major factor. This invariably means that many orders are made together or conversely are not made. There is either a feast or a famine for the shipbuilders.

Why is the cycle more muted today ? There seem to be two important factors. Firstly, world output has been consistently upward since 1946. There are small dips in the upward trend but without any doubt production - and therefore demand - has been rising strongly for the past 20 years. This in itself has limited the force of any downswings.

The second factor is the much smaller contribution made by the U.K. and the N.E. to total world output. A world leader, particularly on the scale that the U.K. achieved in the last quarter of the 19th century, receives the full force of variations in demand. A smaller industry, and today Japan is in a dominant position, finds it easier to maintain stable production.

NAVAL OUTPUT

This was even more fluctuating than merchant ship production, being dependent not on market forces but on political decisions. Often these two factors conflicted; seldom were they complementary.

The two outstanding examples were the periods 1910-1914 and 1930-1936. In the former example, merchant shipbuilding was at a very high peak - the spate of naval orders stretched the capacity of the yards on the Tyne to the utmost. In the second example, the depression of the 1930's produced a dearth of merchant ship orders yet this was the time when the British Government was hopefully pursuing a disarmament policy so that contracts for naval work were minimal. Vickers Armstrong, for example, gained not a single naval order between 1929 and 1935 even though its yard was specifically geared to naval work.

Naval production has been confined to the river Tyne as far as the N.E. is concerned, although Sunderland yards did produce negligible outputs at the turn of the century. On the Tyne itself, Vickers Armstrong and Palmers were the main manufacturers. Today Swan Hunter is responsible for the majority of naval work available.

Before the First World War, as we have seen in Chapter 4, naval shipbuilding was an important ~~asset~~ aspect of the business. In fact J.R. Parkinson estimates it accounted for between 20 and 25 % of total output.*

Shipbuilding work frequently led to armament rings, formed by armament and warship producers. Armstrong Mitchell, which became Armstrong Whitworth then Vickers Armstrong, was a case in point. The purchase of the Barrow Shipbuilding Company in 1897 was a natural avenue of further expansion from the production of guns and armour to the ships that carried them. **

The period from the 1890's up to the First World War represented the peak of naval shipbuilding. In those days yards in the region and in other parts of the country were building not only for the British Admiralty but for almost every Navy throughout the world. This was a situation that could not continue. Nations would want to be responsible for their own naval building - and so it proved. Today the naval work that is available is almost entirely for the British Admiralty.

* Ibid.

** "Vickers - A History" by J.D. Scott, p.44.

EMPLOYMENT

For a century, from approximately 1860 to 1960, shipbuilding has been a major source of employment in the N.E. Table V shows how the numbers employed in the industry rose to a peak in 1921 and since then have declined.

From this table we can see that the N.E. figures increased by about 30% between 1861-71, by about 25% between 1871-81 and by about 45% between 1881-91. From then onwards the figures level off. Although they continue to increase, the rise is much more gentle.

From 1921 onwards, the figures are complicated because they include not only shipbuilding and repairing but also marine engineering too. Marine engineering was almost but not quite as important as the other two combined: the ratio being 48 :52. So the 1921 shipbuilding and repairing employment figure in the N.E. would be about 53,000.

This represented about 6% of the total N.E. labour force and if we include marine engineering, the industry represented 11.6% of the region's total work force.* It was only exceeded by coal mining with 26.6% of the total work force. The third most important sector was the retail trade with 7.5%. The N.E. had 37% of the country's total force in the shipbuilding trades; coal mining in the region represented only 21% of the country's total.

Since 1921 the decline has been steady and persistent. By 1965 the industry occupied 45,280 workers out of a total regional labour force of 1,333,000, i.e. about 3%.** If one took merely this figure, it might be easy to conclude that the industry was today of little account. One must remember, however, the ancillary trades and those in supplying industries. It would be a fair guess to at least double the figure of direct employment - to give about 100,000 people who are in some way dependent on N.E. shipbuilding.

* "Shipbuilding in the North East" by Prof. H.M. Hallsworth, from an Industrial Survey of N.E. Coast prepared for Board of Trade by Armstrong College, 1932.

** Ministry of Labour statistics.

But similarly a multiplication by two in 1921 would have given a figure of over 200,000. So one can say that in the past 45 years the industry in the N.E. has declined by a half while total regional employment has increased by a third.

Although Table V shows a regular increase until 1921 and a regular decrease since, the pattern of unemployment is not so simple as that. In an industry in which there are violent fluctuations in output, one would expect to find fluctuations in employment and these certainly occur. Luckily the fluctuations largely took place between the Census dates so that by and large the Census figures measure employment at the peak of the trade cycle. The exceptions are 1921, the peak occurred in 1920; 1931, the peak occurred in 1929; and 1961, the peak occurred in 1958. A year or two may not seem significant but as the trade cycle table higher in this chapter shows, significant changes could take place within the space of 12 months. Apart from the three exceptions mentioned, the Census figures do measure like with like.

But between the peaks of the trade cycle, large changes in employment could occur, as Table VI illustrates. Between 1883 and 1884 the payroll at the Wallsend Slipway and Engineering Company fell by a third. The figure stayed steady for a couple of years then suddenly increased by 25%. Between 1887 and 1888 it rose by 10%, the following year by 25%. It rose again in 1890 but then started to show a significant drop.

The table perfectly illustrates the precarious state of shipbuilding employment and this precariousness was heightened by the "open-market" method of hiring labour. Under this system the men were chosen daily from a "labour market" by a foreman.

As Dr. Henry Mess shows, the markets for men were held at 7.30 a.m. and 1.0 p.m.* The best workers worked for only one yard and were known as "royals". They were invariably given preference but even they, like all other workers, had gaps in employment. One yard, which employed 960 men in March 1906, employed 1,586 in June. Another yard employed 2,400 men in the summer of 1926. By November the figure was down to 250.

* Industrial Tyneside.

These startling variations led Dr. Mess to call for a better use of labour. "There is no reason to suppose that the problems of the organisation of labour would prove completely intractable if sufficient attention were devoted to them and especially if prejudices were laid aside and there were co-operation in the search."*

The variations in employment together with the variations in earnings were among the main factors in the difficult labour relations experienced by the industry and which I discuss later in this chapter.

PRODUCTIVITY

This is extremely difficult to measure because of the lack of statistics or because of variations in the bases of such statistics as do exist, e.g. the lumping together of employment figures for shipbuilding workers and marine engineers after 1921. But an indication of productivity can be gained from the following table:-

Year	Position in Trade Cycle	Gainfully Employed	Output Tons	Output/ Man (tons)
1901	Peak	45,000	873,000	19.5
1911	Peak	48,000	977,000	20.3
1921	Average	53,000	663,000	12.5
1931	Average	17,000	169,000	9.9
1951	Average	32,000	617,000	19.2
1961	Average	28,000	568,000	20.3

Note: the numbers in the employed column from 1921 are my estimates, derived from dividing the proper employment figures by a little less than two, because after 1921 the Census figures combine shipbuilding and marine engineering workers. The 1931 figure has been especially reduced to take account of high unemployment as indicated in table V.

* op. cit.

The output per man column, which measures productivity, shows that there has been no improvement over this century. Output and employment have fallen by roughly equal amounts. In fact J.R. Parkinson believes that it has been the ready supply of skilled labour that has prevented a more capital-intensive approach.* He even goes so far as to say that the surfeit of skilled labour has acted as a drag on the industry, making it put off reorganisation schemes.

Although these figures appear to show no improvement in productivity over the period, we must remember that output is not the simple figure it appears to be. Changes in the composition of ships have certainly taken place, not all of these changes of course putting the worker of today at a disadvantage. Today's launch figures are boosted by large but simple cargo carriers and tankers - "floating boxes" - and this must largely offset any extra complications in design that the present-day workers must contend with. A value measurement, in real terms, would be of great interest in this connection but is unfortunately impossible to construct.

To an unsatisfactory degree, one can nevertheless conclude that the industry has remained labour-intensive. But in the late 1950's and early 1960's there were signs of a change. Let us take as an example a £3m modernisation scheme carried out by the Sunderland firm of Austin and Pickersgill between 1955-59.**

This involved the removal of 250,000 tons of ballast, the physical integration of two adjacent yards, the building of new sheds and shops and the installation of new machinery.

The effect has been to double output from 50.000 g.r.t. to 100,000 and to reduce building times as the following table illustrates:-

* op. cit.

** The company's own records.

LIST OF SHIPS & BUILDING TIMES FOR AUSTIN AND PICKERSGILL LIMITED *

Name of Ship	Tonnage	Description	Year	Keel to Launch (No. of Weeks)	Launch to Delivery (No. of weeks)
m.v. Baron Kinnaird	11,950 d.w.	Cargo Liner	1957/1958	41½	9
m.v. Baron Pentland	11,950 d.w.	" "	1958	41	6
m.v. Durham Trader	13,055 d.w.	" "	1958/1959	39	10½
m.v. Iron Ore	15,300 d.w.	Ore Carrier	1959	37	12½
m.v. Baron Maclay	11,950 d.w.	Cargo Liner	1959	17	9
m.v. Baron Wemyss	11,950 d.w.	" "	1959	18	9½
m.v. Iron Barque	15,300 d.w.	Ore Carrier	1959/1960	18	10
Shell Oil Barge No.607	600 d.w.	-	1959/1960	9½	½
Shell Oil Barge No.608	600 d.w.	-	1959/1960	9½	½
m.v. Glanely	11,900 d.w.	Cargo Liner	1960	15	6
m.v.Longstone	18,320 d.w.	Ore Carrier	1960	15	9
m.v.Ravenworth	9,740 d.w.	" "	1960	17	9½
m.v. Cheviot	18,000 d.w.	" "	1960	11	11
m.v. Booker Venture	10,450 d.w.	Sugar Carr.	1960/1961	13½	8
m.v. Vasilios R.	15,250 d.w.	Cargo Liner	1961	15½	35
m.v.Torr Head	9,700 d.w.	" "	1961	16½	14½
m.v. Finnamore Meadow	18,500 d.w.	Ore Carrier	1961/1962	10	12

N.B. Weekends & holiday periods included in building times. Normal production based on 5-day week.

The above table illustrates the substantial savings in building times that can be made by flow production methods and by concentrating on a limited range of products. Of course there can be no such concentration as car manufacturers are able to achieve - shipowners have over the years consistently refused to accept the standard ship - but there has been a considerable swing away from the many idiosyncrasies of design that owners once used to insist on.

* Company's own records.

Since 1966 Austin & Pickersgill have produced designs for a shelter deck vessel of 14,000 tons as the nearest equivalent to a standard ship and they and Bartrams, an associated company, have had considerable success with this design.

This success has helped Austin & Pickersgill to maintain very quick production times. The evidence this firm can produce is not unique. Other firms have also increased production times without taking on more workers but not at the same rate as Austin & Pickersgill, who thus provide the best evidence of a belated improvement in productivity.

EARNINGS

Tables VI to X give an indication of earnings at the end of the 19th century. Here again, the main impression is one of fluctuation - fluctuation from year to year and fluctuations between one trade and another.

The fluctuations from one year to another are almost as severe as the fluctuations in employment or production. Table VI, Col. III, shows that not only were men laid off during slack times but that those who were left suffered considerable decreases in their wages. For example, between 1883 and 1884 when employment fell by a third, average earnings dropped by almost 20%.

The evidence of table X is perhaps even more striking for this shows there were 14 changes in piece-rates for iron shipbuilding workers on the Tees within a period of 13 years. As we have shown earlier, decreases were invariably resisted by the men and increases were invariably resisted by the management. The lack of a cogent employment and wages policy did much to harm relationships.

But the workers were not only suspicious of the management, they were suspicious of one another. This suspicion led to the frequent demarcation disputes we shall consider below. It also led to the maintainance of wage differentials.

As the Geddes report said: "There is no correlation based on skill between the wage rates paid for the various crafts.* Each craft seeks to secure whatever it can and differentials are jealously guarded. Should an employer agree to give members of one craft higher wages in return for the abandonment of restrictive practices or in order to secure their co-operation in a different deployment of the craft, he is likely to be faced with demands from the other crafts for a restoration of the differentials, whether or not a similar quid pro quo can be offered."

This dilemma has arisen in an acute form on the Tyne in 1968. As a result of union amalgamations, the Boilermakers' Society, speaking on behalf of all structural workers, was in a position to offer the employers - in this case Swan Hunter and Tyne Shipbuilders Ltd., - greater flexibility and to some extent even interchangeability between various crafts. In return the management offered considerable improvements in wages. Automatically, other unions applied for wage increases and the management announced they were willing to accept these claims sympathetically but needed quid pro quos similar to those being offered by the Boilermakers Society. These other unions, being much smaller and more fragmented than the Boilermakers Society, were unable to offer interesting proposals. Yet they continued to argue strongly in favour of maintaining differentials.

An interesting example of how these differentials can be eroded over time is given in the following table:**

GROSS WEEKLY WAGES TIME RATES

Time Workers Class or Grade 21 Yrs. or Over	July 1914 54 hr. Week	1923-4 47 hr. Week Wage	Increase Over 1914	Jan. 1932 47 hrs. Wage	Increase Over 1914	Increase Over 1923
1. Fully skilled	41s.	48s.6d	18%	60s.	46%	24%
2. Riveters&Caulkers	37s.	44s.	19%	57s6d	55%	31%
3. Holders-on	31s.6d	41s.2d	31%	55s.	75%	34%
4. Drillers	27s.6d	39s.10d	45%	55s.	100%	38%
5. Semi-skilled	24s.0d	38s.10d	62%	41s6d	73%	7%
(according to exp-	to	to	to	to	to	to
erience, ability & Job	31s.6d	41s.2d	31%	50s.	59%	21%
6. Gen. Labourers	23s.6d	38s.6d	64%	41s.	74%	6%
Ministry of Labour Cost of Living Index (Increase over July 1914)		November 1923 + 77%		November 1931 + 46%		

* Shipbuilding Enquiry Committee 1965-6, Cmnd. 2937 p.101.
** Source: "Shipbuilder", January 1932.

This shows, for example, that drillers received a 100% increase between 1914 and 1932 while fully skilled workers received an increase of 46%. This reduced the skilled worker's lead over the driller from approximately 50% to 10%. Indeed, the skilled workers were only keeping pace with the increase in the cost of living while all other workers, apart perhaps from the rivetters and caulkers, beat the cost-of-living index increase by substantial margins.

Despite the evidence of this table, attempts to maintain differentials, certainly in the short-term, present problems for managements. The Geddes Committee urged that managements should "ensure either that before such extension of increases the other workers should agree to similar productivity measures or alternatively that they know what the ultimate cost is likely to be before making the productivity bargain."*

INDUSTRIAL DISPUTES

In earlier chapters I have traced in some detail the course of industrial relations. The general picture is clearly not ahappy one and one authority has claimed that not only was shipbuilding more trouble-prone than most other industries but that the North East coast was the main centre for the trouble.**

While we can understand the general picture clearly enough, we can only examine, analyse and compare the N.E. position in great detail from 1901 when the Ministry of Labour started to publish regional statistics of trade disputes. The figures are to be found in Table X.

Before we consider these figures, it may be as well to remember that shipbuilding and repairing in the country as a whole has been beset by disputes as the following table shows:-

* Cmnd. 2937, p.116-117.

** H.A. Clegg & Others in "A History of British Trade Unions 1889-1910", London 1964, p.128.

Industry Groups		Average Annual Nos. of Days Lost per 1,000 Employees in Employment	
		1949-58	1960-64
1.	Shipbuilding & repairing	1,862	1,457
2.	Coal mining	717	667
3.	Construction	78	141
4.	Engineering & vehicles	263	436
5.	Textiles	19	27
6.	Food, drink & tobacco	11	41
7.	Port & Inland Water Transport	2,049	1,215

Source: Ministry of Labour

As the Geddes report commented: "The industry's record remains poor in comparison with other industries and the number of stoppages which are "official" is high - in terms of working days lost 54% as compared with about 6% in the docks, two per cent in coal mining and 51% in engineering including vehicle building."*

In the years 1961 to 1964 inclusive shipbuilding had on three occasions the highest number of working days lost in disputes per 1,000 of employees in employment. If we consider the Northern region alone the position is even more alarming. In 1961, for example, the working days lost per 1,000 in the labour force saw shipbuilding almost 50% higher than the next industry for Great Britain as a whole. For the northern region only shipbuilding was two and a half times higher than the next industry. In 1962 and 1964 the same thing occurred. This means that shipbuilding disputes stood out more in the regional economy than in the national one. At the same time, in three of the years the national figures were proportionately much higher than the regional ones - it was just that other industries were affected more by national than by local strikes too.

* Cmnd. 2937, p. 105.

When we look at the number of men involved in strikes, an almost contrary picture emerges. Now proportionately the figures are higher for the northern region than for Great Britain as a whole. The clear implication is that the northern workers were more prone to strike but stayed on strike for a shorter time.

Two years stand out in particular: 1962 and 1964. In the first case over 2,700 working days were lost in disputes in the north east per 1,000 of labour force and in 1964 the figure was over 1,000 days. During 1965 and 1966 the figures declined and 1966 was a very peaceful year. Unfortunately the trend was reversed in 1967.

SHIPBUILDING FINANCE

The financial returns for some of the area's shipbuilding companies are given in tables XI and XII. They are as eloquent of the industry's fortunes as the statistics of production. One can see, for example, how Palmer's Shipbuilding & Iron Company, having made good profits in 1917-18, 1918-19 and 1919-20, started to decline in 1920-21 and then made substantial losses in the next four years. True, a number of companies ran into financial difficulties at this period but none so severely as Palmer's. Indeed, the latter made even bigger losses in its last few years and it was these losses that brought the company down, not the knives of the "financial assassins" of National Shipbuilders' Securities Limited.

To a large extent, of course, output and financial returns are but different aspects of the same story. When production is low because orders are scarce, one would expect to find narrow profit margins leading to poorer financial returns. When output is soaring, the opposite obtains. A simple table, as below, indicates the correspondence of financial results and output. I have compared the movement up or down of Swan Hunter's financial returns with a similar movement in the production returns. Sometimes there is no movement from one year to another, indicated by "S" for "same".

	1915	1916	1917	1918	1919
Swan Hunter	U	S	U	U	U
Production	D	S	U	U	D

1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
D	U	S	D	D	D	U	D	U	U	D
U	D	D	D	U	D	D	U	U	U	D
1931	1932	1933	1934	1935	1936	1937	1938	1946	1947	
S	D	D	U	U	D	U	U	U	D	
D	D	D	U	U	U	S	U	U	D	
1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	
U	D	U	U	U	S	U	U	U	U	
U	U	S	U	D	U	D	U	U	D	

This simple table shows that in 19 out of the 36 years, the movement in both these factors was in the same direction.

The next most obvious characteristic is the size of the returns in different periods. The First World War and its immediate aftermath brought handsome profits followed by difficulties in the middle and late twenties and early and middle thirties. These years were then followed by more profitable ones. Over the period, there is a growth in the size of the returns for the successful companies. But this growth is largely illusory, created by the permanent inflation of prices. If we reduce all figures to the London and Cambridge Economic Bulletin's capital goods index, then we can see there has been no growth at all in the level of profits.*

PROFITS RECORDED BY SWAN HUNTER

	1914	1915	1956	1957
Actual	£218,000	£306,000	£1,036,000	£1,500,000
Adjusted to 1958 Level	£1,557,000	£1,530,000	£1,102,000	£1,588,000

Adjusting the profit figures in the above way confirms the conclusion reached earlier that for the past 50 years British and N.E. shipbuilding has been in decline, both absolutely and relatively to the rest of the world. It has failed to grow during a period when other countries have seen their shipbuilding activities grow considerably.

* "Key statistics of the British Economy 1900-1964" published by the London & Cambridge Economic Service. Table C for capital goods prices takes 1958 = 100. The index table then shows the price index for 1914 as 16, for 1915 as 20, for 1956 as 94 and for 1957 as 97.

In earlier chapters I have explained my view that this lack of growth springs from a lack of confidence in the future and this in turn springs from the experiences in the 1930's. The deep recession then sapped the industry of financial resources and personal will-power.

There has of course been some investment in the industry. Austin & Pickersgill spent £3 m. on modernising their Southwick yard between 1955-59. The Swan Hunter Group spent £15 m. on investment between 1955-65. For the individual companies they were large sums of money. On an international scale they were not remarkable at all.

While real profits have not gone up, real prices for ships certainly have. Table XI shows the prices and the prices for deadweight ton charged by John Readhead & Sons for a fairly standard type of cargo vessel. The column indicating price per deadweight ton is especially interesting. It shows a tenfold increase or more since the beginning of the century. If we adjust the figures using the same Cambridge index as above we can construct a price per deadweight ton table like the following:-

1902	£50	1922	£60
1915	£34	1949	£60
1919	£55	1960	£102

Even on an adjusted basis, prices to the customer still increased over the period. Yet profits remained steady, indicating a rise in shipbuilder's costs. It is an excellent indication of the difficulties that the shipbuilder faced - either from lack of demand or from foreign competition - that the increased prices were caused by the increase in costs and not by the increase in profits. This failure to improve profits (in a real sense, i.e. allowing for inflation) has been another important factor in the failure to maintain investment, mentioned above.

For example, Harland & Wolff of Belfast spent £13 m. (of which £5 m. was a Government grant and the rest was a loan at favourable rates) on a new large building dock in 1967-68. This single piece of investment was greater than many other yards had spent in total. Yet, it is only one of eight similar docks planned or under construction in Western Europe. In Japan ten docks, capable of building vessels well in excess of 200,000 gross tons, were in operation by 1968.

Thus the industry is becoming increasingly capital intensive but this is a trend that the U.K. is following only at a distance. Many firms are simply too small. But the grouping of yards represents a first step to the acquisition of sufficient financial power to build bigger and bigger vessels, especially oil tankers, where maximum world growth has been concentrated. The biggest part of Japanese production comes from large yards; the biggest part of U.K. production from yards incapable of building more than 100,000 gross tons a year. This is one of the biggest and most important differences between the two countries as the following table shows:-

PROPORTION OF TONNAGE LAUNCHED IN SHIPBUILDING COUNTRIES BY SIZE OF SHIPBUILDING GROUP

(Ships of 100 Gross Tons or more in 1964)

In Groups of Firms with Annual Launchings of '000 Gross Tons	JAPAN		GERMANY		SWEDEN		UNITED KINGDOM	
	Gross tons '000	% of Total Launchings	Gross tons '000	% of Total Launchings	Gross tons '000	% of Total Launchings	Gross tons '000	% of Total Launchings
Over 750	1,576	38.6	-	-	-	-	-	-
250-750	1,336	32.7	-	-	720	70.5	-	-
100-249	508	12.4	458	51.5	230	22.5	440	42.2
Under 100	361	8.8	397	44.6	63	6.2	597	57.2
Unspecified yards *	304	7.5	35	3.9	8	0.8	6	0.6
TOTAL	4,085	100	890	100	1,021	100	1,043	100

* Not individually recorded
Source: Glasgow Herald Trades Review (Jan. 1965).

'ABLE I

LAUNCHING OF SHIPS OVER 100 g.r.t. EXCLUDING WARSHIPS

Source: Lloyd's Register of Shipping

EAR	U.K.		WORLD		U.K. % of World	U.K. % Export Launchings	NORTH EAST		
	Nos.	Tons	Nos.	Tons			Nos.	Tons	% of World
1892	681	1,109,950	1,051	1,358,045	81.7		251	570,296	41.9
1893	536	836,383	846	1,026,741	81.4		192	431,405	41.9
1894	614	1,046,508	932	1,323,538	79.0		252	544,768	41.1
1895	579	950,967	880	1,218,160	78.0		222	497,564	40.8
1896	696	1,159,751	1,113	1,567,882	74.0		280	611,727	39.0
1897	591	952,486	990	1,331,924	71.4		236	498,594	37.4
1898	761	1,367,570	1,290	1,893,343	72.3		299	763,825	40.0
1899	726	1,416,791	1,269	2,121,738	66.7		276	766,282	36.0
1900	692	1,442,471	1,364	2,304,163	62.5	23	264	794,300	34.4
1901	639	1,524,739	1,538	2,617,539	58.2	23	279	872,723	33.4
1902	694	1,427,558	1,650	2,502,755	57.0	19	258	701,005	28.0
1903	697	1,190,618	1,650	2,145,631	55.5	20	252	581,343	27.0
1904	712	1,205,162	1,643	1,987,935	62.0	19	257	671,580	33.7
1905	795	1,623,168	1,576	2,514,922	64.5	21.5	276	872,314	34.6
1906	886	1.828,343	1,836	2,919,763	62.6	20.3	334	1,005,148	37.4
1907	841	1,607,890	1,788	2,778,088	58.0	34.1	297	817,510	29.4
1908	523	929,669	1,405	1,833,286	50.7	40.3	154	355,859	19.3
1909	526	991,066	1,063	1,602,057	62.0	24.4	197	434,810	27.1
1910	500	1,143,169	1,277	1,957,853	58.4	19.5	196	578,315	29.5
1911	772	1,803,844	1,599	2,650,140	68.0	22.4	331	977,278	36.8
1912	712	1,738,514	1,719	2,901,769	60.0	23.9	267	888,683	30.6
1913	688	1,932,153	1,750	3,332,882	58.0	21.7	267	974,109	29.2
1914	656	1,683,553	1,319	2,852,753	59.0	24.4	262	854,697	30.0
1915	327	650,919	743	1,201,638	54.2	14.75	110	352,825	29.2
1916	306	608,235	964	1,688,080	36.0	-	108	353,445	20.9
1917	286	1,162,896	1,112	2,937,786	39.6	-	136	611,233	20.8
1918	301	1,348,120	1,866	5,447,444	24.7	-	162	736,858	13.5
1919	612	1,620,442	2,483	7,144,549	22.6	6.0	184	716,295	10.0
1920	618	2,055,624	1,759	5,861,666	35.0	41.0	210	948,902	16.5
1921	426	1,538,052	1,379	4,356,843	35.3	38.5	137	662,753	15.2
1922	235	1,031,081	852	2,467,084	41.8	26.0	90	432,137	17.4
1923	222	645,651	701	1,643,181	39.2	2.9	89	255,542	15.5
1924	494	1,439,885	924	2,247,751	64.1	15.3	202	631,258	28.0
1925	342	1,084,633	855	2,193,404	49.5	16.4	108	382,855	17.4
1926	197	639,568	600	1,674,977	38.2	14.0	57	198,979	11.8

YEAR	U.K. Nos.	U.K. Tons	WORLD Nos.	WORLD Tons	U.K. % of World	U.K. % Export Launchings	NORTH EAST Nos.	NORTH EAST Tons	NORTH EAST % of World
1927	371	1,225,873	802	2,285,679	53.6	21.8	129	567,197	24.8
1928	420	1,445,920	869	2,699,239	53.6	20.2	162	641,120	23.9
1929	489	1,522,623	1,012	2,793,210	54.5	17.1	199	679,321	24.8
1930	481	1,478,563	1,084	2,889,472	51.2	44.0	148	608,476	21.0
1931	148	502,487	596	1,617,115	31.1	40.7	35	168,796	10.4
1932	100	187,794	307	726,591	25.8	31.2	30	72,252	9.9
1933	108	133,115	330	489,016	27.2	9.1	23	37,419	7.5
1934	173	459,877	536	967,419	47.5	10.2	40	66,717	6.8
1935	185	499,011	649	1,302,080	38.3	12.8	43	134,928	10.3
1936	328	856,257	999	2,117,924	40.4	10.9	96	340,922	16.1
1937	309	920,822	1,101	2,690,580	34.2	13.5	96	341,199	12.6
1938	267	1,030,375	1,119	3,033,593	34.0	19.8	87	398,100	13.1
1939	201	629,705	941	2,539,424	24.8				
1940	229	842,910	495	1,754,198	48.1				
1941	245	1,185,894	510	2,491,173	47.6				
1942	273	1,270,714	1,300	7,815,369	16.4				
1943	243	1,136,804	2,078	13,884,776	8.0				
1944	279	919,357	1,738	11,169,503	8.1				
1945	307	893,515	1,326	7,192,679	12.7	2.03	111	433,758	6.1
1946	314	1,120,526	690	2,114,702	53.3	10.2	107	509,995	23.9
1947	343	1,192,759	787	2,102,621	56.9	31.6	103	474,842	22.6
1948	342	1,176,346	872	2,309,743	50.9	34.9	105	500,681	21.6
1949	320	1,267,467	926	3,131,805	40.5	41.2	96	531,121	16.7
1950	275	1,324,570	1,013	3,492,876	38.0	33.3	82	538,956	15.4
1951	261	1,341,024	1,022	3,642,564	36.8	44.9	77	616,894	16.9
1952	254	1,302,548	1,074	4,395,578	29.6	31.8	72	540,333	12.5
1953	220	1,317,463	1,143	5,096,050	25.9	27.7	73	612,110	12.0
1954	253	1,408,874	1,233	5,252,631	26.8	34.2	72	576,111	10.9
1955	276	1,473,937	1,437	5,314,850	27.7	36.6	75	623,970	11.7
1956	275	1,383,387	1,815	6,670,218	20.7	31.4	72	639,304	9.5
1957	260	1,413,701	1,950	8,501,404	16.6	18.5	72	624,187	7.3
1958	282	1,401,980	1,936	9,269,983	15.1	24.1	78	688,626	7.4
1959	274	1,372,595	1,808	8,745,704	15.7	8.4	70	618,581	7.1
1960	253	1,331,491	2,020	8,356,444	15.9	11.0	66	614,980	7.2
1961	247	1,191,758	1,990	7,940,005	15.01	23.6	61	568,442	7.1
1962	187	1,072,513	1,901	8,374,754	12.8	15.4	46	461,420	5.5
1963	160	927,649	2,001	8,538,513	10.9	30.6	36	440,171	5.1
1964	179	1,042,576	2,147	10,263,803	10.1	14.3	45	530,108	5.1
1965	158	1,073,074	2,280	12,215,817	8.8	12.7	36	455,120	3.7

MERCHANT SHIPPING LAUNCHES IN THE NORTH EAST

Source: Lloyd's Register of Shipping

Notes: * In 1918 Whitby figures were included with those of Middlesbrough and Stockton rather than with Hartlepool.
** Some small sailing vessels built by North East in this period, but negligible.

	Hartlepools and Whitby		Middlesbrough and Stockton		Newcastle		Sunderland		Totals	
r	No.	g.r.t.	No.	g.r.t.	No.	g.r.t.	No.	g.r.t.	No.	g.r.t.
2	36	98,623	46	103,725	94	181,508	75	186,440	251	570,296
3	28	79,120	46	89,707	70	144,261	48	118,317	192	431,405
4	30	81,839	45	104,071	106	190,601	71	168,257	252	544,768
5	37	95,819	47	115,003	86	161,476	52	125,266	222	497,564
6	29	82,093	63	112,932	103	200,746	85	215,956	280	611,727
7	25	65,686	38	88,827	113	169,585	60	174,496	236	498,594
8	44	125,791	51	140,729	120	238,551	84	258,754	299	763,825
9	41	128,034	51	146,599	112	249,038	72	242,611	276	766,282
0	40	140,623	44	144,164	110	265,142	70	244,371	264	794,300
1	41	150,607	46	161,058	116	292,989	76	268,069	279	872,723
2	21	81,824	40	108,230	130	280,860	67	230,091	258	701,005
3	28	80,808	39	91,675	125	219,360	60	189,500	252	581,343
4	31	96,154	38	110,236	116	236,055	72	229,135	257	671,580
5	36	124,006	40	132,748	126	310,391	94	305,169	276	872,314
6	44	144,603	44	147,857	149	385,987	97	326,701	334	1,005,148
7	28	94,469	48	138,621	131	292,814	90	291,606	297	817,510
8	13	37,843	18	57,210	83	174,259	40	86,547	154	355,859
9	18	57,712	27	62,492	95	182,235	57	132,371	197	434,810
0	23	86,295	44	108,754	69	203,831	60	179,435	196	578,315
1	34	135,557	95	141,934	117	412,959	85	286,828	331	977,278
2	30	121,725	71	143,570	86	317,654	80	305,732	267	888,681
3	33	153,071	62	154,743	94	366,331	78	299,964	267	974,109
4	29	124,419	70	137,165	91	315,585	72	277,528	262	854,697
5	13	59,308	30	58,574	36	124,001	31	110,942	110	352,825
6	11	54,295	27	31,342	35	133,336	35	134,472	108	353,445
7	13	65,622	23	109,306	52	231,907	48	204,398	136	611,233
8*	25	100,413	24	109,298	55	266,594	58	260,553	162	736,858
9	20	82,233	36	119,943	64	239,836	64	274,283	184	716,295
20	16	73,221	44	195,452	83	365,775	67	314,454	210	948,902

contd.

	Hartlepools and Whitby		Middlesbrough and Stockton		Newcastle		Sunderland		Totals	
r	No.	g.r.t.	No.	g.r.t.	No.	g.r.t.	No.	g.r.t.	No.	g.r.t.
1	6	34,101	28	129,559	73	354,813	30	144,280	137	662,753
2	4	18,822	17	45,814	42	240,788	27	126,713	90	432,137
3	5	23,864	23	42,709	44	137,408	17	51,561	89	255,542
4	14	55,804	56	105,707	76	275,672	56	194,075	202	631,258
5	9	37,874	25	58,786	51	194,614	23	91,581	108	382,855
6	3	14,814	21	22,369	25	126,609	8	35,187	57	198,979
7	13	65,588	18	64,783	61	274,056	37	162,770	129	567,197
8	9	39,743	33	93,223	70	300,508	50	207,646	162	641,120
9	15	70,385	61	91,824	65	271,601	58	245,511	199	679,321
0	14	39,481	40	71,935	54	323,750	40	173,306	148	608,476
1	-	-	9	38,990	19	120,992	7	8,814	35	168,796
2	7	31,911	14	13,487	7	24,226	2	2,628	30	72,252
3	-	-	14	14,685	4	11,033	5	11,701	23	37,419
4	2	1,100	21	16,238	9	30,169	8	19,210	40	66,717
5	2	10,228	14	12,582	19	80,736	8	31,382	43	134,928
6	9	41,015	40	51,667	21	109,441	36	138,799	96	340,922
7	10	43,615	30	39,740	18	102,121	38	155,723	96	341,199
8	11	47,633	16	39,569	25	141,897	35	169,001	87	398,100
				WAR YEARS						
5	10	45,270	15	50,342	37	122,635	49	215,511	111	433,758
6	13	46,653	14	87,279	35	184,052	45	192,011	107	509,995
7	11	43,309	16	56,072	35	185,914	41	189,547	103	474,842
8	12	40,443	25	75,348	30	206,845	38	178,045	105	500,681
9	7	27,967	22	104,075	30	217,971	37	181,108	96	531,121
0	7	35,693	19	105,344	22	206,501	34	191,418	82	538,956
1	9	50,506	16	125,556	24	243,499	28	197,333	77	616,894
2	8	45,347	13	122,756	25	201,338	26	170,892	72	540,333
3	6	29,180	13	153,544	27	234,714	27	194,672	73	612,110
4	7	45,891	11	125,076	28	214,967	26	190,177	72	576,111
5	6	32,665	10	130,776	30	238,146	29	222,383	75	623,970
6	6	39,916	10	129,120	27	259,391	29	210,877	72	639,304
7	5	38,238	10	111,877	29	263,274	28	210,798	72	624,187
8	5	39,143	11	131,303	32	249,837	30	268,343	78	688,626
9	3	20,305	7	92,875	32	257,874	28	247,527	70	618,581
0	2	23,503	7	120,959	34	262,085	23	208,433	66	614,980
1	2	19,559	5	95,628	27	193,942	27	259,313	61	568,442
2	-	-	3	50,275	22	196,790	21	214,355	46	461,420
3	-	-	5	81,830	15	154,355	16	203,986	36	440,171
4	-	-	7	72,047	20	226,533	18	231,528	45	530,108
5	-	-	2	43,513	18	158,930	16	252,677	36	455,120

TABLE III

NAVAL SHIPBUILDING

Source: T. A. Brassey's Naval Review

Year	Name	Type	Displacement Tons	Owner
	MIDDLESBROUGH			
1882	Dolphin	Cruiser	925	Admiralty
	SUNDERLAND			
1895	Hardy	Torpedo Boat Destroyer	265	Admiralty
1895	Haughty	" " "	265	Admiralty
1899	Lee	" " "	300	Admiralty
1899	Voilet	" " "	283	Admiralty
1901	Success	" " "	380	Admiralty
1901	Sylvia	" " "	350	Admiralty
1916	11 Vessels	" " "	1,100	Admiralty
1917	5 Vessels	" " "	1,200	Admiralty
1918	5 Vessels	" " "	1,300	Admiralty
1919	Shamrock	" " "	905	Admiralty
	BLYTH			
1914	Ark Royal	Aircraft Carrier	6,900	Admiralty

NAVAL TONNAGE LAUNCHED FROM THE TYNE

Source: T. A. Brassey's Annual Review

Year	Displacement Tons	Year	Displacement Tons
1870	3,480	1909	43,228
1872	20,780	1910	28,515
1873	6,640	1911	33,090
1875	1,815	1912	35,245
1876	2,515	1913	136,976
1878	2,950	1914	46,371
1882	1,350	1915	85,210
1883	10,088	1916	104,224
1885	12,282	1917	44,266
1886	2,297	1918	74,927
1887	6,742	1919	20,308
1888	26,364	1920	9,567
1889	19,975	1925	35,662
1890	16,050	1926	1,444
1891	30,767	1927	1,930
1892	11,150	1928	18,400
1893	37,792	1929	3,560
1894	15,500	1930	4,240
1895	32,206	1931	8,160
1896	42,240	1932	2,750
1897	35,989	1934	12,500
1898	17,182	1936	31,075
1899	43,265	1938	86,100
1900	10,503	1939	19,380
1901	34,100	1940	9,450
1902	14,757	1941	21,585
1903	33,745	1942	10,860
1904	30,830	1943	40,260
1905	21,825	1944	110,290
1906	19,250	1945	45,310
1907	37,602	1946	2,315
1908	22,161	1947	4,630
	contd.	1948	22,930

Note: These totals frequently differ from the Company's own records for a reason that is not clear to me. After 1940 many Companies refuse to provide statistics regarding tonnage for security reasons

TABLE III

NAVAL SHIPBUILDING BY SWAN HUNTER

NEPTUNE YARD

Source: T. A. Brassey's Annual Review and Company's Own Records

Year	Name	Type	Owner
1915	Acacia	Sloop	Admiralty
1915	Anemone	Sloop	
1916	Greenwich	Naval Repair	
1915	Zinnia	Sloop	
1915	Jessamine	Sloop	
1915	Poppy	Sloop	
1915	Primula	Sloop	
1917	Eldorol	Fleet Oiler	
1917	Elmol	Fleet Oiler	
1918	Andromede	Sloop	
1917	Sweetbriar	Sloop	
1918	Tuberose	Sloop	
1918	Flying Fox	Sloop	
1918	Aro Patrick	Sloop	
1918	Rock Sand	Sloop	
1918	Cicero	Sloop	
1918	Spearmint	Sloop	
1918	Orby	Sloop	
1918	Minoru	Sloop	
1936	Abbey Dale	Fleet Oiler	
1936	Arndale	Fleet Oiler	
1940	Bull Finch	Cable Ship	
1943	Porchester Castle	Frigate	
1943	Rushen Castle	Frigate	
1944	Tunsberg Castle	Frigate	
1944	Loch Morlich	Frigate	
1944	Loch Shin	Frigate	
1945	Natal	Frigate	
1945	Derby Haven	Frigate	
1945	Woodbridge Haven	Frigate	
1944	St. Margarets	Cable Ship	
1944	Bullfrog	Cable Ship	
1945	Bullhead	Cable Ship	
1944	L.C.T. 7097		
1944	L.C.T. 7098		
1944	L.C.T. 7099		
1944	L.C.T. 7100		
Plus	Three Landing Craft		

TOTAL = 119,310 Tons Displacement.

TABLE III

NAVAL SHIPBUILDING BY SWAN HUNTER

WALLSEND YARD

Source: T. A. Brassey's Annual Review and Company's Own Records

Year	Name	Type	Displacement Tons
1909	Hope	Destroyer	780
1910	Sandfly	Destroyer	750
1913	Shark	Destroyer	935
1913	Sparrowhawk	Destroyer	935
1913	Spitfire	Destroyer	935
1913	Laertes	Destroyer	965
1913	Lysander	Destroyer	965
1914	Matchless	Destroyer	965
1915	Comus	Cruiser	3,895
1915	Marmion	Destroyer	1,000
1915	Martial	Destroyer	1,000
1916	Mary Rose	Destroyer	1,000
1916	Menace	Destroyer	1,000
1916	L43	Sub.	1,000
1916	L44	Sub.	1,200
1916	L49	Sub.	1,200
1914	Stonewall Jackson	Monitor	1,000
1915	Nessus	Destroyer	1,200
1916	Nestor	Destroyer	1,200
1916	Partridge	Destroyer	1,300
1916	Pasley	Destroyer	1,300
1916	Radstock	Destroyer	1,300
1916	Raider	Destroyer	1,300
1916	Sorceress	Destroyer	1,300
1917	Torrent	Destroyer	1,300
1917	Torrid	Destroyer	1,300
1917	Tower	Destroyer	1,300
1918	Coventry	Cruiser	4,290
1918	L5	Sub.	1,000
1917	Vimiera	Destroyer	1,200
1917	Violent	Destroyer	1,200
1918	Vittoria	Destroyer	1,200
1918	Whirlwind	Destroyer	1,200
1918	Wrestler	Destroyer	1,200
1919	L33	Sub.	1,000

NAVAL SHIPBUILDING BY SWAN HUNTER

WALLSEND YARD

Year	Name	Type	Displacement Tons
1918	Shark	Destroyer	1,000
1918	Sparrowhawk	Destroyer	1,000
1918	Splendid	Destroyer	1,200
1918	Tilbury	Destroyer	1,200
1918	Tintagel	Destroyer	1,200
1918	Sportive	Destroyer	1,200
1919	Stalwart	Destroyer	1,200
1920	Whitehall	Destroyer	1,200
1919	Whitshed	Destroyer	1,120
1919	Wildswan	Destroyer	1,120
1930	Codrington	Destroyer	1,540
1930	Folkstone	Sloop	900
1930	Scarborough	Sloop	-
1931	Brilliant	Destroyer	1,360
1931	Bulldog	Destroyer	1,360
1930	Hindustan	Sloop	-
1934	Esk	Destroyer	1,375
1934	Express	Destroyer	1,375
1935	Sydney	Cruiser	7,000
1936	Hunter	Destroyer	1,350
1936	Hyperion	Destroyer	1,350
1937	Somali	Destroyer	1,850
1938	Tartar	Destroyer	1,850
1939	Edinburgh	Cruiser	10,000
1939	Janus	Destroyer	1,690
1939	Khartoum	Destroyer	1,920
1942	Anson	Battleship	35,000
1942	Mauritius	Cruiser	8,000
1940	Hambledon	Destroyer	1,690
1940	Holderness	Destroyer	1,690
1942	Gambia	Cruiser	8,000
1940	Mendip	Escort	1,690
1940	Meynell	Escort	1,690
1941	Eridge	Escort	1,375
1941	Farndale	Escort	1,690
1941	Heythrop	Escort	-
1941	Lamerton	Escort	1,375

NAVAL SHIPBUILDING BY SWAN HUNTER

WALLSEND YARD

Year	Name	Type	Displacement Tons
1943	Newfoundland	Cruiser	8,000
1941	Exmoor	Escort	-
1941	Calpe	Escort	1,375
1942	Grove	Escort	-
1942	Hursley	Escort	-
1942	Quality	Destroyer	1,710
1942	Queenborough	Destroyer	1,710
1942	Pindus	Escort	1,375
1942	Adrias	Escort	-
1942	Melbreak	Escort	-
1942	Miaoules	Escort	-
1943	Tuscan	Destroyer	1,710
1943	Tyrian	Destroyer	1,710
1943	Vindex	Auxiliary Aircraft Carrier	-
1943	Grenville	Destroyer	1,710
1943	Ulster	Destroyer	-
1943	Vigilant	Destroyer	-
1943	Virago	Destroyer	1,710
1945	Superb	Cruiser	8,000
1945	Barfleur	Destroyer	2,315
1945	Trafalgar	Destroyer	2,315
1946	St. Kitts	Destroyer	2,315
1945	Vengeance	L.A.C.	14,000
1945	Leviathan	L.A.C.	14,000
1947	Gabbard	Destroyer	2,315
1947	Corunna	Destroyer	2,315
1946	Oudenarde	Destroyer	-
1954	Albion	Aircraft Carrier	18,300
1952	Daring	Destroyer	-
1956	Pellew	Frigate	-
1957	Russell	Frigate	-
1960	Lion	Cruiser	-
1961	Falmouth	Cruiser	-
1963	London	G.M.	-
1964	Galatea	Frigate	-
?	Norfolk	Destroyer	-

ABLE III

NAVAL SHIPBUILDING BY HAWTHORN LESLIE

AT HEBBURN

Source: T. A. Brassey's Annual Review and Company's Own Records

Year	Name	Type	Displacement Tons	Owner
1888	Kostroma	C	7,975	Russian Vol. Fleet
1889	Orel	C	7,990	Russian Vol. Fleet
1890	Grand Duke Alexis	C	2,350	Russian Vol. Fleet
1890	H.M.S. Bellona	C	-	
1891	Grand Duke Constantine	C	2,400	Russian Vol. Fleet
1894	Roumantzeff	C	760	Russian Vol. Fleet
1894	Petersburg	C	9,252	Russian Vol. Fleet
1895	Kherson	C	10,225	Russian Vol. Fleet
1895	Ranger	T	264	Admiralty
1895	Opossum	T	290	Admiralty
1895	Sunfish	T	290	Admiralty
1896	Ekaterinoslav	C	10,500	Russian Vol. Fleet
1897	Cheerful	T	300	Admiralty
1898	Mermaid	T	355	Admiralty
1899	Viper	T	363	Admiralty
1900	Greyhound	T	385	Admiralty
1900	Racehorse	T	385	Admiralty
1901	Roebuck	T	385	Admiralty
1902	Velox	T	419	Admiralty
1903	Derwent	T	534	Admiralty
1903	Eden	T	527	Admiralty
1903	Waveney	T	534	Admiralty
1904	Boyne	T	600	Admiralty
1904	Doon	T	600	Admiralty
1904	Kale	T	600	Admiralty
1907	Ghurka	T	880	Admiralty
1907	H.B.T.B. No.21	T	305	Admiralty
1908	H.B.T.B. No.22	T	307	Admiralty
1909	H.B.T.B. No.33	T	310	Admiralty
1909	H.B.T.B. No.34	T	310	Admiralty
1909	Zulu	T	1,000	Admiralty
1910	Scourge	T	925	Admiralty
1910	Nemesis	T	780	Admiralty
1910	Nereide	T	780	Admiralty
1911	Nymphe	T	780	Admiralty
1911	Jackal	T	780	Admiralty
1911	Tigress	T	780	Admiralty

NAVAL SHIPBUILDING BY HAWTHORN LESLIE

AT HEBBURN

Year	Name	Type	Displacement Tons	Owner
1913	Christopher	T	935	Admiralty
1913	Cockatrice	T	935	Admiralty
1913	Contest	T	1,089	Admiralty
1914	Mentor	T	1,189	Admiralty
1914	Mansfield	T	1,199	Admiralty
1915	Champion	C	4,657	Admiralty
1915	Marksman	F	1,853	Admiralty
1915	Talisman	T	1,199	Admiralty
1915	Termagant	T	1,202	Admiralty
1915	Trident	T	1,201	Admiralty
1916	Turbulent	T	1,201	Admiralty
1916	Pigeon	T	1,127	Admiralty
1916	Plover	T	1,131	Admiralty
1916	Sarpedon	T	1,179	Admiralty
1916	Starfish	T	1,206	Admiralty
1916	Stork	T	1,206	Admiralty
1917	Thruster	T	1,207	Admiralty
1917	Thisbe	T	1,207	Admiralty
1917	Verdun	T	1,464	Admiralty
1917	Versatile	T	1,464	Admiralty
1917	Verulam	T	1,464	Admiralty
1917	Warwick	T	1,524	Admiralty
1917	Calypso	C	4,942	Admiralty
1918	Wessex	T	1,512	Admiralty
1918	Montrose	F	1,996	Admiralty
1918	Stuart	F	1,996	Admiralty
1918	Tenedos	T	1,226	Admiralty
1918	Thanet	T	1,226	Admiralty
1919	Turbulent	T	1,226	Admiralty
1920	Thracian	T	1,226	Admiralty
1926	El Amir Farouq	C	1,444	Egypt
1927	San Juan	S	992	Argentine
1927	San Luis	S	992	Argentine
1928	Sussex	C	13,084	Admiralty
1928	Bridgewater	S	1,357	Admiralty
1928	Sandwich	S	1,361	Admiralty
1929	Active	T	1,773	Admiralty
1929	Antelope	T	1,773	Admiralty

NAVAL SHIPBUILDING BY HAWTHORN LESLIE

AT HEBBURN

Year	Name	Type	Displacement Tons	Owner
1930	Blanche	T	1,767	Admiralty
1930	Boadicea	T	1,774	Admiralty
1932	Goncalves Zarco	S	1,413	Portugal
1932	Goncalo Velho	S	1,413	Portugal
1934	Afonso de Albuquerque	S	2,434	Portugal
1934	Bartolomeu Dias	S	2,439	Portugal
1934	Electra	T	1,920	Admiralty
1934	Encounter	T	1,922	Admiralty
1934	Indus	S	1,590	India
1936	Imogen	T	1,892	Admiralty
1936	Imperial	T	1,887	Admiralty
1937	Manchester	C	9,000	Admiralty
1939	Naiad	C	5,450	Admiralty
1938	Jervis	F	1,600	Admiralty
1938	Kelly	F	1,600	Admiralty
1939	Legion	T	1,920	Admiralty
1940	Lightning	T	1,920	Admiralty
1940	Cleopatra	C	5,450	Admiralty
1940	Welshman	M	2,650	Admiralty
40/41	10 Landing Craft			Admiralty
1941	Packenham	F	-	Admiralty
1941	Pathfinder	T	-	Admiralty
1941	Slazak	H	-	Admiralty
1941	Bicester	H	-	Admiralty
1941	Quilliam	F	-	Admiralty
1942	Blean	H	-	Admiralty
1942	Quail	T	-	Admiralty
1942	Quadrant	T	-	Admiralty
1942	Diadem	C	5,770	Admiralty
1942	Savage	T	1,695	Admiralty
1942	Saumarez	F	1,695	Admiralty
1943	Apollo	M	-	Admiralty
1943	Whelp	T	1,710	Admiralty
1943	Whirlwind	T	2,880	Admiralty
1943	Armada	F	2,200	Admiralty

NAVAL SHIPBUILDING BY HAWTHORN LESLIE

AT HEBBURN

Year	Name	Type	Displacement Tons	Owner
1944	Solebay	F	2,200	Admiralty
1944	Saintes	F	2,200	Admiralty
1944	Triumph	LFC	18,300	Admiralty
1945	9 Landing Craft	-	-	Admiralty
1945	Agincourt	F	2,550	Admiralty
1945	Alamein	F	2,550	Admiralty
1955	Llandaff	Fr	2,350	Admiralty
1966	Argonaut	Fr	2,800	Admiralty

H = Hunt Class Destroyer
F = Flotilla Leader
Fr = Frigate
LFC = Light Fleet Carrier
T = Torpedo Boat Destroyer
C = Cruiser
S = Sloop
M = Minelayer

PALMERS SHIPBUILDING AND IRON COMPANY LIMITED

JARROW and HEBBURN

Source: Company's Own Records

Year	Name	Displacement Tons	H.P.
	BATTLE CRUISER		
1913	Queen Mary	27,000	75,000
	BATTLESHIPS		
1856	Terror	1,844	800
1862	Defence	6,270	2,540
1872	Cerberus	3,480	1,670
1872	Gorgon	3,480	1,670
1872	Swiftsure	6,910	4,910
1872	Triumph	6,910	4,910
1893	Resolution	14,150	13,000
1893	Revenge	14,150	13,000
1902	Russell	14,000	18,000
1908	Lord Nelson	16,500	16,750
1911	Hercules	20,000	25,000
1916	Resolution	25,750	41,000
	CRUISERS		
1885	Surprise	1,650	3,000
1885	Alacrity	1,650	3,000
1888	Orlando	5,000	8,500
1888	Undaunted	5,000	8,500
1891	Pique	3,600	9,680
1891	Rainbow	3,600	9,680
1891	Retribution	3,600	9,680
1898	Pegasus	2,135	7,000
1898	Pyramus	2,135	7,000
1905	Sapphire	3,000	9,800
1918	Dauntless	4,730	40,000
1928	York	8,400	80,000

PALMERS SHIPBUILDING AND IRON COMPANY LIMITED

JARROW and HEBBURN

Year	Name	Displacement Tons	H.P.
	MONITORS		
1915	General Wolfe	5,680	-
1915	Marshal Ney	6,770	-
1915	Marshal Soult	6,780	-
	RIVER GUNBOATS		
1875	Medina	363	410
1875	Medway	363	410
1875	Sabrina	363	410
1875	Spey	363	410
1875	Slaney	363	410
1876	Esk	363	410
1876	Tay	363	410
1876	Tees	363	410
1876	Don	363	410
1876	Dee	363	410
1876	Trent	363	410
1876	Tweed	363	410
1889	Planet (Austrian)	500	3,500
	TORPEDO BOAT DESTROYERS		
1895	Janus	252	3,790
1895	Lightning	252	3,790
1895	Porcupine	252	3,790
1897	Star	322	6,000
1897	Whiting	322	6,000
1897	Bat	322	6,000
1897	Chamois	322	6,000
1897	Crane	322	6,000
1897	Flying Fish	322	6,000
1898	Fawn	322	6,000
1898	Flint	322	6,000

PALMERS SHIPBUILDING AND IRON COMPANY LIMITED

JARROW and HEBBURN

Year	Name	Displacement Tons	H.P.
	TORPEDO BOAT DESTROYERS continued		
1899	Spiteful	322	6,000
1899	Peterel	322	6,000
1901	Myrmidon	322	6,000
1901	Kangaroo	322	6,000
1901	Syren	322	6,000
1904	Erne	560	7,000
1904	Ettrick	560	7,000
1904	Exe	560	7,000
1904	Cherwell	560	7,000
1904	Dee	560	7,000
1905	Ure	560	7,000
1905	Wear	560	7,000
1905	Swale	560	7,000
1905	Rother	560	7,000
1909	Albacore	440	8,000
1909	Bonetta	440	8,000
1910	Viking	1,050	15,500
1914	Leonidas	1,034	24,500
1914	Lucifer	1,034	24,500
1914	Murray	1,120	25,000
1915	Myngs	1,120	25,000
1916	Nonsuch	1,120	25,000
1916	Negro	1,120	25,000
1916	Norman	1,120	25,000
1916	Northesk	1,120	25,000
1916	Oriole	1,120	25,000
1916	Osiris	1,120	25,000
1917	North Star	1,120	25,000
1917	Nugent	1,120	25,000
1917	Urchin	1,120	27,000
1917	Ursa	1,120	27,000
1918	Waterhen	1,420	27,000
1918	Wryneck	1,420	27,000
1919	Steadfast	1,120	27,000
1919	Sterling	1,120	27,000
1919	Stonehenge	1,120	27,000
1920	Stormcloud	1,120	27,000

PALMERS SHIPBUILDING AND IRON COMPANY LIMITED

JARROW and HEBBURN

Year	Name	Displacement Tons	H.P.
	FIRST-CLASS TORPEDO BOATS		
1909	First-class Torpedo Boat, No. 24	300	4,000
1909	First-class Torpedo Boat, No. 35	300	4,000
1909	First-class Torpedo Boat, No. 36	300	4,000
931-33	4 Torpedo Boats	1,365	-
	TORPEDO MINERS		
1879	No. 1	104	130
1879	No. 2	104	130
1879	No. 3	104	130
1880	No. 4	104	130
1881	No. 5	104	130
1881	No. 8	104	130
1881	No. 9	104	130
1881	No. 10	104	130
1881	No. 13	104	130
1881	No. 14	104	130
	SUBMARINES		
1916	E. 39	810	-
1916	E. 40	810	-
	TROOPSHIP (Indian)		
1866	Jumna	6,050	700

NAVAL SHIPBUILDING BY VICKERS ARMSTRONG

NAVAL YARD, WALKER.

Source: Company's own Records

ear	Name	Type	Owner
915	H.M.S. Malaya	Battleship	Admiralty
916	H.M.S. Centaur	Cruiser	Admiralty
916	H.M.S. Concord	Cruiser	Admiralty
916	H.M.S. Courageous	Battle Cruiser	Admiralty
916	H.M.S. Furious	Battle Cruiser	Admiralty
916	Alexander	Ice Breaker	British (ex Russian)
918	M3	Submarine	Admiralty
919	M4	Submarine	Admiralty
918	H.M.S. Danae	Cruiser	Admiralty
917	H.M.S. Anchusa	Sloop	Admiralty
917	H.M.S. Bergamot	Sloop	Admiralty
917	H.M.S. Candytuft	Sloop	Admiralty
917	H.M.S. Ceanothus	Sloop	Admiralty
917	Train Ferry No. 1	Sloop	British
917	Train Ferry No. 2	Sloop	British
918	L52	Submarine	Admiralty
918	L53	Submarine	Admiralty
917	H.M.S. Arbutus	Sloop	Admiralty
917	H.M.S. Auricula	Sloop	Admiralty
917	H.M.S. Bryony	Sloop	Admiralty
917	H.M.S. Chrysanthemum	Sloop	Admiralty
919	L67	Submarine	Admiralty
919	L68	Submarine	Admiralty
918	H.M.S. Delhi	Cruiser	Admiralty
918	H.M.S. Dunedin	Cruiser	Admiralty
919	H.M.S. Hermes	Aircraft Carrier	Admiralty
918	N41	Submarine	Admiralty
918	N42	Submarine	Admiralty
919	N43	Submarine	Admiralty
919	N44	Submarine	Admiralty
918	R9	Submarine	Admiralty
918	R10	Submarine	Admiralty
920	H.M.S. Emerald	Cruiser	Admiralty
925	H.M.S. Nelson	Battleship	Admiralty

NAVAL SHIPBUILDING BY VICKERS ARMSTRONG

NAVAL YARD, WALKER.

ear	Name	Type	Owner
936	H.M.S. Newcastle	Cruiser	Admiralty
936	H.M.S. Hero	Destroyer	Admiralty
936	H.M.S. Hereward	Destroyer	Admiralty
936	H.M.S. Sheffield	Cruiser	Admiralty
937	H.M.S. Afridi	Destroyer	Admiralty
937	H.M.S. Cossack	Destroyer	Admiralty
937	H.M.S. Eskimo	Destroyer	Admiralty
937	H.M.S. Mashona	Destroyer	Admiralty
939	H.M.S. King George V	Battleship	Admiralty
939	H.M.S. Victorious	Aircraft Carrier	Admiralty
939	H.M.S. Nigeria	Cruiser	Admiralty
939	H.M.S. Eglinton	Fast Escort Vessel	Admiralty
940	H.M.S. Exmoor	Fast Escort Vessel	Admiralty
941	H.M.S. Uganda	Cruiser	Admiralty
940	H.M.S. Marne	Destroyer	Admiralty
940	H.M.S. Martin	Destroyer	Admiralty
940	H.M.S. Liddesdale	Fast Escort Vessel	Admiralty
940	H.M.S. Oakley	Fast Escort Vessel	Admiralty
941	H.M.S. Penn	Destroyer	Admiralty
941	H.M.S. Petard	Destroyer	Admiralty
941	H.M.S. Porcupine	Destroyer	Admiralty
941	H.M.S. Haworth	Fast Escort Vessel	Admiralty
941	H.M.S. Middleton	Fast Escort Vessel	Admiralty
941	H.M.C.S. Iroquois	Destroyer	Canadian Government
941	H.M.C.S. Athabaskan	Destroyer	Canadian Government
-	MLC 59-66	Landing Craft	Admiralty
941	H.M.S. Bleasdale	Fast Escort Vessel	Admiralty
940	T.L.C.3.	M.L. Craft	Admiralty
940	T.L.C.4.	M.L. Craft	Admiralty
941	H.M.S. Hatherleigh	Fast Escort Vessel	Admiralty
942	H.M.S. Haydon	Fast Escort Vessel	Admiralty
941	T.L.C.21.	M.L. Craft	Admiralty
941	T.L.C.22.	M.L. Craft	Admiralty

NAVAL SHIPBUILDING BY VICKERS ARMSTRONG

NAVAL YARD, WALKER.

ear	Name	Type	Owner
941	Triple Screw T.L.C.	M.L. Craft	Admiralty
941	Triple Screw T.L.C.	M.L. Craft	Admiralty
941	Triple Screw T.L.C.	M.L. Craft	Admiralty
942	H.M.C.S. Huron	Destroyer	Canadian Government
942	H.M.C.S. Haida	Destroyer	Canadian Government
942	H.M.S. Abercrombie	Monitor	Admiralty
943	H.M.S. Swiftsure	Cruiser	Admiralty
942	H.M.S. Unsparing	Submarine	Admiralty
942	H.M.S. Usurper	Submarine	Admiralty
942	H.M.S. Untamed	Submarine	Admiralty
943	H.M.S. Untiring	Submarine	Admiralty
943	H.M.S. Varangian	Submarine	Admiralty
943	H.M.S. Uther	Submarine	Admiralty
943	H.M.S. Unswerving	Submarine	Admiralty
943	H.M.S. Myngs	Destroyer	Admiralty
943	H.M.S. Zephyr	Destroyer	Admiralty
943	H.M.S. Colossus	Aircraft Carrier	Admiralty
944	H.M.S. Perseus	Aircraft Carrier	Admiralty
943	H.M.S. Vivid	Submarine	Admiralty
943	H.M.S. Voracious	Submarine	Admiralty
943	H.M.S. Vulpine	Submarine	Admiralty
944	H.M.S. Varne	Submarine	Admiralty
945	H.M.S. Hercules	Aircraft Carrier	Admiralty
944	H.M.S. Cossack	Destroyer	Admiralty
944	H.M.S. Constance	Destroyer	Admiralty
944	H.M.S. Virulent	Submarine	Admiralty
944	H.M.S. Volatile	Submarine	Admiralty
944	H.M.S. Votary	Submarine	Admiralty
944	H.M.S. Vagabond	Submarine	Admiralty
945	H.M.S. Aisas	Destroyer	Admiralty
945	H.M.S. Albuera	Destroyer	Admiralty
944	T.L.C.	Landing Craft	Admiralty

NAVAL SHIPBUILDING BY VICKERS ARMSTRONG

NAVAL YARD, WALKER.

ear	Name	Type	Owner
944	T.L.C.	Landing Craft	Admiralty
944	T.L.C.	Landing Craft	Admiralty
944	T.L.C.	Landing Craft	Admiralty
944	T.L.C.	Landing Craft	Admiralty
944	T.L.C.	Landing Craft	Admiralty
945	Transport	Ferry	Admiralty
945	Transport	Ferry	Admiralty
945	Transport	Ferry	Admiralty
945	Transport	Ferry	Admiralty
955	H.M.S. Eastbourne	Frigate	Admiralty

ABLE III

NAVAL SHIPBUILDING BY VICKERS ARMSTRONG

ELSWICK YARD

Source: Company's Own Records

ear	Name	Type	Displacement Tons	Nationality
885	Panther	Cruiser	1,541	Austrian
886	Leopard	Cruiser	1,541	Austrian
887	Dogali	Cruiser	2,050	Italian
888	Victoria	Battleship	10,810	British
886	Rattler	Gunboat	691	British
886	Wasp	Gunboat	679	British
887	Chih Yuan	Cruiser	2,317	Chinese
887	Ching Yuan	Cruiser	2,317	Chinese
887	Isla de Luzon	Cruiser	1,054	Spanish
887	Isla de Cuba	Cruiser	1,054	Spanish
889	Piemonte	Cruiser	2,597	Italian
888	Castore	Cruiser	624	Italian
888	Polluce	Cruiser	624	Italian
888	Elisabeta	Cruiser	1,331	Roumanian
891	25 de Mayo	Cruiser	3,312	Argentine
891	Catoomba	Cruiser	2,571	British
891	Mildura	Cruiser	2,571	British
891	Wallaroo	Cruiser	2,571	British
891	Boomerang	Gunboat	755	British
891	Carrakatta	Gunboat	755	British
891	Plassy	Gunboat	755	British
891	Assaye	Gunboat	755	British
891	Sirius	Cruiser	3,493	British
892	Spartan	Cruiser	3,493	British
893	9 de Julio	Cruiser	3,587	Argentine
891	Para	Launch	29	Brazilian
892	Tiradentes	Cruiser	728	Brazilian
893	Republica	Cruiser	1,260	Brazilian
893	Gustavo Sampaio	Gunboat	465	Brazilian
893	Yoshine	Cruiser	4,180	Japanese
894	Blanco Encalada	Cruiser	4,568	Chilean
894	Tatsuta	T.B.D.	920	Japanese
896	Buenos Aires	Cruiser	4,620	Argentine

NAVAL SHIPBUILDING BY VICKERS ARMSTRONG

ELSWICK YARD

ear	Name	Type	Displacement Tons	Nationality
896	Swordfish	T.B.D.	280	British
896	Spitfire	T.B.D.	280	British
895	Fei Ting	T.B.D.	350	Chinese
897	Yashima	Battleship	12,330	Japanese
896	Ministro Zenteno	Cruiser	3,437	Chilean
897	Almirante Barroso	Cruiser	3,437	Brazilian
898	Almazonas	Cruiser	3,437	Brazilian
897	Esmeralda	Armoured Cruiser	7,032	Chilean
898	O'Higgins	Armoured Cruiser	8,476	Chilean
898	Pactolus	Cruiser	2,136	British
899	Asama	Armoured Cruiser	9,700	Japanese
899	Tokiwa	Armoured Cruiser	9,700	Japanese
899	Hai Tien	Cruiser	4,514	Chinese
889	Almirante Reis	Cruiser	4,253	Portuguese
902	Capitan Thompson	T.B.D.	348	Chilean
901	Cobra	T.B.D.	348	British
899	General Baquedano	Training Ship	2,335	Chilean
900	Albany	Cruiser	3,437	American
901	Hatsuse	Battleship	14,967	Japanese
900	Idzumo	Armoured Cruiser	9,733	Japanese
901	Iwate	Cruiser	9,733	Japanese
901	Norge	Battleship	3,847	Norwegian
901	Eidsvold	Battleship	3,847	Norwegian
904	Lancaster	Armoured Cruiser	9,901	British
904	Abdul Hamid	Cruiser	3,805	Turkish
904	Swiftsure	Battleship	11,728	British
905	Hampshire	Armoured Cruiser	10,726	British
905	Amethyst	Cruiser	3,009	British
905	Adventure	Scout	2,850	British
904	Erthogroul	Yacht	896	Turkish
906	Attentive	Scout	2,850	British
907	Achilles	Armoured Cruiser	13,658	British
906	Kashima	Battleship	16,400	Japanese

NAVAL SHIPBUILDING BY VICKERS ARMSTRONG

ELSWICK YARD

ear	Name	Type	Displacement Tons	Nationality
909	Afridi	T.B.D.	795	British
909	Invincible	Battle-cruiser	17,480	British
910	Minas Geraes	Battleship	19,281	Brazilian
914	Agincourt	Battleship	27,500	British
909	Superb	Battleship	18,663	British
910	Bahia	Scout	3,100	Brazilian
910	Rio Grande do Sul	Scout	3,100	Brazilian
909	Rosario	Armoured Gunboard	1,055	Argentine
909	Parana	Gunboat	1,055	Argentine
910	Newcastle	Cruiser	4,821	British
911	Weymouth	Cruiser	5,257	British
912	Monarch	Battleship	22,645	British
913	Chao Ho	Training Ship	2,750	Chinese
915	Canada	Battleship	28,000	British
914	Birmingham	Cruiser	5,440	British

In addition to thoselisted one aircraft carrier, two coast defence vessels, and ten submarines were launched at Elswick, but completed at Walker Naval Yard.

TABLE IV

EMPLOYMENT IN SHIPBUILDING

SOURCE: CENSUS RETURNS & MINISTRY OF LABOUR STATISTICS

YEAR	ENGLAND & WALES	NORTH EAST	NEWCASTLE	SUNDERLAND	MIDDLESBROUGH
1861	43,779	9,475	-	-	-
1871	45,066	12,470	-	-	-
1881	54,080	16,878	808	4,737	657
1891	70,517	29,722	2,037	6,354	1,689
1901	86,637	45,242	3,131	8,821	2,467
1911	104,750	47,973	6,882	9,178	1,924
1921	283,443*	104,631*	-	-	-
1931	200,779*	78,262*	12,838	15,880	2,169
1951	199,938*	60,283*	6,977	10,777	107
1961	261,000*+	55,270*	-	-	-
1965	222,000*+	45,280*	-	-	-

The 1931 totals shown above include the following numbers who were out of work:

1931	82,683	48,337	6,973	11,821	1,299

* These figures include those working in marine engineering.

\+ These totals are for the U.K.

TABLE V

AVERAGE NUMBERS EMPLOYED & ANNUAL WAGE BILL

"WALLSEND SLIPWAY & ENGINEERING CO. LTD."

Year	Average number of men employed	Wages paid in the year	Average annual earnings per man
		£	£
1879	640	49,000	76. 10s.
1883	1245	108,200	89
1884	812	57,546	71
1885	854	58,676	68. 10s.
1886	846	57,930	69
1887	1033	75,154	72. 13s.
1888	1172	86,669	74
1889	1465	121,595	82. 10s.
1890	1565	128,284	82
1891-93	1264	95,070	75

from "The Story of the Wallsend Slipway and Engineering Co. Limited" by W. Boyd.

LE VI

EARNINGS OF THE BOILERMAKERS AT VARIOUS DATES

PALMER'S JARROW SHIPYARD

	Sept. 1871 60 hours		Nov. 1871 57 hours		Sept. 1882 54 hours		Dec. 1885 54 hours	
	Week	Day	Week	Day	Week	Day	Week	Day
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
ters	54. 6.	10.11.	67. 9.	13. 6.	77. 6.	15. 6.	57. 1.	13. 0.
etters	34. 5.	6.10½	35. 6.	7. 1.	51. 2.	10. 3.	37. 3.	7.10.
. Smiths	45. 9.	9. 2.	37.11.	7. 7.	84.10.	16.11.	55. 3.	11. 0.
lkers	38. 6.	7. 8½	38. 9.	7. 9.	45. 9.	11. 2.	40. 7.	8. 1.
llers	35. 7.	7. 1.	32. 0.	6. 5.	34. 0.	6. 9.	25. 8.	4. 8.

(The drillers of course were not members of the Boilermakers' Society, data was provided for comparison.)

Three reductions had preceded the figures for December 1885 from 1884.

Data from information provided by J. Price to the Royal Commission on Depression, 1886, 3rd Report p.299.

TABLE VII

WAGES AND EARNINGS IN TYNE SHIPYARDS

	(a)		(b)		(c)	
	1886		1901		1904	
	No. Men	Earned s. d.	No. Men	Earned s. d.	No. Men	Earned s. d.
Anglesmiths	8	54. 1.	7	109.	3	62. 9.
Platers	73	61. 6.	96	97. 6.	26	96. 9.
Rivetters	148	40. 8.	136	59. 0.	8	64. 9.
Caulkers	42	49. 0.	48	71. 6.	7	48. 0.
Holders-up	80	35. 0.				
Smiths	28	30. 8.	20	37.10.	21	35.11.
Smiths strikers	12	20. 3.				
A.I.S. strikers	4	26. 6.				
Platers' helpers	192	24. 8.				
Fitters	56	29. 4.	141	35.11.	189	35. 2.
Drillers	41	34.10.	75	54. 6.	16	40. 9.
Shipwrights	153	33. 1.	272	40. 6.	155	39. 0.
Ships joiners	107	30. 3.	220	39. 6.	239	38. 6.
Ships painters	44	28. 4.	40	34. 3.	74	33. 2.
Labourers	223	19. 1.				
Frame Turner Asst.						
Time Work Rates						
Rivetters	67	30. 0.	9	36. 0.	10	34. 6.
Platers	-	-	15	38. 0.	6	36. 6.
Caulkers	12	30. 0.	13	36. 0.	8	34. 6.
Holders-up	32	24. 0.				
Drillers	8	22. 6.	2	30. 0.	11	29. 0.

SOURCES (a) from the Wages Census 1886 - C.6889 quoted by Bowley & Wood p.589 Jrnl Royal Stat. Soc. 1905.

(b)(c) Information privately supplied to Bowley & Wood p.589 Journal of Royal Statistical Society 1905.

TABLE VIII

WEEKLY EARNINGS IN SHIPBUILDING & REPAIRING

SEPTEMBER 1906

	A.I. Smiths	Platers	R. Heaters	Helpers	Shipwrights
	s. d.	s. d.	s. d.	s. d.	s. d.
United Kingdom	71. 10.	71. 3.	23. 1.	30. 2.	36. 4.
TYNE, WEAR & TEES	77. 2.	82. 0.	24. 0.	30. 5.	39. 11.
Mersey & Barrow	51. 6.	56. 0.	22. 0.	30. 3.	40. 10.
South of England	45. 9.	66. 9.	21. 10.	23. 9TW	34. 9.
Clyde	67. 1.	63. 1.	22. 6.	29. 9.	37. 5.

These figures are for Smiths (general) matching figures for this class were:
Tyne etc: 55/9 Clyde: 54/9 U.K.: 53/-

	United Kingdom	Tyne etc.	Mersey & Barrow	South of England	Clyde
All men	35s.11d.	40s. 5d.	35s. 1d.	32s. 3d.	36s.1d.
No. of men covered	41,066	9,149	2,521	10,400	13,380

SHIPWRIGHTS were paid time work, all other rates are piecework and the figures for 'all men' is an average of time and piece rates.

TABLE IX

CHANGES IN THE PIECEWORK RATES FOR IRON SHIPBUILDERS ON THE TEES (1879-1892)

Decreases	%	Increases	%
Feb. 1879	7½	Nov. 1880	5
Nov. 1879	7½	Mar. 1881	5
Feb. 1884	10	Jul. 1881	5
Jun. 1884	7½	Jun. 1888	5
Jan. 1885	7½	Feb. 1889	7½
Mar. 1886	8	Nov. 1889	2½
Jan. 1892	5	Jan. 1890	5
TOTAL	53	TOTAL	35

from the answer of R. Rothwell to Q. 21,176 before the Royal Commission on Labour, 1892-4.

STATISTICS OF TRADE DISPUTES IN NORTHERN REGION AS COMPARED WITH GREAT BRITAIN 1961-1964

Industrial Group	1961				1962				1963				1964			
	A		B		A		B		A		B		A		B	
	N.R.	G.B.	N.R.	G.B.	N.R.	G.B.	N.R.	G.B.	N.R.	G.B.	N.R.	G.B.	N.R.	G.B.	N.R.	G.B.
Mining and Quarrying	54	339	67	1003	45	215	90	429	7	221	7	471	46	255	50	464
Metals and Engineering	15	40	47	213	1072	908	1107	1038	92	38	187	130	35	58	76	241
Shipbuilding and Marine Engineering	108	95	323	1452	1697	1204	2759	1716	71	59	143	439	175	105	634	669
Vehicles	74	164	135	538	1291	1002	1149	1300	4	192	70	442	72	187	355	526
Textiles and Clothing	10	6	59	16	33	9	58	31	23	5	38	16	28	8	17	24
Construction	28	32	113	189	56	35	259	140	31	44	163	220	19	15	51	73
Transport and Communications	15	35	32	137	226	176	285	244	3	23	22	42	43	146	106	182
All Industries	20	32	45	134	252	190	325	248	20	25	53	75	25	37	60	96

A = No. of Workers involved in disputes per 1,000 of Labour Force.

B = Working Days lost in disputes per 1,000 of Labour Force.

N.R. = Northern Region G.B. = Great Britain

TABLE X (continued)

	1965				1966				1967			
	A		B		A		B		A		B	
	N.R.	G.B.	N.R.	G.B.	N.R.	G.B.	N.R.	G.B.	N.R.	G.B.	N.R.	G.B.
Mining and Quarrying	14	187	17	655	12	87	28	203	4	74	10	193
Metals and Engineering	82	64	363	213	105	70	349	237	163	107	549	378
Shipbuilding & Marine Eng'g.	110	114	420	580	37	39	114	146	110	113	760	675
Vehicles	121	307	86	1,051	-	178	-	454	130	269	348	651
Textiles and Clothing	7	6	-	31	4	2	-	7	12	34	20	100
Construction	24	16	86	77	38	20	78	81	39	22	135	122
Transport and Communication	51	79	104	184	42	70	1,179	641	32	68	228	500
All Industries	28	36	91	119	21	22	133	97	32	31	118	117

A = No. of workers involved in disputes per 1,000 of labour force.
B = Working days lost in disputes per 1,000 of labour force.

N.R. = Northern Region. G.B. = Great Britain.

TABLE XI

VESSELS BUILT TO THE ORDER OF HAIN STEAMSHIP CO. LIMITED

BY JOHN READHEAD & SONS.

Hull No.	Name of Vessel	Date	Contract plus extras	Dwt.	Price per Dwt.
			£		£
363	Trevider	1902	37250	5310	7.0
364	Treloske	1902	37250	5310	7.0
365	Trevean	1902	37250	5310	7.0
366	Tregantle	1903	37250	5310	7.0
367	Trewyn	1903	37250	5310	7.0
368	Tregothnan	1903	37250	5310	7.0
375	Tregarthen	1904	26020	3620	7.2
376	Trematon	1904	26020	3620	7.2
383	Tremeadow	1905	36750	6270	5.8
384	Tremorvah	1905	36750	6270	5.8
391	Treneglos	1906	36600	6700	5.4
392	Tremayne	1906	36600	6700	5.4
398	Trelawny	1907	37250	6700	5.5
399	Trecarrell	1907	37250	6700	5.5
400	Trevinge	1907	37250	6700	5.5
408	Trelissick	1909	38800	7077	5.4
410	Treveal	1909	38800	7100	5.4
412	Treverbyn	1909	38800	7129	5.4
418	Trevorian	1911	38800	7585	5.1
419	Tregurno	1911	38800	7565	5.1
421	Trevalgan	1911	38800	7585	5.1
425	Trevanion	1912	42100	7700	5.4
429	Treglisson	1912	42142	7700	5.4
430	Trevaylor	1912	42642	7700	5.5

contd.

Hull No.	Name of Vessel	Date	Contract plus extras	Dwt.	Price per Dwt.
			£		£
431	Trevethoe	1913	42642	7700	5.5
432	Trevilley	1913	43142	7700	5.6
433	Trevider	1913	43142	7700	5.6
434	Tregathen	1913	43142	7700	5.6
442	Trewellard	1914	52545	7790	6.7
443	Trematon	1914	52545	7830	6.7
445	Trevarrack	1914	53545	7855	6.8
446	Trecarne	1915	53545	7850	6.8
447	Trehawke	1915	53545	7820	6.8
454	Trewidden	1917	80598	8000	10.0
455	Tregenna	1917	83448	8000	10.4
456	Treneglos	1918	88448	8000	11.0
457	Trevose	1918	90948	8000	11.3
458	Tregantle	1918	124886	7865	16.0
459	Treloske	1918	125156	7865	16.0
Std.Vessel 11	Trelyon	1919	160715	8210	19.6
Std.Vessel 12	Trekieve	1919	167127	8210	20.0
Std.Vessel 13	Trewyn	1919	166781	8210	20.0
462	Trevorian	1920	216822	8367	26.0
463	Trebartha	1920	220181	8387	26.3
464	Tredinnick	1921	222669	8387	26.6
469	Min	1922	191586	8450	22.7
470	Treworlas	1922	171560	8450	20.4
564	Tregenna	1949	371500	9430	39.4
565	Treothnan	1949	364810	9430	38.7
604	Trewidden	1960	1045746	10350	102.0
609	Trefusis	1961	1108430	13060	85.0
610	Trebartha	1962	1071720	13560	79.0

(Shipbuilder)

	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit
		£		£		£		£
SWAN HUNTER	Dec.1914	218,498	Dec.1915	306,083	Dec.1916	298,440	Dec.1917	316,473
VICKERS	Dec.1914	1,019,034						
ARMSTRONG WHITWORTH	Dec.1914	801,885	Dec.1915	852,349				
WILLIAM DOXFORD	Dec.1914	161,294						
S. P. AUSTIN	Dec.1914	11,968	Apr.1916	12,820	Apr.1917	17,203	Apr.1918	13,866
JOS. T. ELTRINGHAM	Dec.1914	8,198					Jun.1918	134,321
R. & W. HAWTHORN LESLIE	Jun.1915	169,726	Jun.1916	200,284	Jun.1917	181,023	Jun.1918	190,292
PALMER'S	Jun.1915	103,822	Jun.1916	33,754			Jun.1918	180,546
SMITH'S DOCK	Aug.1915	156,201	Aug.1916	177,402	Aug.1917	183,890	Aug.1918	191,483
BLYTH	Sep.1915	58,115						

Note: The figures are for net trading profits - i.e. after providing for depreciation, debenture interest and tax but before dividend payments.

(Shipbuilder)

	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit
		£		£		£		£
SWAN HUNTER	Dec.1918	374,190	Dec.1919	433,896	Dec.1920	383,356	Dec.1921	401,657
VICKERS					Dec.1920	541,260	Dec.1921	708,103
ARMSTRONG WHITWORTH	Four years Dec.1915 - Dec.1919		Dec.1919	4,053,605	Dec.1920	675,180*	Dec.1921	434,888
WILLIAM DOXFORD								
S. P. AUSTIN					Apr.1921	19,078	Apr.1922	24,509
JOS. T. ELTRINGHAM	Jun.1919	74,800	Jun.1920	88,897	Jun.1921	36,640	Jun.1922	-20,480
R. & W. HAWTHORN LESLIE	Jun.1919	197,344	Jun.1920	208,428				
PALMER'S	Jun.1919	276,406	Jun.1920	225,019	Jun.1921	85,376		
SMITH'S DOCK	Aug.1919	268,350	Aug.1920	275,583	Sep.1921	151,414	Sep.1922	62,587
BLYTH	Sep.1919	37,370			Sept.1921	29,503	Sep.1922	22,697

*Subject to profit tax

(Shipbuilder)

	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit
		£		£		£		£
SWAN HUNTER	Dec.1922	397,535	Dec.1923	384,752	Dec.1924	326,725	Dec.1925	186,816
VICKERS	Dec.1922	683,205	Dec.1923	499,556	Dec.1924	403,224		
ARMSTRONG WHITWORTH	Dec.1922	467,550	Dec.1923	436,377	Dec.1924	505,251	Dec.1925	-891,502
S.P.AUSTIN	Apr.1923	18,200	Apr.1924	-9,848	Apr.1925	-13,440	Apr.1926	-15,894
JOS. T. ELTRINGHAM	Jun.1923	-26,239						
R. & W. HAWTHORN LESLIE								
PALMER'S	Jun.1923	-109,564*			Dec.1924	-180,621*	Dec.1925	-206,946
SMITH'S DOCK	Sep.1923	-116,668	Sep.1924	23,789	Sep.1925	48,247		
BLYTH	Sep.1923	6,929	Sep.1924	-27,624				
		*2 years trading 1921-3				*18 month period		

(Shipbuilder)

	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit
		£		£		£		£
SWAN HUNTER	Dec.1926	198,782	Dec.1927	126,380	Dec.1928	168,695	Dec.1929	188,388
VICKERS	Dec.1926	562,283	Dec.1927	992,984	Dec.1928	939,902	Dec.1929	941,971
ARMSTRONG WHITWORTH	Dec.1926	-531,210**	Dec.1927	-527,953	Dec.1928	9,884		
S. P. AUSTIN	Apr.1927	-14,404	Apr.1928	-20,749	Apr.1929	-5,940	Apr.1930	5,605
R. & W. HAWTHORN LESLIE	Jun.1927	178,816*	Jun.1928	20,021	Jun.1929	26,617	Jun.1930	36,802
PALMERS	Dec.1926	-669,712	Dec.1927	10,490	Dec.1928	1,744	Dec.1929	6,596
SMITH'S DOCK	Dec.1926	48,736			Sep.1928	85,224	Sep.1929	144,153

**Before Depreciation

*Six years' operations

SHIPBUILDING FINANCE

(Shipbuilder)

	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit
		£		£		£		£
SWAN HUNTER	Dec.1930	158,293	Dec.1931	150,384	Dec.1932	34,544	Dec.1933	18,956
VICKERS	Dec.1930	775,926	Dec.1931	574,493	Dec.1932	529,038	Dec.1933	543,364
S. P. AUSTIN	Apr.1931	-6,616	Apr.1932	-11,585	Apr.1933	-6,231	Apr.1934	-6,909
R. & W. HAWTHORN LESLIE	Jun.1931	35,398	Jun.1932	14,428	Jun.1933	-1,193	Jun.1934	16,157
PALMER'S	Dec.1930	-49,802	Dec.1931	-88,868				
SMITH'S DOCK	Sep.1930	80,754	Sep.1931	-47,215	Sep.1932	-7,869	Sep.1933	-39,035

SHIPBUILDING FINANCE

(Shipbuilder)

	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit
		£		£		£		£
SWAN HUNTER	Dec.1934	96,416	Dec.1935	191,919	Dec.1936	162,583	Dec.1937	249,925
VICKERS	Dec.1934	613,261	Dec.1935	928,105	Dec.1936	1,162,610	Dec.1937	1,361,056
S. P. AUSTIN	Apr.1935	-2,610	Apr.1936	-4,138	Apr.1937	415	Apr.1938	17,300
R. & W. HAWTHORN LESLIE	Jun.1935	23,194	Jun.1936	25,648	Jun.1937	36,439	Jun.1938	77,377
SMITH'S DOCK			Sep.1935	28,982	Sep.1936	46,601	Sep.1937	-

SHIPBUILDING FINANCE

(Shipbuilder)

	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit
		£		£		£		£
SWAN HUNTER	Dec.1938	426,362	Dec.1939	490,315	Dec.1940	238,445	Dec.1941	312,568
VICKERS	Dec.1938	1,398,953	Dec.1939	1,226,871				
S. P. AUSTIN			Apr.1940	7,560	Apr.1941	5,885	Apr.1942	11,451
R. & W. HAWTHORN LESLIE	Jun.1939	160,815	Jun.1940	161,536	Jun.1941	132,271	Jun.1942	130,934
SMITH'S DOCK	Sep.1938	100,673	Sep.1939	82,697	Sep.1940	78,700	Sep.1941	36,902

SHIPBUILDING FINANCE

(Shipbuilder)

	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit
		£		£		£		£
SWAN HUNTER	Dec.1942	398,018	Dec.1943	368,744	Dec.1944	390,275	Dec.1945	434,245
VICKERS							Dec.1945	951,682
S. P. AUSTIN	Apr.1943	5,447	Apr.1944	2,235	Apr.1945	10,992	Apr.1946	9,392
R. & W. HAWTHORN LESLIE	Jun.1943	133,632	Jun.1944	130,486	Jun.1945	126,549	Jun.1946	191,298
SMITH'S DOCK	Sep.1942	42,662	Sep.1943	54,331	Sep.1944	44,766	Sep.1945	83,835

SHIPBUILDING FINANCE

(Shipbuilder)

	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit
		£		£		£		£
SWAN HUNTER	Dec.1946	502,800	Dec.1947	395,316	Dec.1948	453,957	Dec.1949	421,956
S. P. AUSTIN	Apr.1947	9,980	Apr.1948	32,584	Apr.1949	38,673	Apr.1950	43,499
R. & W. HAWTHORN LESLIE	Jun.1947	209,487	Jun.1948	177,019	Jun.1949	202,444	Jun.1950	223,795
SMITH'S DOCK	Sep.1946	156,660	Sep.1947	253,108			Sep.1949	317,451

SHIPBUILDING FINANCE

(Shipbuilder)

	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit
		£		£		£		£
SWAN HUNTER	Dec.1950	480,600	Dec.1951	573,137	Dec.1952	601,863	Dec.1953	597,640
S. P. AUSTIN	Apr.1951	57,791	Apr.1952	33,478	Apr.1953	19,981	Apr.1954	19,130
R. & W. HAWTHORN LESLIE	Jun.1951	205,689	Jun.1952	272,507	Jun.1952	275,866		
SMITH'S DOCK	Sep.1950	391,647	Sep.1951	291,016	Sep.1952	384,880	Sep.1953	389,015

SHIPBUILDING FINANCE

(Shipbuilder)

	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit	Year Ending	Net Profit
		£		£		£		£
SWAN HUNTER	Dec.1954	720,756	Dec.1955	839,959	Dec.1956	1,036,251	Dec.1957	1,482,952
AUSTIN & PICKERSGILL*	Jun.1955+	28,791	Jun.1956	29,370	Jun.1957	44,809	Jun.1958	32,349
SMITH'S DOCK	Sep.1954	278,586	Sep.1955	471,449	Sep.1956	413,313	Sep.1957	421,985
HAWTHORN LESLIE			Jun.1956	508,343	Jun.1957	521,435		

*Amalgamation of Austin & Pickersgill

+14 months trading

EPILOGUE

So far, this thesis has tried to describe and analyse North East shipbuilding only in the light of documentary evidence. There are two final questions left to consider where one must take a more subjective, impressionistic stance: why did the industry decline in the post-war period in the face of rising world demand; and what is the prospect for the future. There is clearly no definitive answer to either of these questions; the subjective approach must be the main guide.

In 1947, British shipbuilding was responsible for 57 per cent of world output (1.2 m. g.r. tons out of 2.1 m. g.r. tons). Since then, with only minor exceptions in 1954 and 1955 and 1959 and 1960, the percentage share has dropped steadily. By 1965 the U.K. share represented only 8.8 per cent of world output (1.0 m. g.r. tons out of 12.2 m. g.r. tons). *

The same trend is clearly discernible with regard to North East shipbuilding. From 22 per cent of the world's output in 1947, the region's percentage output was reduced to 3.7 in 1965. **

The percentage reduction was caused not so much by an absolute drop in output, although this did happen marginally, but rather by a big increase in world output while British production remained almost static.

In 1947 British output was 1,192,000 g.r. tons. It slowly climbed to a post-war peak of 1,473,000 g.r. tons in 1955 and then fell to a low point of 927,000 g.r. tons in 1963.θ For the North East alone, output was 474,842 in 1947, rising to a post-war peak of 688,626 g.r. tons in 1958 and falling to a low point of 440,171 g.r. tons in 1963. Meanwhile, world production increased from 2,102,000 g.r. t. in 1947 to 12,215,000 g.r.t. by 1965. In other words, world production increased sixfold over the period, while British production never increased by more than 25% and North East never increased by more than 50 per cent. In addition, both these relatively small increases were followed by setbacks so that output in 1965 was less than in 1947 while world output was six times greater. Why did Britain and the North East in particular fail to expand with the rest of the world ?

* See Appendix, Table I.

** Ibid.

θ Ibid.

One reason is that the United Kingdom had an unuaually large share of world output in 1947. As other competitors, particularly Japan and Germany, started to bid for work again, this percentage was bound to drop.

Secondly, the size of the British fleet has remained constant at about 20 m. g.r. tons.* Meanwhile, the Panamanian and Liberian fleets, "flags of convenience", have grown from 3.5 m. gross tons in 1948 to 20 m. gross tons in 1965. The Norwegian fleet has grown from 4.25 m. gross tons to 15 m. gross tons in the same period and the Japanese fleet almost exclusively home-built, has grown from 1 m. gross tons to 11 m. gross tons.

The domestic fleet must usually be the most important customer for any nation's shipbuilders. Certainly despite its high share of world output over the years, British shipbuilding in every year this century has relied on British shipping for most of its work. The highest export figures were recorded in 1930 and 1951 with 44% of output for foreign customers. As table I has shown, the average percentage of foreign work is about 20.

So clearly if British shipping was not growing, this was a handicap for British shipbuilders. It was even more of a handicap considered in relation to the growth of foreign fleets, most of them built by the domestic shipbuilding industry. For example, the total fleets of the U.S.A., France, Germany and Italy increased to about 24 m. g.r. tons between 1960 and 1965. But these countries were outshone by Japan which built up a very big fleet very quickly. By 1965 this fleet exceeded 11 m. g.r. tons and by the end of 1968 was expected to be about 17 m. g.r. tons. This growth naturally led to growth by Japanese shipbuilding companies. And this growth was reserved to domestic producers by the protection of a 15% tariff and special credits.

With this firm base, Japanese yards could tender for foreign work at extremely competitive terms and they have won a major share of the uncommitted market represented by Norway, Greece, Liberia and Panama - a market that grew at 8% a year between 1960 and 1965. In these conditions it is perhaps little surprise that Japanese output should almost double between 1964 and 1967 or that of her output in 1967 of 7.4 m. g.r. tons, 2.9 m. was for home buyers and 4.5 m. for export. **

* Shipbuilding Enquiry Committee 1965-6, Report (Cmnd.2937) p.34.

** Ibid, p.39.

The lack of growth in the British fleet compared with the rapid increase in other fleets does not wholly explain British shipbuilding's failure to expand, however. We must also look at other factors.

The immediate post-war period was a time of exhaustion and complacency. The war had drained away a lot of energy and at the same time victory had produced a feeling of euphoria. Demand for ships was high, competition among shipbuilders was almost non-existent. In this seller's market, the British industry simply postponed delivery dates with impunity or increased prices when necessary. At the same time the memories of the 1930's prevented managements from indulging in large-scale investment programmes. In short, there was a lack of urgency.

This feeling lasted too long, however. By the early 1950's Japan and Germany had rebuilt their shipbuilding industries and were ready to offer keen competition to the British. Especially in Japan, shipping and shipbuilding were chosen as two of the key industries to re-establish Japanese supremacy. The new yards were part of large groups, often practising vertical integration. Until recently, there was a ready supply of cheap labour for shipbuilding offered higher wages in Japan than most other industries yet wage costs were still well below the European level.

In addition, the new yards incorporated the latest technology. They had plenty of space, had plenty of access to water for launching, were less hemmed in on the landward side than British yards and usually operated under a different building system. Where British shipbuilding still uses launching ways the Japanese build their ships in dry docks, using a large measure of prefabrication. The British are now developing prefabrication but apart from Harland and Wolff's new dry dock at Belfast, ships are still launched into the water in this country rather than floated out.

One further factor aided the Japanese. The main growth in the post-war period has been in tankers and bulk carriers. In 1967, for example, these two types of vessel represented two thirds of the total world launches. These large but essentially simple ships eminently suited Japan's methods of production.

Furthermore, the Japanese Government has introduced numerous measures over the past 20 years to help the industry: granting funds; paying the interest on the industry's debts; reducing the price of steel.*

*   p.t.o.

For all these reasons, Japan was able to move ahead, to grow and expand. By 1967 it was responsible for 47.5 per cent of world output. The United Kingdom, on the other hand, was responsible for only 8.2 per cent. The essential reason was this country's inability to increase production because of its failure to operate efficiently and to reduce its costs. Between 1955 and 1965 the industry spent £65 m. on new investment but as the Geddes Report commented: "particular investment decisions were seldom based on a thorough assessment of benefits having regard to the market to be served." * Those yards which invested most did not necessarily become the most competitive. Too often we copied current practice in, say, Japan without realising that this represented thinking that had taken place five years previously.

Investment programmes were often undertaken without a full study of the market at which they were aimed or of the benefits that would result. In nearly every case investment was designed to increase capacity and a saving could be shown because fixed costs and overheads could be spread over bigger resources. Seldom was investment undertaken to improve plant utilisation and thereby increase productivity. This was the essential area of difference between the British and the Japanese. **

Let us now turn to the question of the future. As already shown in an earlier chapter, a committee of enquiry was set up to investigate the industry. It produced a very constructive report in March 1966, which suggested, inter alia, the reorganisation of the industry into groups. It suggested, too, that a Shipbuilding Industry Board should be set up for a limited period to supervise the reorganisation and provide finance, where necessary, to lubricate the process. ***

This reorganisation is now taking place. On the Clyde eight individual companies have formed two groups. All the companies on the Tyne and the Tees belong to one group and there are two groups on the river Wear.

The advantages are beginning to emerge. The groups are now clearly competing against foreign competition. Previously individual yards were fighting one another as well as overseas competitors. This showed itself in unnecessarily low tendering, resulting in unprofitable work. There was also a duplication of effort in the task of tendering itself.

* Cmnd. 2937, p. 23.
** Ibid. p. 81-2.
*** Ibid.

Economies of scale are becoming apparent, particularly in regard to the buying power of the companies. It is possible to gain large discounts from steel mills and component manufacturers for bulk purchase. In fact, the discounts are even larger than the most optimistic estimates had expected. *

Work can now be spread around the yards in a more logical way. It could happen in the past that one yard was solidly booked with work while another yard had very little work. In the same way, workers can be moved around from one yard to another. This leads to more efficient production and to greater security for the workers.

To the benefits of reorganisation, one can now add the power of devaluation. This has resulted in a reduction of British prices in terms of the American dollar by about six to eight per cent. Assuming that this reduction is not whittled away by wage increases or rising prices for steel and components, this will be enough to undercut Japanese prices for some years ahead. In fact, the latter are beginning to rise quite sharply as a result of wage increases.

An interesting example is the replacement market for Liberty general cargo ships. The Sunderland yard of Austin and Pickersgill has produced a model called the S.D. 14 with a deadweight capacity of 15,000 tons. The Japanese have also produced a model called "Freedom" which is about 2,000 tons smaller than the S.D. 14. Until devaluation the price for the Japanese or Sunderland ships was about the same. Today the Sunderland ship is between £90,000 and £100,000 cheaper than its Japanese competitor. As a result the yard has increased its orders from 18 to 30 this year while the Japanese order book has stuck at 47 for 18 months.**

Two other financial considerations must be taken into account. Credit terms available in this country for either British or foreign buyers are now as good as any in the world. They amount to 80 per cent of the cost with 5 per cent interest repayable over tenyears. Secondly, the industry is almost wholly concentrated in development areas and thus benefits from the considerable grants that are available for new buildings or equipment. It also benefits from the Selective Employment Tax premium and the Regional Employment premium. These are two sets of grants payable for each employee. Together they are worth to a company £90 a year per employee. In addition training and retraining grants are available.

* Sir John Hunter, Chairman, Swan Hunter Group, in conversation with the author.

** Mr. K. Douglas, Managing Director, in conversation with the author.

Finally, in our attempt to consider the future of North East shipbuilding, let us take a detailed look at labour relations.

We have already seen in the previous chapter that there was a marked decline in the number of man hours lost through industrial disputes between 1960 and 1966. The figure rose again in 1967 primarily because of the Government's incomes policy rather than because of a deteriorating relationship between management and men. *

Disputes, however, are not a satisfactory touchstone of labour relations. They measure only one extreme. We must therefore turn again to impressions. Let us look, first of all, at the experience of the Furness yard at Haverton Hill near Middlesbrough.

In March 1968 the Furness Shipbuilding Company, which had been in existence since 1917 and was part of the Sears Holding Group, announced that it was to close at the end of 1968 when existing contracts were completed. The reason given was an inability to secure further profitable work.

One might have expected that the morale of the men would sink to zero, that they would demonstrate, perhaps even go on strike. In fact, nothing of the kind occurred. The last three ships were completed on or before schedule. As a result the men qualified for bonus payments.

Part of the high spirits must be attributed to the management's policy of trying to place the men in other work. Men were allowed to go off for interviews during the company's time and Ministry of Employment and Productivity teams were regularly in the yard advising the men of other opportunities. Between March and September 1968 the total labour force shrank from 3,000 to 2,000.

Why were relations so amicable ? One reason was the management policy outlined above. But more important, the men felt that a high standard of workmanship and timekeeping would force the Ministry of Technology to consider every possibility of keeping the yard open.

* Ministry of Labour regional industrial disputes statistics.

The upsurge in orders during the summer provided the opportunity for Swan Hunter and Tyne Shipbuilders to acquire the yard. The sum was £2.5 m., of which £1.5 m. was to be in cash (with the help of a Ministry grant of £1 m) and the rest in shares. Swan Hunter and Tyne Shipbuilders was able to put £24 m. worth of orders into the yard immediately.

At a conference to announce the above arrangements, Mr. Anthony Wedgewood Benn, the Minister of Technology, declared that it was the calm, sensible attitude of the men that had provided the greatest stimulus to finding a solution to the Furness problem when at many times the prospects for the yard had looked extremely bleak.

Another specific example of improving labour relations was the shipyard charter signed on the river Tyne in October 1968. This charter standardised working practices throughout the five yards on the river now that they were part of the same group. The document covered such points as overtime, disputes procedures, timekeeping and double shift working. One of the interesting features of the way the document was drawn up was that, besides management and union representatives, each meeting was attended by two shop stewards from each yard, in an attempt to bring the feelings of the men to bear on the problems in hand. *

Another example was the negotiations that went on for most of 1968 between the Boilermakers Society, which controls platers, welders, caulkers and burners, shipwrights and virtually all structural workers, and Swan Hunter and Tyne Shipbuilders on new rates of pay for more flexible operating practices. The Boilermakers Society was prepared to offer much greater flexibility and to some extent even interchangeability between men doing different jobs. Flexibility, in particular, would considerably cut production times and prevent workmen hanging around for colleagues to do small jobs for them. **

In return, the union wanted higher wages and a simpler wages structure. There were, for instance, 30 different rates of pay for platers in one yard alone. The proposal was to institute three or four pay grades for all the boilermakers. Agreement between union and management officials had been reached, when these words were written. The next task was for union officials to sell the package to their members.***

* See the author's article in the Financial Times, 10th Sept. 1968

** Ibid.

*** Ibid.

The effects of better labour relations, devaluation reorganisation and other factors are now beginning to show through. In the first six months of 1968 British shipbuilders booked slightly more than a million tons worth of orders. In the second half of the year, the rising momentum seems to be continuing and total new orders for the year in excess of two million tons seem a distinct possibility. At the end of September 1968 the industry had a total order book of £570 m.

There are thus numerous signs indicating a renewed vigour in the industry. Some close observers are prepared to say that the shipbuilding industry is now in a stronger position than it has been in at any time since before the war. At first sight, such claims may look exaggerated but the main basis for making them is that the industry is truly more efficient than it has ever been, that grouping is beginning to provide real strength, that shipyard management is demonstrably more professional, and that the unions are taking a more positive role.

These of course are impressions. Japan has a huge lead which it will not be easy to pull back. But one should remember that the chief deficiency in British shipbuilding in recent years has been in the structure of the industry. Technically, the British product has always been as good as any in the world. As regards price, the product is on a par with or actually undercuts the main competitor nations. It was in production costs and to a lesser extent production methods that the main trouble lay. The indications are that those deficiencies are being corrected.

Given a continuing high level of world demand, there now seems no reason why British shipbuilding should not experience a period of growth and of profitability. It seems equally likely that the North East coast will provide most of the leadership. The movement towards amalgamation has gone further than anywhere else. Industrial relations are noticeably more amicable. Many of Britain's past shipbuilding successes - new models, changes in techniques - were inspired in the region. Together with the Clyde, it is the main shipbuilding district in the country. Regional and national prosperity are therefore closely interwoven. Both should now experience a big change for the better.

End

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