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SHIPS AND SEAMEN

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# SHIPS & SEAMEN

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"ADMIRAL RAWSON," etc.



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## CHAPTER I

### THE RISE OF STEAM

ON a summer's afternoon in the month of July, 1843, there was much excitement in the ancient seaport of Bristol. The city was gay with flags, and crowds lined the streets leading to the waterside where a large concourse had assembled to witness the launching of the iron screw steamer, *Great Britain*, by the Prince Consort.

A public holiday had been proclaimed, and there was disappointment when, the ship having been duly launched, it was found that the dock gates through which she was to pass were too small to allow her exit. She remained imprisoned behind them until the tedious process of widening them was completed, but finally on December 12 of that year the *Great Britain* passed through, on her way to Blackwall Docks, London, to be fitted out and completed for service.

The launching of this vessel was a notable occasion in the history of modern shipping,



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for she was the first large iron ocean-going steamer to be fitted with a screw propeller. When it became known that she was to be constructed at Bristol by the celebrated engineer, Isambard Kingdom Brunel, there was a general outcry against such a foolhardy innovation, particularly when it was rumoured that she was intended for the Atlantic trade. Iron ships, it was said, were not wanted in the Atlantic trade. Shipbuilders refused to tender for the proposed vessel; gloomy fears were expressed regarding her fate if she were ever built, and it was only after some delay that a Bristol builder, Patterson, was prevailed upon to undertake the task.

But after-events showed that the faith of her designer, I. K. Brunel, in his vessel was amply justified. She marked indeed a notable stage in the evolution of shipbuilding; she was an epoch-making vessel; perhaps the most remarkable ship ever built, for she was the first ocean-going screw steamer, the first successful and profitable iron screw steamer. She was, in fact, the original of all modern steamers, in the sense that she was the first of the type.

The *Great Britain* was of 3,500 tons. She was 322 feet long and, in addition to her screw-propeller, she was fitted with six masts

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to carry sails. Her engines had cylinders 80 inches in diameter with a six-foot stroke, turning a propeller which was 15 feet in diameter with a 25-foot pitch. The crank shaft was hollow and a stream of water circulated through it to cool the bearings. It had at first been intended that she should be a paddle steamer, but Brunel prevailed on her owners to fit a screw, and his foresight and courage in this respect contributed later to the maritime prestige of his country.

The *Great Britain* proved to be a wonderful ship. Shortly after she was placed in service she stranded on the Irish coast and remained there throughout the winter gales, but she received so little damage from this severe test that the incident only served to prove—once and for all—that iron hulls were superior to timber. Though launched in 1843 she survived as a serviceable hulk in the Falkland Islands until 1934.

The *Great Britain* was not only the largest ship of her time, but she was the largest steamer also. Forty years before, Symington had shown with his *Charlotte Dundas* that the steam-propelled vessel could be made a commercial success. This notable vessel, fitted with a stern paddle, had successfully towed barges on canals, but the wash from

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her paddle damaged the banks, and despite the initial success the project was abandoned, and the *Charlotte Dundas* laid up, out of commission. There Fulton saw her and, realizing the possibilities of steam navigation, went back to the United States and built the *Clermont*.

The experimental engine which Symington made was fitted in a small double-hulled pleasure skiff which was tested on Dalswinton Lake, near Dumfries, in October, 1788. It was an auspicious occasion in the history of steamship development, but thirteen years passed before Symington, under the auspices and with the assistance of Lord Dundas, produced the first practical steamboat, the celebrated *Charlotte*. The *Charlotte Dundas* made the *Great Britain* possible in the same way that the *Great Britain* pointed the way to the modern Atlantic liner. It was, too, the *Charlotte* which in all probability spurred on Fulton to emulate and surpass her with the *Clermont* in 1807, and led Henry Bell to the production of the *Comet* five years later, thus establishing successful steam navigation on the waters of the world. Symington never reaped the harvest of his pioneer work. He died in poverty and obscurity, but he lived to see the *Rob Roy* built at Glasgow, the

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first sea-trading steamer in the world ; the City of Dublin Steam Packet Company and the General Steam Navigation Company established ; and the *Enterprise* make the first steam passage to India. It has been said that all the vast concourse of shipping which throngs the ports and waterways to-day is the product of Symington's fertile inventiveness, and that the giant Cunarder, now building (1934), is a lineal descendant of the *Charlotte Dundas*. But with the Scotsman must also be associated the name of the American, Robert Fulton. Though not the first to apply steam to navigation, he was the first to apply it successfully, with the *Clermont*.

The *Clermont* was the first really successful steamboat and by her many voyages up and down the Hudson River proved conclusively that the steamer had come to stay. In 1812, ten years after the *Charlotte Dundas*, Bell in Scotland built the *Comet* with two paddles on each side, and she successfully plied up and down the Clyde. In 1817 there was a marked advance when the *Caledonia* crossed the North Sea to Rotterdam, and by the following year there were steamers on rivers, cross-channel services, and in the coasting trade. But the voyages were short and limited and there were constant troubles

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with boilers and machinery. In 1821 the first iron steamboat was launched, but it was not until seventeen years later that the first iron steamboat crossed the Atlantic and even so the passage was made under sail.

Then came Brunel with the *Great Britain*—the climax of all these happenings.

The launch of the *Great Britain* coincided with the advent of fundamental changes in the world's shipping. There was the transition from sail to steam, from timber-built hulls to iron hulls, from paddles to screw propellers. In addition, there was a vast expansion in overseas exploration, settlement and trade, bringing improved methods of sea transport, and there was also beginning an era of invention, mechanical ingenuity, industrial activity and enquiry which contributed to bring about a change so fundamental as to have been termed "revolutionary."

One of the most significant of the transitions was the change from timber to iron hulls. From the dawn of time mankind had employed wood in the building of ships. The history of wooden ships was almost the history of civilization, and the newfangled idea that ships should henceforth be built of metal instead of timber was regarded with so much disfavour that even the Admiralty

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scoffed. Iron ships would not float ; they would be torn to pieces by the effects of shot and shell ; the world had done very well with wooden ships—why make a change ? As for Britain, her pre-eminence at sea had been built up on her Hearts of Oak, for that timber during a thousand years had been found, by experience, to be the best for shipbuilding. Any suggestion to abandon this ancient and tried practice could only be fraught with danger to the nation.

So strong was the opposition that even after iron ships had proved their superiority the change from wood to iron proceeded gradually.

The first iron vessel was classed at Lloyd's Registry in 1837—the year in which Queen Victoria came to the throne—but right down to the end of the century wooden shipbuilding was in progress. As late as 1893 a wooden full-rigged ship was launched at Phippsburgh, Maine, and during the Great War a large number of timber hulls was launched to meet the emergency of the times.

Almost from the outset iron showed its superiority to wood. Ships constructed of iron proved even at the beginning to have many advantages. Timber was becoming

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scarce and expensive ; it was calculated that 80 acres of oak forest was required to supply the timber for a three-decker ; an iron vessel has a smaller displacement than a wooden one ; there was consequently greater cargo space and earning capacity ; timber-built ships were limited, by stresses and strains, and by the size of the oak tree, to a maximum length ; they were subject to hogging and sagging ; in 1790 the largest ship in the world, the French *Commerce de Marseille*, was only 211 feet long and she was notoriously of flimsy build ; iron ships were fire-resisting ; and finally, the example of the *Great Britain* had shown that an iron ship could survive, without appreciable damage, the severe test of being stranded on a rock-bound coast throughout an entire winter, in circumstances which would have destroyed any wooden vessel.

In these early days the paddle steamer had held the field, but with the introduction of the screw it was found that the paddle had its shortcomings and disadvantages. In rough water, such as might be expected on ocean voyages, the paddles and paddle-boxes were liable to be severely damaged ; the paddle wheels necessitated a disproportionate beam and took up valuable cargo space ;

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the screw propeller was more economical in fuel consumption and it gave greater driving power. Furthermore, paddles were of little use to warships since they could be damaged by enemy gunfire and occupied valuable gun-space, but the screw-propeller made the steam warship possible.

The superiority of the screw over the paddle was finally settled in 1845, when the *Rattler* (screw) and the *Alecto* (paddler) were fastened, stern to stern. In the tug-of-war that ensued the *Rattler* "walked away" with the paddler, towing her at the rate of 2 miles an hour, though her engines were going full speed ahead.

The great and rapid improvements in the marine engine, the finer lines of the iron hull and various improvements in other directions brought increased speeds and larger ships, but even so progress was moderate right up to the middle of the century.

In 1853 the *Himalaya*, square-rigged on three masts, was the largest screw steamer afloat, though she was of only 3,550 tons and her length but 374 feet.

Though the steamer was rapidly coming to the forefront in the world's shipping, its rise was accompanied by a corresponding



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renewal of activity in those very sailing ships which were so shortly to be driven from the sea.

Nearly a century has passed since the superiority of the screw-propeller over all other forms of propulsion was proved, and meanwhile the crude marine engine of Watt and other pioneers has passed through all its stages, from the single cylinder to the quadruple-expansion engine, the turbine, and the Diesel. But the sailing ship held its own through all these changes, and it was not until the Great War that it finally passed out of existence. As late as 1905 great fleets of ships were to be seen in any large seaport, and even to-day a few Scandinavian deep-sea sailing ships pick up a precarious livelihood in waters where their predecessors once held sovereign sway.

Such was the success of the iron hull when introduced that it might have been expected that it would enjoy the same long and undisputed sway as the timber hulls which it superseded.

In point of fact, iron for shipbuilding went out of fashion within a very few years of its first introduction. It had superseded timber. Now in its turn it was to be displaced by a new metal—steel. The advantages of iron

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over timber have already been referred to. It was soon found that steel had equal advantages over iron, but though the remarkable achievements of Sir Henry Bessemer in the manufacture of steel were announced as early as 1856, it was not until nearly a quarter of a century later that the era of steel shipbuilding set in, owing to the difficulty experienced in the earlier stages in obtaining sufficient supplies.

Steel offered advantages in every direction over iron as a shipbuilding material, except in respect of durability. It had greater tensile strength; it was ductile and malleable; it was uniform in quality; and it was so much lighter than iron that there was an average saving of weight of about 15 per cent. This latter was an important factor, since it enabled the shipowner to save money on his fuel bill, to carry more cargo and to have a larger vessel at the same cost.

The only advantage that iron had over steel was that an iron ship had far greater durability, but in recent years even this is no longer an advantage since the modern steamer is not expected or desired to have a life of more than about twenty-five years. At the end of that period she has become out of date and unprofitable, and the conse-

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quence is that extreme durability is no longer a factor of any consequence from the shipowner's point of view.

Before passing on, attention should be drawn to one other type of shipbuilding much in vogue in the middle of last century. This was the composite-built ship, in which only the frames and beams were of iron, the planking being bolted on to them. The advantages of this type of construction were that the heavy weight of the massive timber frames and beams was avoided, that repairs were easily made to one or other part of the hull which might be damaged, and that the composite type of vessel seemed to lend itself to speed, since most of the fast sailing ships of the time were of this construction. The planking was usually of teakwood, five to six inches in thickness, bolted to the iron frames with bolts of Muntz metal upon which salt water had little or no effect.

Teakwood is practically the only timber which is not injured by contact with iron, its natural oil seeming to act as a preservative, while the acid in oak corrodes iron with which it is in contact. To keep the ships' bottoms clean they were "coppered," a safeguard which also preserved the vessel's underwater timbers from the ravages of the

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teredo and other worm. As recently as 1930 it was found undesirable to allow Captain Scott's Antarctic ship *Discovery* to lie up in Sydney Harbour, since she is a wooden unsheathed vessel, and Sydney is notorious as a place where the teredo has done considerable damage to wooden hulls in the past.

The major changes in shipping which occurred in the 'thirties of last century included not only improvements in shipbuilding, but also in their propelling machinery.

Even with her primitive machinery the *Great Britain* showed that large steamships could traverse the oceans of the world by steam-power alone, though it was evident that great advances would be necessary in marine engineering before steamers became general and profitable in ordinary trades.

At first the engine was run at a fairly low speed, gearing being fitted to give the propeller shaft the number of required revolutions, but this was in the earlier stages, and gradually the compound engine was introduced, followed by direct-acting vertical engines with one high- and one low-pressure cylinder. Improvements in boilers led to the boiler pressure being raised to 42 pounds per square inch in 1854, and still higher

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pressures resulted in the development of triple-expansion engines which were next duplicated to drive twin screws.

The period from 1880 down to the end of the century was marked by important developments and improvements in the reciprocating engine which had now been adapted for quadruple expansion. Marine engineers were largely concerned with obtaining an increased speed per indicated horse-power, diminished fuel consumption, reductions in the weight of the machinery, with corresponding lessening of vibration and fewer engine-room personnel.

Quadruple expansion was adopted for engines of high power, scientific methods of balancing were employed, improved qualities of steel and bronze evolved, forced lubrication fitted, and increased rates of revolution of the screw-propeller attained. In the stokehold there were corresponding improvements such as superheating for boilers, accelerated combustion by forced draught and by induced draught.

To save weight and to enable steam to be raised more rapidly in an emergency, water-tube boilers were adopted in the Navy. In general, by the end of the century, naval architecture and marine engineering had

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made such great advances that there were no comparisons with the epoch of seventy years before. Then, the reciprocating steam engine was a novelty, viewed with distrust and suspicion, and employed only as an auxiliary or a substitute for sail-power. The *Great Britain* with a speed of 12 knots and of 3,500 tons was the wonder of her time, but the close of the century witnessed the magnificent spectacle of the great British and German liners, *Lucania*, *Campania*, *Oceanic*, *Kaiser Wilhelm der Grosse*, *Deutschland* and *Kronprinz Wilhelm*, all over 20,000 tons and all with reciprocating engines, setting a speed across the Atlantic of over 23 knots in a desperate race for the Blue Riband of the Atlantic.

But though the wonderful quadruple-expansion reciprocating engine had been brought, in these great liners, to the highest standard of perfection, the quiet and patient researches of one whose genius was destined to revolutionize the whole conception of engineering had resulted in the appearance of a small vessel no larger than a launch, whose astonishing speed and efficiency inaugurated a new era in ship propulsion.

In 1898 the *Turbinia*, only 100 feet in length, was equipped with a marine steam

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turbine, the invention of the Hon. Charles Parsons. She drew but three feet of water and her displacement was less than 50 tons, but her three turbines gave her a horse-power exceeding 2,000 and a speed of nearly 33 knots. Although this tiny vessel was purely an experiment, so great was the success of the turbine as invented by Parsons that extraordinary developments followed almost immediately.

Within four years of the successful trials of the *Turbinia*, the British Government had made an agreement with the Cunard Company under which two vessels of 25 knots speed and of 32,000 tons displacement were to be built for mail and passenger service across the Atlantic, and were to be available for the use of the Admiralty in time of war. They were to be supplied with Parsons's turbines of 70,000 horse-power, driving four screws.

Thus, within this short period, the inventor had the satisfaction of seeing his turbine adopted for the largest, fastest and most magnificent ships ever built.

The two vessels at once justified his faith in his turbines, and at once regained for Great Britain the Atlantic record which the German ships had held uninterruptedly for

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ten years. Both vessels maintained very high speeds and steadily improved their records, the *Mauretania* holding the Atlantic record for twenty years, until her speed was finally eclipsed by the German fliers, *Europa* and *Bremen*.

The advent of the turbine in the large liners was followed a few years later by a yet more significant development in marine engineering, due chiefly to the patient researches of a German scientist, Dr. Rudolf Diesel, whose name will always be associated with the successful development of the internal combustion engine. As early as 1892 he had taken out a patent for his ideas, and throughout the next two decades he was continuously engaged in improving and extending his engines. The first significant success of the Diesel engine at sea came with the motor vessel *Selandia* in 1912. She was a vessel of 5,000 tons with twin screw propellers, each shaft being driven by an eight-cylinder four-stroke cycle engine, the total brake horse-power being 2,450 at 140 revolutions per minute, giving her a speed of 12 knots.

Diesel lived long enough to see this striking vindication of his twenty years' work, but in September, 1913, he fell overboard from



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a steamer in the North Sea and was never seen again.

The war interrupted the progress of the Diesel engine to a certain extent, though in the German submarines it was brought to a high pitch of efficiency, but thereafter the increasing use of oil fuel and the rapid advances in marine engineering of all kinds resulted in immense progress in internal combustion engines at sea. Twelve years after the *Selandia* had made her maiden voyage, the *Aorangi* of 18,000 tons was similarly equipped, and in the following year the then largest motor ship in the world, the Italian *Augustus*, of 33,000 tons, was launched. The possibilities of this type of engine appear to be unlimited and it is specially suited for installation in the growing fleets of oil tankers, which have long uninterrupted runs, and can obtain their oil fuel cheaply from the same source as their cargoes.

Although not required, it is interesting to note that in deference to uninstructed public opinion shipowners invariably equip their passenger motor ships with funnels.

A further development in marine engineering has been the turbo-electric drive which met with great favour in the United States. In recent years electric drive has been adopted

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for many large liners and has been found entirely satisfactory. There is an absence of vibration, the electric drive is itself noiseless, there is no racing of the propellers, and maintenance costs are low. The *California* (20,000 tons), the *Viceroy of India*, *Strathnaver*, and *Strathaird*, and the new Cunarder, are examples of large ships equipped with this form of main propulsion.

Meantime, higher boiler pressures and higher temperatures, increased efficiency in fuel combustion and in steam generation, are being sought by marine engineers whose aim it is to supply shipowners with means to carry a larger tonnage of cargo at a higher speed on the same fuel bill. Fuel consumption varies approximately with the cube of the speed of the engine, and whereas 8 hundredweight of coal per hour will give a ship a speed of 10 knots, over  $3\frac{1}{2}$  tons is required to drive the same ship at 20 knots.

The increasing use of oil fuel and its higher cost compared with coal has forced shipowners to adopt every economy in fuel consumption.

Oil fuel has great advantages over coal. Combustion can be properly regulated, the boilers can be forced, there is no dust or ash, a fewer number of men is required in

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the stokehold, less bunker space is required, there is a greater evaporative power than with coal, and bunkering is quick, clean and easy. A notable example of the reduction in the number of stokers is shown by the fact that when the liner *Aquitania* was converted from coal to oil burning, her engine-room personnel was reduced from 320 to 42.

On the other hand, Britain, though she commands extensive coal deposits, is placed at a disadvantage in the matter of oil supplies. There is an increased risk of leakage and fire from oil (though spontaneous combustion in some coal cargoes is notorious), while the contamination of harbours and watering-places by waste oil fuel discharged from ships has become an acute if minor nuisance.

The remarkable increase of motor-ship tonnage in recent years has been a major phenomenon in the world's shipping. In 1923 the world gross tonnage of motor ships was 1,315,931 tons ; in 1930 it had risen to 7,783,539 tons.

The burning of pulverized fuel under boilers in ships is still in its infancy, though encouraging results have been attained, and it is probable that complete technical success will be obtained in the future ; but

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meanwhile oil is the fuel of the present and there is no immediate prospect of it being displaced.

Despite the enormous and indeed revolutionary changes in marine engineering which have taken place in the past thirty years, there is apparent a conservative element in shipowners of all countries which causes them to be reluctant to abandon old ideas in favour of new. In some modern liners the carefully balanced triple-expansion engine has been installed—a remarkable tribute to the system which had its slow development and growth during the nineteenth century. The improved reciprocating engine is, indeed, still the standard beloved of engineers throughout the world. Reliable, economical, efficient—it is the engine with which the present generation of engineers has grown up. It has a glorious record and still maintains its place in the struggle which has been precipitated by the claims of its rivals—the turbine, the internal combustion engine, and the electric drive.

Concurrently with these changes, there is proceeding a great change in the size and speed of ships. It was thought that when liners of 40,000 and 50,000 tons had been built that the limit had been reached, for

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docks and quays could no longer accommodate them.

But nowadays docks are subordinated to ships, and as the ships grow larger so, too, are docks enlarged or specially constructed to receive the new leviathans. Rivers and estuaries are dredged to enable the deeper-draft vessels to enter and leave them ; the Suez Canal is constantly being dredged, deepened and widened to allow the passage through of bigger and yet bigger ships. Finally we have the spectacle of the world's present Wonder Super-ship—the new Cunarder of 70,000 tons with a speed which is believed to be 30 knots.

She is the direct descendant of that old hulk which, until recently, lay at her last moorings in the Falkland Islands. The measure of the difference between the two ships is the measure of the progress which has been made in less than a century. The *Great Britain* was the wonder ship of her time ; the new Cunarder is of hers. It has been a century of expansion, but there are not wanting signs that that era of expansion is coming to an end. What the future holds in the sphere of ships and shipping is wrapped in the uncertainty which envelops all the future. At the launch of the *Great Britain* on that

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summer's afternoon in July, 1843, there were few who could have visualized what the future held. It would be equally futile for us to prophesy what the next ninety years will bring forth.

## CHAPTER II

### THE GREAT DAYS OF SAIL

AFTER the survey of the modern developments of shipping it is desirable in this chapter, before passing on to the other aspects of the modern industry, to recall the era of sail and to understand the foundations on which shipping of to-day has been built.

Down to the beginning of the present century the sailing ship continued to be a not inconsiderable factor in the world's carrying trade, but now a new generation has arisen which regards the old sailing ship with disdain. Nevertheless, she had certain qualities which demand recognition. She bred a school of seamen whose skill, endurance, and courage have no parallel in modern times, and who were masters of an art and a craft which have now almost disappeared. It was the seamen of the seventeenth, eighteenth, and nineteenth centuries who made possible that vast expansion of Western civilization which was the result of their long and arduous

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voyages, and those voyages were made in ships which were dependent on, and at the mercy of, wind and wave. They were handled and navigated with a skill and knowledge which is now almost a lost art, and though they were probably larger and less clumsy than the three small vessels which formed the flotilla of Columbus, they were in essentials the same as the craft in which he ventured across the Atlantic.

The sixteenth century opened a great era of maritime expansion and overseas exploitation in which many seafaring nations took part. A Portuguese, Magellan, led the way across the Pacific, and this small nation was in the van and held the lead for many years, until finally ousted—like all other nations—by England. It was the Portuguese, in fact, who led the way to India, followed by England. Spain for a period dominated the Western Ocean; while the Dutch were renowned for their courage, skill and hardihood, and may be said, with the voyages of Tasman, to have closed the great age of exploration. French seamen and navigators shed lustre on their country, Bougainville being the first French navigator to sail round the world. America, in those days known as the New World, was soon to compete success-



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fully in the world's maritime trade and produce the finest and fastest of all ships—the celebrated Yankee clippers.

It has been the custom to assume that in the great days of sail England was pre-eminent in ship design and construction. The truth is that other nations were equally skilled, often produced better and faster ships, and bred seamen who were in no whit inferior to their English rivals.

In the Napoleonic period English designers and naval architects copied captured French ships, and the English vessels were admittedly inferior to the French and later to the American. Furthermore, the English timber policy was so faulty that it was only by extraordinary efforts that sufficient timber was finally secured to fit enough ships for sea to secure the victory at Trafalgar. The French ships carried heavier guns which could be fought in weather which obliged the English ships to keep their gunports closed.

In seamanship the Dutch sailors had no superiors ; in merchant-ship design the American clipper was far ahead of the English ships, and in some respects this pre-eminence of other nations has survived even to this day. At the beginning of the present century Germany produced a very large type of

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steel, square-rigged sailing ship which made passages round the Horn in the teeth of the worst weather, being driven as ships had seldom been driven before. Among them were the *Preussen*, *Placilla* and *Potosi*, great steel five-masted barques engaged in the South American nitrate trade, whose strength and massiveness defied the worst Cape Horn gales. In modern battleship design, Colonel Cuniberti is now generally acknowledged to have originated the Dreadnought all-big-gun ship, while the superiority of the German ships at the Battle of Jutland was acknowledged by the British commander-in-chief.

Nevertheless, throughout a period extending from 1630 to 1830 of the great days of sail, England was foremost in the tremendous developments which were taking place in exploration, exploitation of trade, and the expansion of maritime commercial enterprises.

Foremost in the era under review was the Honourable East India Company. This powerful corporation is said to have been founded by Queen Elizabeth, acting on the advice of Drake, and on the information obtained by him on his voyage round the world, and from papers which he had captured from a Spanish galleon. Certainly it owed its origin to the Spanish Armada and

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for over two centuries, until its end in 1834, it represented the main effort of England to capture and dominate Eastern trade. The history of the Company is the history of the British in India. The East Indiamen, as they were termed, were famous in their day. Their route lay round the Cape of Good Hope and they found their path disputed first by the Portuguese and then by the Dutch. The ships were fine big lumbering vessels, built of oak or of teak, and combined the qualities of a man-o'-war, a cargo ship and a passenger vessel. They were the connecting-link between the medieval fleets and the modern clipper ships and were built not so much for speed, but rather for carrying capacity, strength and offensive power. They were conducted on lines of naval discipline and routine ; and they were heavily armed and well equipped for long voyages which often occupied three or more years. They carried on their trading ventures in the teeth of armed opposition from Continental enemies. Thus, while concerned with their lawful occasions, they had often to fight their way.

The Eastern trade was lucrative. A new commodity, tea, was coming into fashion among Western nations ; muslins, calicoes,

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silks, camphor, spices and other Eastern produce formed rich homeward cargoes, and owing to the monopoly of trade which the Company enjoyed handsome profits were made.

The ships were maintained much as men-o'-war, but leisurely passages were made. At night-time the upper sails were furled and masts and lower yards were housed with a view to making "all snug for the night." Every officer was allowed certain perquisites and a free issue of wine. Officers and crew both wore the Honourable Company's uniform and no laxity was permitted on board. Owners, captains and officers enjoyed the rich proceeds of the voyages, and the monopoly gave them complete control of what was then the richest trade in the world.

In times of peace the large yards on the Thames were chiefly engaged in building ships for the Company, which were very solidly constructed and equal to small ships of the line. Expense was no object, and the builders often outbid the Navy Board for the choicest timbers. On several occasions the Admiralty ordered the Company to reduce the size of timber used in its ships, and in 1771 it was ordered to suspend the building of ships altogether. A few years later

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Gabriel Snodgrass, master builder for the Company, suggested that the Navy should build ships of the line that would answer equally well in times of peace and could be rented to the Company, thus saving an immense amount of oak timber. The Company was the chief rival of the Navy in securing the best. His suggestion was not adopted. It is interesting to note that many years later the British and German Admiralties adopted a plan of subsidizing fast merchant liners which could be adapted for naval purposes in time of war.

The size of oaks limited the size of ships, and throughout her history England, owing to a lack of any definite timber policy, was handicapped by the scarcity of suitable timber for her ships, though she possessed the finest oak groves and forests in Europe. But instead of being carefully conserved and nurtured, her timber preserves were ruthlessly decimated. On several occasions she was forced to import inferior timbers for her shipbuilding simply because of the supineness and indifference of those in authority. The most successful attempt to relieve the timber shortage, upon which depended the fate of the greatest maritime nation in the world, came from the use of teak. For generations

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English oak had been regarded as the finest ship timber available, but the scarcity of oak and the discovery that teak was as good, if not better for the purpose, came at a critical time. England armed dozens of ships built of Indian teak between 1795 and 1800, and it is claimed that had it not been for these vessels, her control of Indian waters could not have been maintained.

Most of the King's ships were built at the Royal dockyards, but in time of war it was customary to allot to private builders much of the construction and repairing work. The largest and most important yards were on the Thames, and here the great East Indiamen were built, chiefly at Blackwall, which, in the Napoleonic period, came under the ownership of Messrs. Wigram & Green, the most celebrated English builders of their time.

The first ships built on the Blackwall stocks were all East Indiamen, but when the yard came under the control of Wigram & Green this enterprising firm not only began building a new type of vessel, but embarked in the shipping trade itself. The famous Blackwall frigates succeeded the lumbering East Indiamen, differing from them in almost every particular. But they resembled their

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predecessors in being built of oak or teak ; they still carried the stern windows and quarter galleries of the previous century and they had no sheer. They were faster than the old East Indiamen, though they were not "frigates" in the naval sense at all, but purely merchant trading ships. They did not wait for full holds but sailed on an advertised day, and were "positively despatched with strict punctuality," as their advertisements had it. Once clear of the harbour they cracked on all sail with the single object of making as speedy a passage as possible. They were the first ships to supply the demand for that speed which the shipping world was beginning to demand. Steamers were not yet established on the ocean, nor had they yet won the confidence of passengers and shippers. The new traders speeded up the trade ; their power was supplied by nature, free of charge ; their cargo space was not limited by the requirements of engines, boilers and coal, and there were no vexing delays or dangers owing to the breakdown of the "newfangled" machinery as yet in its embryonic stage.

But the Blackwall frigates were soon to be outspeeded and outsailed by a rival from across the Atlantic. The first of the Black-

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wall ships had been the precursor of a new type of vessel, faster and better suited to the trading conditions of the times—the first of the American clippers which established new standards of speed and fast passages. These new “clippers,” as they were called, out-sailed the Blackwallers which had no sheer, were bluff in the bows and were short.

The American clippers were very sharp in the bow with the greatest beam well aft, and had fine under-water lines. They had a greatly increased length in proportion to their beam ; they were heavily masted and sparred, and carried an enormous area of cotton canvas. They were manned by officers and men who knew their business and who drove them as ships had never been driven before. The fame of these smart ships was soon noised abroad. Their captains' names became a household word and are still remembered in story and in song. The hardships and cruelties which were allegedly practised on board, the defiant spirit which drove on the ships when prudence demanded a shortening of sail, the astonishing passages which they made, and the general atmosphere of “ Buck-o-brazeness ” which characterized ships and crews inspired awe and terror. “ The clipper and the spirit which drove her was typical



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of *Young America*," and that spirit was an audacious challenge to all other maritime nations. It was accepted by the owners and designers of the Blackwall frigates, who are said to have secretly obtained the draft of the lines of one of the fastest of the clippers, the *Oriental*, when she was lying in dry dock at Blackwall. With the help of these lines, the *Challenger* was built in response to the American ship *Challenge*. The *Challenger* was the forerunner of that great and magnificent fleet of British clipper ships which succeeded the American clippers and which marked, in the great days of sail, a period when the sailing ship reached its highest development. The increasing trade with China and the East provided a scope for these fine fleets, and the finding of gold in California and Australia, with the consequent rush of emigrants to these new lands, the huge increase in the passenger and emigrant trade and the rapidity with which new markets were being opened out in all parts of the world, gave tremendous and indeed unlimited scope for employment of the sailing fleets in this, their greatest and most profitable period, which lasted from 1837 to 1877.

It was during these years that the record celebrated passages were made which have

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been the object of so much interest and research. Chief among them were the fast passages of the China tea clippers, *Taeping*, *Serica*, *Ariel* and *Sir Lancelot*, designed to carry comparatively small cargoes of tea with the utmost despatch. Their composite construction gave them strength ; their fine lines and sail plan gave them speed and they were beautifully tight and dry. In all the oceans, during this period, record passages were being made by these fast-sailing clippers, which in favourable circumstances sometimes overhauled and passed even steamers.

On the England-Australia run the composite-built *Thermopylae* in 1868-9 made the record passage from London to Melbourne of 60 days ; on the homeward run from Australia the wooden ship *Lightning* (American clipper) sailed from Melbourne to Liverpool in 63 days ; the *Alnwick Castle* ran from the Channel to Calcutta in 67 days ; the *Ariel* to China in 80 days ; while in 1854 the American clipper *James Baines* crossed the Atlantic from Boston to Liverpool in 12 days 6 hours. In the Pacific, the American ship *Swordship* sailed from San Francisco to Shanghai in 32 days. The fastest day's run ever made by a sailing ship is usually credited to the American-built *Lightning*, when cross-

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ing from Boston to Liverpool on her maiden voyage. On March 1, 1854, this ship, in a strong gale, covered 436 miles in 24 hours, her speed at times exceeding 18 knots. Another American vessel, the *Great Republic*, when on a passage from New York to San Francisco, is said to have averaged 19 knots for 19 hours.

There was great rivalry to make these fast passages and the feats of the various shipmasters in driving their ships and taking advantage of every favourable breeze were made known in the newspapers, which took a keen interest in record passages and communicated that interest to the public. Passengers, who had themselves taken part in these stirring races, went on shore at the end of the voyage to noise abroad the name and fame of their respective ships.

In the old days ships had lumbered slowly along on their voyages ; their hulls were not designed for speed, nor were their sail plans. Foreign waters were incompletely or imperfectly charted, and shipmasters preferred to proceed under easy sail as soon as darkness fell, or to heave-to for the night. But with the advance of exploration and marine surveys, improvements in hull design and sail plans, and the increased demand for speed,

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ocean passages were speeded up until they reached their climax during the period under review.

Yet, while faster and yet faster passages were being made, and while the clipper ship passed from one triumph to another, new and unsuspected forces were at work which were destined ultimately to undermine the whole foundation on which this ancient maritime trade had been built up. The clippers reached their prime in the 'seventies. It was at this time also that the opening of the Suez Canal and the slow but now assured progress of the steamship made certain the decline and eventual disappearance of the sailing ship. For at the very time when, in the pride of their maturity, sailing ships and their crews referred contemptuously to the new "smoke stacks" and the newfangled steamboats, these much-derided vessels had already sealed the fate of their proud predecessors. Only two generations were to pass and the men of the steamers were to look with equal contempt on the windjammers.

In the 'seventies the steamer was becoming every day more reliable and more efficient; an immense amount of capital had been profitably sunk in a hundred new steamer lines; and finally the opening of the Suez

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canal had deprived the Cape route to the East of any value that it might have possessed.

The day of the windjammer was at hand—but not yet. She still maintained a precarious hold on special trades and she was very cheap to run. Her initial cost was far less than that of a steamer, nor did she require a large complement of engineers and stokers. In special circumstances she acted as a floating warehouse, when the market was unprofitable or quick despatch was not necessary or desired; and for certain cargoes in bulk, such as coal, wheat, wool, nitrate, etc., on long passages she was both economical and suitable. The consequence was that, despite the overwhelming increase in steam tonnage in the last quarter of the century, the sailing ship still managed to eke out a hard livelihood at sea. Timber gave place to iron, and iron to steel, and steel sailing ships of larger tonnage than ever before were placed in service. The regulations of various maritime countries demanded experience in sail of all aspirants for officers' certificates, and down to this day a "square-rigged" certificate is an essential qualification for certain appointments. In 1905 record passages were still being made and recorded, and even after the

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Great War there was a large number of sailing ships still engaged in profitable trade, but few now sail the high seas. The sail era seems to have definitely ended.

## CHAPTER III

### THE HEROIC AGE—JAMES COOK

THERE is something notable in the fact that in the course of a thousand years the two greatest figures in England's sea history should have emerged at the same time and should have been contemporaries.

From the days of King Alfred no greater names in English sea lore are to be found than those of Nelson and of Cook. In the classic phrase of Mahan, "It is the appointed lot of some of History's chosen few to come upon the scene at a moment when a great tendency is nearing its crisis and culmination."

Such was the lot of Nelson and of James Cook. The times at which these two great men accomplished their life's work were critical times for England. The hour brings the man, and it was a fortunate hour for England that brought Nelson and Cook upon the scene. On the one hand, the ambitions of Napoleon threatened the gravest danger to England. On the other, the centuries which had elapsed

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since Columbus, Magellan and others had lifted the veil on the unknown spaces of the world had borne fruit. The acquisitive and imperial ideas of the nations were fully aroused and the opening of the eighteenth century marked the beginning of that period when new lands and new seas were discovered, surveyed and acquired. In this spacious age, England was fortunate in possessing two great seamen. One gave her the supremacy of the seas ; the other gave her a hundred New Lands.

Each in his own domain was supreme ; each was a master of his art ; the world had produced no more terrible fighter than Nelson. As navigator, explorer and surveyor, the peerless Cook was unrivalled. In the words of Froude : " He was self-taught, self-directed ; with no impulse but what was beating in his own royal heart he went out across unknown seas, discovering and colonising, and graved out the channels, paving them at last with his bones, through which the commerce and enterprise has flowed out all over the world."

It is not to be supposed that men of genius perform their great deeds by the possession of that God-given gift alone. To the natural gifts must be added another quality—that of long and arduous preparation. If genius be



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an infinite capacity for taking pains, both Nelson and Cook had it in large measure.

“By degrees,” wrote Nelson, “I became a good pilot and confident of myself among rocks and sands which has many times since been of the greatest comfort to me. . . . I prided myself I could navigate her (a four-oared cutter—his first command) better than any other boat in the ship . . . nothing less than a distant voyage could satisfy my desire for maritime knowledge. . . . I made myself a complete pilot for all the passages. . . .”

All this at a time when the young seaman was still a mere boy.

Cook himself spent a decade in surveying the St. Lawrence and the shores of Newfoundland, before his abilities attracted the attention of the Admiralty.

In those stormy, ice-swept waters, during ten long years he was slowly perfecting himself in the art of marine surveying, and no harder testing ground could be found in any portion of the globe over which he was afterwards to roam.

It is notable also that both Nelson and Cook performed their great feats before the sciences of war and of peace had been “redacted into strict rules and certain observations.” Yet each had such perfect know-

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ledge of them that "all those who since their time have laboured have made use of them as of absolutely perfect masters in the knowledge of all things." So that to-day the classic actions of Nelson and the charts and sailing directions of Cook remain the standards from which all enquiry springs.

James Cook joined the Navy three years before Nelson was born. He was then twenty-seven and had already spent ten years as a deck-hand, and as mate in North Sea colliers, and in the Baltic trade. It would be difficult to conceive of greater hardships and privations than those suffered by the crews of these vessels in the eighteenth century. Such a life made or broke those whom necessity compelled to adopt it. The misery and discomfort of the brigs themselves, the severity of the winter gales, the appalling conditions of the trade, and the ceaseless hardship of the life, were such as to produce a breed of seamen who contributed in no small measure to the greatness of our island story. Only the fittest survived—and among them James Cook, who, by virtue of his position as mate, had part in the rough-and-ready navigation of the vessels, and thus picked up a rudimentary knowledge of the art in which he afterwards excelled.

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It was during this period, in his early formative years, that he laid the foundation of the wide technical knowledge and skill which in later years served his innate genius so well. For Cook was not only a born sailor—he was a trained and experienced seaman when, at the late age of twenty-seven, he volunteered for the Navy, to avoid being pressed, and first set foot upon the deck of one of His Majesty's ships. It was soon clear that among the rough and untutored men who surrounded him his talents and character would not long escape notice, and within four years the coal brig's ex-mate was made Master of the *Mercury*, destined for Wolfe's force, then engaged in the siege of Quebec.

The term "Master" is one which is held in high esteem in the merchant service. It has long disappeared from the Navy List, but in the days of Cook the master was primarily the navigator of the ship. He wore no prescribed uniform; he had a warrant but not a commission; his position in the naval hierarchy was junior to the youngest lieutenant, but he was the man who handled the ship, manœuvred, piloted and navigated her. Years later, when Cook himself had reached the rank of commander, he generously praised the master of his own ship, *Resolution*.

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“The charts,” he wrote, “are partly constructed from my own observations and partly from Mr. Gilbert’s, my master, whose judgment and assiduity in this, as well as in every other branch of his profession, is exceeded by none.”

And now began that second decade of preparation and readiness for the three great voyages which he was subsequently to make. For ten years, from 1759 to 1769, Cook was engaged practically continuously in survey work on the North American coast. The estuary of the St. Lawrence, the coasts of Newfoundland and of Labrador, and much of the mainland littoral, were surveyed and charted by him. These waters are scarcely less inhospitable than those of the North Sea and the Baltic in winter, and it was in this hard school that Cook perfected his art and trained himself for the great work of his life.

His charts and sailing directions were published and “have maintained even to this day a singular reputation for exact accuracy,” and the charts he made are the basis of those still in use. He had now achieved a considerable reputation as a surveyor, and when in 1768 an expedition was projected to the South Seas to observe the Transit of Venus,

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Cook was selected by the Admiralty for the command.

May 25, 1768, was an eventful day in his life. On that day he passed from the ranks of warrant officers and received a commission as lieutenant and the command of his own ship, the *Endeavour* bark. True, she was but an old collier taken from the Whitby coal trade in which he had served his apprenticeship to the sea, but he had himself selected her, confident that she was the best type of vessel for the purpose.

Cook was now a lieutenant in command ; he was about to set forth on a long voyage of observation and discovery during which he would be in supreme control and untrammelled by the orders of his superiors ; he was admirably equipped both by nature and by his special training for the task before him. The third and final decade of his career lay before him ; his name was soon to be on all men's lips and his fame as an explorer and navigator was to spread round the world.

There are striking similarities in the lives of both Nelson and James Cook. Nelson himself was an experienced pilot, surveyor and boat sailor. Cook distinguished himself in several occasions when in action with the

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enemy. Each died at the zenith of his fame ; each appeared upon the scene when the genius of each had its fullest scope ; each asserted the supremacy of England on the sea ; each was distinguished for the extraordinary skill with which the health and well-being of their crews was guarded, and each served a long and arduous apprenticeship. Nelson won three great victories, Cook made three great voyages ; one met his death at the hands of an unknown Frenchman—the other was slain by an obscure savage ; and finally, each was a genius in his particular field, a past-master of his art.

But there the likeness between them ends, for whereas the one was pre-eminent in the art of war, Cook excelled in the arts of peace. When Cook lay dying on the beach at Karakakoa, Nelson was just beginning his career. Nelson sprang from a distinguished and aristocratic family ; Cook came from the humblest of homes. Cook's greatest work was performed in the Pacific and Southern Oceans whose broad spaces Nelson's keels never furrowed. Cook was scantily rewarded for his services, if at all, Nelson was the recipient of the highest honours ; Cook was still a lieutenant at forty-three, Nelson was a captain at nineteen ; Cook's married life was

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one of unalloyed happiness, Nelson's domestic affairs were the tragedy of his life ; Cook was a man of peace, Nelson a "terrible fighter."

But both were intensely devout, and the journals of each are filled with references to a Divine Providence of whose continued presence both these great seamen were always consciously aware.

To his natural genius for exploration Cook added an almost boyish enthusiasm for adventure.

"I had ambition," he said, "to go further than anyone had been before, as far indeed as it was possible for man to go." He sailed ever onwards, over the edges of vast new horizons ; twice he encompassed the world ; for forty years, scarcely without a break, he was continuously at sea ; he was the first to cross the Antarctic Circle, the first to discover Antarctic Land ; he penetrated farther towards the South Pole than any of his predecessors ; and he went farther North than any before him.

He discovered, charted and took possession for England of vast new territories, innumerable islands and archipelagos ; he hoisted the British flag wherever he landed, he "marked red on the map" the great bulk of

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British possessions in the Pacific and Southern Oceans, and he accomplished all this in ships which were dependent on sail-power only and in the face of almost insuperable difficulties and dangers.

But there is this paradox in the lifework of the great explorer—that his chief discovery was not the existence of some great continent, but of its non-existence.

“ He proceeded calmly and systematically to wipe out of the map of the South Pacific, as he had already wiped out of the South Indian Ocean, every line of that imaginary continent of de Quiros. Proceeding to Australia del Espiritu Santos, which had been so gloriously annexed to Spain, Cook and the *Resolution* resolved the dazzling continent into a small unhealthy archipelago inhabited by the most hopeless savages.” (H. R. Mill, *Siege of the South Pole*.)

So much for the fancies of his predecessor, de Quiros, and for the glories of Spain. But prior to this sweeping gesture Cook had already made safe for England the real “ great continent of the South.”

Others before him—long years before he was born—had approached the shores of Australia, and the main outlines of the western and southern coast-line had already



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been crudely etched in by the Dutch navigators and by others. But it was reserved for Cook to discover the eastern shore, to fill in the immense gap, to survey and chart 3,000 miles of coast, and to take possession of this vast area in the name of England.

It was about half-past six o'clock on the morning of April 19, 1770, that the officer of the watch (Lieut. Zachary Hicks) was pacing the poop. In that latitude and at that season the sun rises at about half-past six, bearing about S.  $76^{\circ}$  E. The *Endeavour's* bows were headed north-west and the rays of the rising sun were thus on the starboard quarter, astern of Hicks, falling on the purplish misty outline which lay before him.

For nineteen days the *Endeavour* had been at sea, after making her departure from Cape Farewell in New Zealand. Three days earlier a land bird had perched in the rigging, from which Cook surmised he was approaching the coast. He sounded, but though the lead fell to 120 fathoms, there was no bottom at that depth.

As Zachary Hicks, officer of the watch, gazed from the poop he saw clearly defined before him the land! Raising its bold contour above the coast-line, about a mile and a half inland, was a hill nearly a thousand feet

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high. Excitedly Hicks stepped to the companionway leading down to the Captain's quarters.

Cook was asleep in his bunk. He was roused by Hicks's voice, and jumping out he hastily ascended the stairway.

His eye eagerly follows Hicks's outstretched hand and there before him, in the soft light of the newly risen sun, lay the coast of New Holland, the great Southern continent indeed! It was yet a great way off, "some four or five leagues," and extended as far as the eye could see.

To the west lay the waters which had already been sailed over by his Dutch predecessors. The Australian Bight was known, Van Diemen's Land was known, but to the north and east lay the Unknown. Cook tacked ship and steered north-east, mindful of his ambition to "go further than anyone had been before."

The tale of the next four months is one of difficulties and dangers triumphantly overcome in the course of which he followed and explored the whole of the Eastern coast from south to north. "I am confident," he wrote in just pride, "that it was never seen or visited by any European before us. . . . I now hoisted English colours and in the name

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of His Majesty took possession of the whole Eastern coast."

In the course of the passage up the coast Cook stumbled unwittingly on the immense and far-reaching Barrier Reef, the most remarkable phenomenon of its kind in the world.

"It was the most dangerous navigation that ever perhaps ship was in," he wrote feelingly to the Secretary of the Admiralty, but in his usual modest style, he added: "Although the discoveries made in this voyage are not great, I flatter myself that they are such as may merit the attention of their Lordships," and he concluded with the remarkable statement: "I have not lost one man by sickness during the whole voyage."

Two years, nine months and fourteen days after he had sailed Cook at length arrived back in English waters. But poor Hicks, the first lieutenant, was never to see England again. While still in African waters the young officer, the first white man ever to set eyes on the "coast of New Holland," sickened and died. The seeds of tuberculosis were in him when he sailed. Cook buried him at sea, but his name remains on the charts and in the sailing directions of to-day, affixed to the

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point which he sighted for the first time on the morning of April 19.

The success of this first expedition encouraged the Government to prepare another. Cook received one step in promotion, the only reward the Government ever bestowed on him for an achievement which would have been adequately rewarded by a knighthood and advancement to post rank. But he received the command of the new expedition, sufficient testimony to the regard in which he was held by the Admiralty.

He sailed from England on his second voyage on July 13, 1772, with two ships, *Resolution* and *Adventure*. He was despatched primarily to investigate the vague statements of de Quiros regarding a "continent" in the South Pacific, which he had dignified with the magnificent appellation "Australia del Espiritu Santos." Cook in his prosaic and more exact way stated in his report to the Admiralty:

"We continued our route for Terra del Espirette Santo of Quiros (the New Hebrides), which we made the 16 July, 1774. I found this land to be composed of a large group of isles . . . the exploration of them furnishing all I had intended to do within the tropics."

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“If I have failed in discovering this continent,” he wrote later, “it is because it does not exist in a navigable sea and not for want of looking after.”

And he concludes his account of this first and greatest Antarctic voyage thus : “It doth not become me to say how far the principal objects of our voyage have been attained . . . but without claiming any merit but of attention to my duty I can conclude with the observation of our having discovered the possibility of preserving health among a numerous ship’s company, for such a length of time, in such vagaries of climate and amid such continued hardships and fatigues as will make this voyage remarkable . . . when the disputes about a southern continent shall have ceased to engage the attention and to divide the judgment of philosophers.”

The truth is that Cook was the first to wage war successfully against scurvy. Not once or twice, but thrice he made protracted voyages without a sign of its appearance among his crew. In spite of this extraordinary success, other expeditions which followed his, down even to our own day, have been marred by this scourge. Cook took the most stringent measures to preserve his crews in health ; he flogged them into obedience to

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his decrees and fought the ignorance and incredulity of his "Tarry Breeks" with every weapon that the naval discipline of the time permitted. There was cause for this severity since the *Resolution*, which was only of 462 tons, carried no fewer than 112 persons on board in addition to a large quantity of live stock and equipment for the voyage. She and her consort were indeed greatly overcrowded according to our modern standard and laws. They were at sea for very long periods, the supply of provisions was not of the best quality and lime juice as an anti-scorbutic was then unknown. Cook took more pride in his healthy crews than in his discoveries and set an example to his successors which none ever followed with greater success.

And now began his third and last voyage in search of the North-West Passage, from the Pacific to the Atlantic. His voyage to the north was preceded by lengthy and protracted passages via the Cape, New Zealand, the Pacific Ocean and the Sandwich Islands (now discovered), from whence Cook stood away to the North-West to the shores of New Albion in the vicinity of Vancouver. From here he pushed north in search of the passage round the north coast of the Ameri-

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can mainland. But he advanced no farther than Icy Cape in latitude 71 degrees.

Some commentators have noted his want of success in pushing farther on into the ice, but the circumstances make it plain that Cook had gone "as far indeed as it was possible for man to go." His ship was now nearly 800 days out from England; her bottom was very foul and she was leaking and much strained; facing him was the ice, a compact wall, twelve feet high; farther north it appeared much higher; he tried for over a fortnight to push through; he was short of wood and water; there was no comfortable harbour for his ship; he was in shoal water on a lee shore; the main body of the ice was driving down upon him, and the ice was too close and in too large pieces to attempt forcing the ship through.

"The season," he wrote, "was so far advanced that I did not think it consistent with prudence to make any further attempt, but my thought was how I should spend the winter, to be in a condition to return to the north in further search of a passage the ensuing summer."

These are the conclusions of a wise, intrepid and experienced commander, and show Cook's judgment at its best. With this

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intention he sailed for the Sandwich Islands on October 26 and a month later arrived in sight of the islands where he was to meet his death.

The scene of the final tragedy and the events which led up to it have been narrated in detail by Cook's faithful lieutenant, Molesworth Phillips, Royal Marines.

By the irony of fate, Cook, the Man of Peace, met his end through an act of war. The great navigator who had laboured for the benefit of savage and uncivilized peoples met his death at their hands. He who had always set an example of forbearance and goodwill was, in this final tragedy, the immediate author of his own fate. He acted under great provocation; it was only an apparent impossibility which prevented this determined man from imposing his will at the last moment on the savages around him, and it was a tactical error which was primarily responsible for his death. He permitted himself to be surrounded by several hundred hostile islanders with a guard of only nine marines. Such a force was insufficient, and in the upshot the party was surrounded and had to fight their way to the boats. "They made a general attack," wrote Phillips. "The captain called out: 'Take to the boats.'"



## SHIPS AND SEAMEN

It was his last order. So long as he faced the islanders none dared to offer him violence, but turning round to shout to the boat's crew, he was stabbed in the back and fell with his face in the water.

Perhaps at this dreadful moment, the climax of his life, the culmination of all his adventures, when he was about to set out for

that undiscovered country from whose bourn  
No traveller returns,

the thoughts of the dying man had time to fly back across the years.

If, in the moment of death, our thoughts take wing, what a grand panorama flitted before Cook's eyes!

The haberdasher's shop in Staithes, his first ship, the *True Love*, the Heights of Quebec, the first sight of New Holland, the Arctic, the Antarctic, the Tropics, the Antipodes. All these had yielded up their secrets to him whose earthly voyages were now ended on this sandy beach in the far Pacific.

The spot is "for ever England." It may be seen by the curious traveller to-day, marked by a bronze plate which is under water except at low tide.

The body of the man whom England would surely have laid in the Abbey was

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given over to the knives and spears of those barbarians whose existence he had first made known to the world.

Thus perished James Cook, Captain R.N., F.R.S. Of himself he modestly wrote: "I have not natural or acquired abilities for writing. I have been, I may say, constantly at sea from my youth; and have dragged myself (with the assistance of a few good friends) through all the stations belonging to a seaman, from apprentice boy to commander." This was his own modest estimate of himself and his gifts, but a more worthy epitaph has been pronounced over him in later years.

He was, indeed, "one of the most celebrated navigators that this or former ages can boast of." But he was more than that. In the words of Dr. H. R. Mill he was "the greatest of British maritime explorers, the one man who alone could be compared with Columbus and Magellan."

## CHAPTER IV

### SAILING DIRECTIONS

IN the vast bulk of the literature of the sea, Sailing Directions have an important place, not to be confused with Sailing Orders. These latter are still couched and issued in the old-time phrasing, opening with the stereotyped sentence : " Being in all respects ready for service, you are hereby required and directed to proceed."

Sailing Directions contain advices how to proceed, and supplement the charts. In the seventy-four volumes issued by the Admiralty will be found the "principal navigations, voyages, traffics and discoveries of the English (and other) nations made by sea or overland to the remote and farthest distant quarters of the earth." They are indeed the technical compilations of those traffics and discoveries from which Hakluyt and others have drawn the romance.

Sailing Directions—or to give them their other title, Pilots—are designed to afford the

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seaman a "compleat guide" to every sea, anchorage and port on the face of the earth, forming a kind of Encyclopædia Nautica. The series of volumes covers the whole globe, from China to Peru, from Arctic to Antarctic, from England to the Antipodes. Here indeed is the whole issue. The vast mass of information recorded in these volumes which contain some 25,000 pages and some 10,000,000 words comprises the accumulated knowledge and sea lore of many generations of English seamen, explorers and freebooters, surveyors and buccaneers, navigators, missionaries and traders.

The Sailing Directions are a common pool into which has been poured the entire nautical knowledge of all men. Here is an immense reservoir of sea lore, accurate and precise, which embraces the earth's highways and byways, the ocean lanes, the roads and the harbours where seamen fain would be.

There is here detailed account "of all the Kingdoms, Lands and Lordships that are in the world," of winds and currents, of hidden dangers,

of antres vast and deserts idle,  
Rough quarries, rocks and hills whose heads touch  
Heaven,

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Of cannibals that each other eat,  
The Anthropophagi, and men whose heads  
Do grow beneath their shoulders,

of busy marts, of remote islets.

Of perilous seas, in faery lands forlorn.

There are no flowery periods, however, in these sedate, even severe, volumes. The Admiralty does not encourage airy flights of imagination in the Sailing Directions. Their compilers have kept strictly to business, but even so the reader may light upon some passages suggesting the mystery and perils of the sea.

For the sea still has its mysteries and its perils as those who run may read; though longitudes are not now based on lunars but on wireless time signals, and though the mariner be guided not by coal beacons but by million-candle-power lights, revolving in their mercury baths. Yet to-day, as of yore, there are directions for sailing-ship passages, though these are seldom thumbed in the great cabin aft, as previous generations of English seamen thumbed them.

The fables of the past have yielded to the precise facts of to-day. The old-time tales and wonders of returned travellers, the lands and seas "incognita," the heavenly cherubims blowing forth from puffed cheeks the

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prevailing wind have gone, and in their places are the standardized lettering and the cold phrasing of the modern chart.

Nevertheless, the modern navigator owes a debt to his forerunners. All this knowledge and accumulated experience so freely placed at his disposal—at ten shillings per volume—represents the price of Admiralty, the agony and bloody sweat of twenty generations of seamen.

In their hey-day Spain, Portugal, Holland and France competed with the English for the maritime supremacy of the world. Trade followed the flag and each nation tried to keep secret her discoveries. Spain forbade the publication of her navigators' maps; the Dutch East India Company's parchment charts were jealously guarded; sailing orders were marked "Secret"; the French held Flinders and his charts a prisoner for years, and there was, in short, a disposition for each nation to regard its maritime knowledge as a State secret which it would not share.

But the Book of Knowledge could not thus be kept closed, and by the beginning of the eighteenth century the numerous and increasing voyages of navigators who over-ran the oceans brought in such an immense volume of new material that Sailing Direc-

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tions and charts became more and more complete, and publishers vied with each other in their eagerness to print them.

The world's sea lanes became tolerably well known. Those round the Cape and round the Horn were familiar. The Indian Seas, the North American waters, the Spanish Main, the East Indies and China Seas were beginning to be laid down on charts more or less accurately, but there still remained great areas waiting for the nation which should first seize the opportunity to explore and to colonize.

At this juncture the old-time methods and ideas of navigation were being displaced by the new, the period of vague conjecture as to landfalls, and guessing at longitudes, came to an end. The new regime was marked by the general adoption of the sextant invented by the Englishman, Hadley, by the introduction of the marine chronometer, invented by the Englishman, Harrison, and by the eventual appearance upon the scene of a great navigator, the Englishman, James Cook.

It was fortunate for England that there still remained a vast expanse awaiting the coming of Cook. He found full scope for his genius. He wiped off the map the

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legendary "Great Southern Continent"; he filled in with great accuracy the coast-lines of Australia and New Zealand, hitherto incomplete sprawls on the charts; he explored, surveyed and charted vast regions of the Pacific; he circumnavigated the Antarctic Continent, crossing the Antarctic Circle for the first time in history; and he performed these feats in circumstances which have made him a living hero in the eyes of every English seaman from that day to this. Cook was not only a great seaman, but a hydrographer who was pre-eminent in his time. His work placed England in the van, and so accurately was it carried out that in the Sailing Directions current to-day one may still read in their Prefatory Notes acknowledgments to him.

The lead thus taken by England in the surveys of seas, the compilation of charts and Sailing Directions, and the improvement of navigation, has never been surrendered. Ten ships and a company of a thousand men are to-day prosecuting the work which has continued for three centuries.

"Finis" can never be written to the exploration of the sea. For even when the whole water surface of the globe has been explored and delineated—and this original



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work is still in its infancy—surveys will continue. Beneath its surface the sea conceals from man, as it has concealed from the dawn of time, a whole world. “ Unlike the earth it cannot be subjugated at any cost of patience and toil.” Slowly and painfully man seeks to learn what lies below, and the Sailing Directions and charts reveal all that he has learned—a fraction of what remains.

The early and fragmentary knowledge of old is being reduced to scientific form, exact data. Exact—but not always exact enough. The secrets of the great Tidal motions are still unprobed; the ocean currents are broadly defined but not accurately charted; geodesy, meteorology, and cognate matters, still offer a virgin field; many areas have been only partially examined; the charting of thousands of miles of coast-line remains to be perfected, and on charts in current use one may still read such signs as “ PD ” (position doubtful) or even “ ED ” (existence doubtful). The great waste of waters north of Siberia is comparatively unknown; the Beaufort Sea is unexplored; the Persian Gulf, home of the earliest navigators, is poorly charted; the Australian coast-line remains in large measure much as Cook and Flinders left it; and there are yet regions

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in the Pacific which remain unfurrowed by modern keels.

But science moves on, and knowledge daily increases. Wireless has brought the most distant navigator into instant touch with maritime headquarters. The entry in yesterday's log recording some change or "find" is to-day broadcast to the world; and the notes, remarks and experiences of the modern seaman, if of interest and importance to "the cloth," are communicated by means of weekly supplements to the Sailing Directions, and charts known as "Notices to Mariners." Ten millions of these Notices are printed and distributed from London annually. If a derelict be reported, a shoal discovered or the characteristics of a light changed, a bulletin is issued in the form of a Notice to Mariners, and thus every seaman is able to keep his Sailing Directions and his charts posted up to date.

The Hydrographic Department at the Admiralty is the clearing-house for the day-to-day sea news of the world, and a constant stream of reports, discoveries, contemplated changes, verifications, strange occurrences, and unusual phenomena, are classified, investigated and issued.

In addition, there are supplementary pub-

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lications augmenting the Sailing Directions, and charts. Tide Tables, Light Lists, Wireless Signals and Distance Tables have been issued for every ocean and sea. Wireless time signals have facilitated the determination of accurate longitudes; the Echo Depth Finder is replacing the old-time lead, and the gyroscopic compass is superseding the magnetic compass.

In this great task, all maritime nations have taken a part. Each has its hydrographic department and all contribute to our knowledge of the seas. It is to an American, Maury, that seamen are indebted for the foundation of our knowledge of the physical geography of the sea, and to another for a standard treatise on the Practice of Navigation; Spain and Portugal glory in the name of Columbus, Da Gama, Magellan and others; from France came some of the most distinguished navigators and explorers of the past; Dutch seamen have shed lustre on their country, and Italy has ever been forward in the science of navigation.

But England may justly pride herself on her long-standing pre-eminence in maritime discoveries and surveys. To-day, as of yore, her charts and Sailing Directions are consulted by the whole world and she has set

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a standard which has been followed by other nations. In her glorious annals shine the names of her many sons, renowned for their courage and intrepidity, their discoveries, the accuracy and faithfulness of their work and their scientific attainments. They were great seamen, great navigators, who performed feats which fill the modern sailor with admiration and astonishment.

In this glorious gallery are Drake, the first Englishman to circumnavigate the world; Hudson, Baffin, and Davis, pioneers in the Arctic; Anson, who came home round the world with half a million in prize money; Vancouver, the first to survey the north-west coast of North America; Hadley, who invented the sextant; Harrison, who invented the marine chronometer; Banks, the patron of voyages of discovery; Bligh, who made the most wonderful boat voyage in the annals of the sea; Franklin, the first to establish the existence of a North-West Passage; Flinders, the father of marine surveying; and, greatest of all, James Cook.

To these Englishmen—and their contemporaries—we owe the lead which England took, and which England maintains, in the great work of exploration, survey, and charting of the oceans.

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Of all who since have used the open sea  
Than the bold English none more fame have won  
Beyond the year, and out of Heaven's highway  
They make discoveries where they see no sun.

But what so long in vain, and yet unknown  
By poor mankind's benighted wit is sought  
Shall in this Age to England first be shown  
And hence be to admiring nations taught.

Then we upon our Globe's last verge shall go  
And view the ocean leaning on the sky,  
From thence our rolling neighbours we shall know  
And on the Lunar World securely pry.

DRYDEN.

Chief among the instruments used in survey and navigation have been the sounding lead, the compass and the chronometer. Since the dawn of time the navigator had but one method of knowing the depth of water under his keel. The Ancient Briton, poling his frail canoe along the waterways and coasts, sounded by means of the pole which thus propelled and steered the vessel and indicated also the depth of water.

As larger craft were built and mariners ventured farther afield, the problem of sounding in deeper water—an important matter in those chartless days—was solved by the simple method of lowering a weight of any

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kind to the bottom, and this method has persisted down to the present time.

The sounding lead is by common consent the chief navigating device at the disposal of the seaman when in soundings. The constant use of it is his safest assurance against stranding, and those High Priests of the maritime hierarchy—My Lords of the Admiralty, and the Board of Trade—are continually insisting on the importance of sounding—and add an awful warning. “Navigators are reminded that in the event of a casualty to a vessel which could be attributed to the omission to take soundings, the fact will be brought to the notice of the Court of Enquiry.”

In short, the safety of every craft, large or small, depends on the proper use of a lead weight suspended from the end of a line.

There are two kinds of weights—the hand lead and the deep-sea lead. The hand lead is about 6 inches long and weighs some 10 pounds with a line 30 fathoms long; the deep-sea lead is far heavier and has a very much longer line. The hand lead is used in shallow waters and when entering or leaving harbour; the deep-sea lead in depths up to 40 or 50 fathoms, and when approaching the land or making a landfall.

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The casting of the deep-sea lead was a manœuvre, an evolution which, on a dark and dirty night with the land under the lee, became a feat of seamanship.

It was a task that the Captain was loath to undertake since it necessitated turning out the watch, bringing-to the ship and backing the main yard. It involved trouble, inconvenience, risk, delay, and a "cast of the lead" was therefore a necessary nuisance to be postponed as long as possible.

In order that the line should be vertically up and down when the lead reached the bottom, it was necessary to take the way off the ship; the line itself had various marks such as a piece of white canvas at 5 fathoms and so on, the different materials being used so that on a dark night the leadsman, by putting the wetted mark to his lips, would feel the material and thus be able to distinguish by touch what he could not distinguish by sight.

But these archaic notions have now passed away, though in theory and in law they still survive. The embryo navigator, when appearing for his examination, is still obliged by the regulations to explain to the examiners how he would take a cast of the deep-sea lead. Occasionally, when the main yard has been

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backed, the way taken off the ship, the line passed along the weather side and round to the lee bow and the lead is cast, then the old cry may still be heard, the warning passing from mouth to mouth with its mournful cadence : " Watch there, Watch ! "

Towards the end of the last century, with the advent of fast steamers, this antiquated and crude method of sounding became hopelessly inadequate. It was necessary to seek some method which would obviate the stopping of the ship and which would also give more accurate soundings.

The most successful and ingenious of the new devices was the Patent sounding machine invented by Sir William Thomson (afterwards Lord Kelvin) in which the lead or sinker is suspended from a fine and strong wire. Above the lead, and secured perpendicularly to the wire, is a brass cylinder in which a thin glass tube is placed, the inside being coated with a preparation of chromate of silver.

As the lead carries the tube to the bottom, the increasing pressure forces the water up through a hole in the tube, the salt water converting the pink colour of the chromate into a milky white. The deeper the depth, the greater the extent of the discoloration.



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The tube is then wound up on a reel, placed against a scale, and the amount of discoloration measured on the scale which indicates the depth in fathoms to which the lead descended.

This "Patent" lead, as it is termed, though it has been in general use for over half a century, was a boon to the navigator. It was no longer necessary to stop the ship, since the tube indicated the depth irrespective of the length of wire run out ; the sounding was accurate, the operation took but a few minutes and the results were entirely satisfactory. But a new tube was required for each sounding, the wire occasionally broke, the initial expense deterred parsimonious shipowners and the Patent did not entirely displace the old-time lead, though its use became fairly general even in sailing ships. There are, indeed, certain primitive fundamental things which seem to survive all chance and change, the Lead and Line being one of them.

But now, after a thousand years or more, a new device has been perfected for sounding at sea. It is superseding the Patent lead and threatens indeed to end the age-old supremacy of the Lead and Line itself. The principle is altogether new, the Lead and Line being entirely abandoned.

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The Echo Depth Finder is based on the principle that a sound wave passes through the water at a known speed and, after striking the bottom, is reflected back to the surface in the form of an echo. Since sound travels at about 4,800 feet per second in sea water, great precision is necessary to measure the minute interval of time which elapses between the despatch of the sound wave and the arrival of the echo.

In 8 fathoms (48 feet) the sound wave would reach the bottom in one-hundredth part of a second, and the problem therefore was to design an instrument which would not only accurately measure this fraction of time but also record it. That problem has been solved and an increasing number of ships is now being fitted with the new device.

The new method of sounding removes the factor of human fallibility ; it provides and records automatically a continuous series of accurate soundings ; it indicates the depth immediately under the ship, whereas the lead indicated the depth at a spot which the ship had long since passed ; thousands of soundings may be made within an hour ; at a depth of 4,000 fathoms (24,000 feet) a sounding can be obtained within ten seconds, and altogether the new method is as great an

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advance beyond the Patent lead as was the latter over the Lead and Line. As its use becomes more general and the initial cost is lowered it seems inevitable that the Echo device will gradually supersede the Lead and come into universal use at sea.

So passes the first of the fundamental Aids to Navigation—the Sounding Lead.

The navigator relies not only on the Lead, but also on the Magnetic Compass which shares with the Lead the honour of being the great navigating instrument of all time. The Lead warned the mariner of dangers, the compass pointed his path ; with the aid of the Lead he could sail on in safety, with the aid of the compass he could sail on his course.

The magnetic compass is probably as old as the lead ; by its means every portion of the globe has been explored ; with its aid navies have been navigated for many centuries ; with it Drake encompassed the world, Nelson pursued the French fleet, James Cook made his voyages ; great liners and fishing smacks are navigated by means of it ; through the ages the lodestone has pointed the way to the mariner. The compass is indeed indispensable at sea. No craft dare leave the

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friendly coast without it, and when all landmarks and seamarks disappear, the magnet remains the seaman's guide. With it he could sail wherever ship could sail ; without it he was blind. " He that first discovered the use of the compass," wrote Locke, " did more for the supply and increase of useful commodities than those who built factories."

Rude as their ships was navigation then  
No useful compass or meridian known.  
Coasting, they kept the land within their ken  
And knew no north but when the Pole Star shone.  
DRYDEN.

But this great, beneficent, wonderful " discovery " of Locke's Unknown had its shortcomings. The needle seldom, if ever, pointed to the true or geographical north ; it was very susceptible to the influence of metals around it ; it had fits and starts of unreliability ; it required constant watchfulness and care and a variety of " compensations " and " corrections." The navigator never dared relax his watch on it. It was his guide but oft-times led him astray ; it was his philosopher but often at fault ; it was his friend but sometimes betrayed his trust.

Nevertheless, the needle pointed to the north, or nearly to the north, and with this

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somewhat inadequate consolation the navigators of a thousand years have steered their path on the trackless deep; there were means of correcting the vagaries of the needle, and if one could not direct it to the true north one could by means of observations of sun, stars and landmarks ascertain the errors and "make allowances" accordingly. But the compass has been a sore trial to the navigator with its irregular and often incomprehensible deviations from the true north, though in recent years many and great improvements have been effected which have resulted in a compass wellnigh as perfect as a magnetic compass can be.

But, as in the case of the Lead and Line, the age-long supremacy of the magnetic compass is now threatened by an entirely new principle, that of the gyroscope. Magnetism as applied to the ship's compass had so many disadvantages that when the war brought new demands and requirements, necessity mothered the application of the principle of the gyro to the directive force required in a compass.

The gyroscopic compass is now installed in modern ships. It fulfils the chief requirement of the navigator, that it should point undeviatingly to the true north; it requires

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no corrections or compensations ; it is not subject to magnetic influences and it has all the virtues and none of the vices of the magnetic compass. In the future it will supersede the ancient lodestone of the Chinese which has held the field for so long. Doubtless in small craft the magnetic compass will still be used, but the gyroscopic compass is already deposing it from the pride of place which it has occupied since the beginnings of recorded history as the grand instrument of world navigation.

So passes the second of the Fundamental Aids to Navigation—the Magnetic Compass.

Consider now the third of the Mariner's Trinity—the timepiece or marine chronometer.

The early navigator, once out of sight of land, was lost, adrift on an illimitable sea which had only one boundary—the far-distant mysterious horizon which afforded him little assistance in determining his position. He knew the cardinal points of the compass ; the sun and the stars gave him a rough idea of direction ; the Pole Star gave him a fairly good latitude, but of longitude he knew nothing at all.

Latitude was not enough. It answered

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only the question : How far north or south ? It was necessary to know also : How far east or west ? to complete the answer and to define the position of the ship. But here a new element entered—Time—and the early navigator did not know the correct time and had no reliable means of finding it.

The increasing range of ocean voyages and the difficulty experienced by navigators in fixing the position not only of their ships, but of their discoveries, induced the English Government in 1714 to offer handsome money prizes for any method which would determine Longitude within an error of 60, 40 and 30 miles respectively. The rewards offered were £10,000, £15,000 and £20,000. Other governments had also offered large rewards, notably Holland, Venice, France and Spain, but the largest and most famous offer was that of England.

It was the only prize that was won and paid, and it was awarded to a humble Yorkshire carpenter who was also a watch-making genius.

His name was John Harrison.

“The reward offered by the English Government remained on offer for fifty years, during which time the phrase ‘the discovery of the longitude’ passed into common English

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speech as expressing a thing of practical impossibility. Eighteenth-century literature is full of such allusions. Swift makes it one of the great discoveries which, Captain Lemuel Gulliver suggests, will enrich the minds of the immortal Struldbugs; Goldsmith puts it into Marlow's mouth as a happy retort to one of Tony Lumpkin's sallies; magazines and newspapers used it as a stock satirical cliché. . . . But the hour and the man were at hand, and in 1764 the great reward was won and the problem—that had baffled Newton, Halley, Huyghens, Leibnitz and a hundred others—definitely solved. Its solution proved to be a little ticking thing in a box, the unaided production of a Yorkshire carpenter, John Harrison." (*The Marine Chronometer*, Gould.)

The "little ticking thing" was Harrison's marine chronometer, a marvellous timepiece. He built several, being occupied six years in the construction of Number One and two years in completing Number Two. Number Four was finished in 1759 and was subjected to the most searching tests on a voyage to Jamaica and back. After various allowances had been made, it was found that in the course of a five months' voyage under all conditions of change of temperature, the



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rolling and pitching of the ship and other disturbances, Harrison's timekeeper lost 15 seconds in five months, or an error of less than a tenth of a second per day. He had won the reward and won it handsomely, but even so the Board of Longitude acted in traditional bureaucratic fashion and Harrison only received the money after long and wearisome delays.

Generations of English chronometer-makers have succeeded one to the other, father to son, and their names are identified with their timepieces. Among them are the families of Arnold, Dent, Earnshaw, Frodsham, Kendall and Kullberg. Harrison's original instrument still "tells the hours" at Greenwich and his name and his fame survive among navigators of to-day.

But a new arrival threatens the supremacy of the chronometer at sea. Whether he be at the North Pole or in the middle of the Pacific or at the Antipodes, the navigator now has another means of obtaining the correct time and it is no longer necessary for him to rely upon his chronometers. For now he can check them with the daily wireless time signals and thus the marine chronometer is no longer required to give the navigator Greenwich or any other time.

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The function of the chronometer is no longer the maintenance of correct time throughout the voyage; it now merely enables the navigator to know the exact time at which he takes an observation, since the chronometer carries on the time of the wireless signal to that of the observation. But any good watch can perform this service and thus the advent of the wireless time signal seems as if it will depose the chronometer from its pride of place.

So passes the third of the Fundamental Aids to Navigation—the marine chronometer.

## CHAPTER V

### THE MIRROR OF THE SEA

THERE is irony in the thought that it should have been reserved for a Pole to interpret the sea to Englishmen, and for another foreigner to have given us the classic *Life of our own Nelson* and to have expounded to us the significance of sea-power. Strange, too, that the "prose epic of the English nation" should have been compiled by one who bore the name of Hakluyt.

And yet Hakluyt, Mahan, and Conrad form the great trinity of sea writers.

Hakluyt, geographer and divine, was the only one of the three who was not a professional seaman. The other two were sailors, one an executive officer in the United States Navy, and the other a master in the British Merchant Service, and both thus wrote with first-hand knowledge of their subject.

There are others whose names are remembered, but one feels that, when all else that has been written about the sea has passed

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away, there will remain, like the peaks of submerged mountains, the *Principall Navigations*, *The Influence of Sea Power* and *The Mirror of the Sea*.

There is a vast difference in the conception, design, style and intention of these three great works. Hakluyt's *Principall Navigations* are the plain unadorned narratives of the exploits of the great seamen of the Elizabethan era ; Mahan's work demonstrates in scholarly and scientific style the power inherent in the command of the sea ; Conrad's *Mirror* sets out to show the reflections and reactions of the sea on seamen.

He has himself explained the motive and the impulse which caused him to write this brief Confession, as he terms it. " From sixteen to thirty-six cannot be called an age, yet it is a pretty long stretch of that sort of experience which teaches a man slowly to see and to feel. It is for me a distinct period."

During these two decades he came to know, but never to love the sea. In this respect he was not altogether singular. No seaman loves the sea. Many hate it and many regard it with a calm dispassion, as of an old enemy or friend. But though he neither loved it, and may indeed have feared it,

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Conrad felt, after twenty years of intimacy with it, that he at least knew the sea.

And feeling this he said to himself : " Now I must speak of these things," and in *The Mirror of the Sea* he has set down his thoughts for the reflection, delight, and exaltation of future generations of seamen.

For when all is said and done, in *The Mirror* Conrad has practically exhausted everything there is to say about the sea. It is no vast canvas, it is true, but a crowded miniature in which every detail is minutely limned. Here is the whole issue of the sea and, as the seaman reads on, he becomes fascinated by the glorious and penetrating insight of the writer, by the superb style, and the consummate mastery of the subject. " I, too, have thought these things."

But this is a book which no Englishman could have written. It is a confession of the writer's emotions, and one cannot conceive of an English seaman setting out solemnly to confess the emotions aroused in him by the sea. Such a thing would never occur to him. He would indeed never admit that he had emotions. Conrad says he " holds nothing back"—and Englishmen hold back nearly everything.

Nevertheless, this is the Seaman's Bible,

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the apologia of every seaman, though there are passages in it to which many take exception as lacking the veracity of Holy Writ.

Conrad cannot conceal his contempt for the new order which succeeded the passing of the sailing ship. He had a virtuous disdain for "steam driven things," for any innovation in the technical appliances of the art and craft of his profession, and for any in the calling who did not possess a "square-rigged" certificate. His sheet anchor was sails and cordage and he almost crooned in sorrow over the passing of his beloved sailing ships.

Sometimes in *The Mirror* he permits his dislike of the new order to cloud his judgment, as when, in *The Character of the Foe*, for the sea is always the Foe to him, he says, speaking of a steamship in a gale: "She receives smashing blows but she advances: it is a slogging fight and not a scientific campaign."

Now the average shipmaster of to-day will not admit that in a gale with a head sea running, he engages in a slogging fight. A seaman who would do that with his ship is no seaman.

A steamer in a seaway requires nursing; she must not be forced; her speed must be

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nicely adjusted, her course set in the direction best calculated to lessen the force of the sea ; if necessary, she must be hove-to and the violence of the gale allayed by oil and by tender handling. In short, the shipmaster who knows his business engages at these times in just that " scientific campaign " to outwit the sea which Conrad claims only for his predecessors in sail.

Indeed, he admits in an earlier passage that " a ship is not a slave," and that " you must make her easy in a seaway," but to him there was only one kind of " ship " and he would deny the right of a steamer to be included in the term.

His dislike of any innovation is shown in his scornful reference to the modern anchor in the chapter entitled " Emblems of Hope."

" An anchor of yesterday," he says, " was the most efficient instrument," but " nowadays there are contrivances like mushrooms and things like claws, of no particular expression or shape—just hooks."

It is true that the anchor of " yesterday " was a most efficient instrument in its primary purpose of holding the ground, but it is also the anchor of " to-day," for it is still to be found in many small craft. But it was not without its vices.

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The "anchor of yesterday," the old Admiralty pattern as it is termed, was a clumsy contrivance, difficult to handle owing to the stock and the flukes not being in the same plane. It was liable frequently to foul the cable, and indeed a Foul Anchor is the very sign and symbol of Admiralty. Its projecting fluke was a menace, and frequently tore out a ship's bottom; the anchor was difficult to stow inboard in ship-shape fashion. "Getting the anchors out" was always a long and laborious evolution, and altogether "working the anchors" was an unpleasant, difficult and anxious task.

Not so with the "contrivances of to-day" which earned Conrad's contumely. The modern anchor has most of the virtues of the old and few of its imperfections. It may not always hold the ground so well, but it is extremely easy to handle, it stows neatly and securely in the hawse-pipe and quite automatically, without any of the complicated apparatus of fishing and catting associated with the old pattern. There are to-day few seamen who would willingly return to the use of the old anchor.

In another passage, Conrad refers to the ship's rigging, the sailing ship's machinery, as he terms it, "doing its work in perfect



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silence." Yet he must have known, as any sailor knows, that masts, yards and rigging do not perform their functions "in perfect silence." On the contrary, for aloft there are always the incessant noises of the "machinery," the creaking of the gear, the groaning of the masts and yards and standing rigging, the whine of the sheaves in the blocks, the chafing of the sails and cordage, the flapping of canvas. This continuous movement and sound is so real that an important feature of the sailing ship's machinery aloft is known as "chafing gear," large mats designed to check and nullify the results of those very movements which Conrad ignores.

A few lines further on, in fact, he seems to go back on this statement, for he admits that "hearing plays a perceptible part in gauging the force of the wind. To take a proper care of a ship's spars it is just as well for a seaman to have nothing the matter with his ears. Such is the intimacy with which a seaman had to live with his ship of yesterday that his senses were like her senses, that the stress upon his body made him judge of the strain upon the ship's masts."

Conrad was in love with "Yesterday" and could see little good in "To-day." The motif of the whole book, the burden of

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his lay, is the decadence of the times in which he lived. *The Mirror of the Sea* is a kind of Swan Song for the Glories of the Past, when seamen were seamen. He sings the Ship of Yesterday and in one passage (Chapter 13) almost seems to suggest that the seaman of To-day does not know his job.

“The hurry of the times . . . the cry for prompt despatch, the very size of his ship stand nowadays between the modern seaman and a thorough knowledge of his craft.”

This may or may not be so, but there are as good fish at sea as ever came out of it, and events in recent years seem to disprove Conrad's contention. Seamen to-day are by no means unanimous that a sailing-ship training is essential for the modern sailor. There has begun to be a doubt about the sacred virtues of training in sail, and with the passage of years the existing proviso that candidates for the plums of the sea service must possess sail experience will inevitably be abandoned, since the opportunities for sailing-ship training are fast passing away, if indeed they have not already gone. There are no longer any candidates in the Board of Trade examinations for square-rigged certificates—not one. Does this fact presuppose the death of all true “seamanship” as

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Conrad understood it? He would seem to think so in *The Mirror*, and yet it is evident that, in generations to come, professional seamen as fine as any in the past will still sail the high seas and maintain the old spirit of the nation. And it will be so until there shall be no more sea.

But enough of these petty carpings at details! Let us once more to *The Mirror of the Sea*, the incomparably drawn picture by that great artist and austere seaman. "Austere," indeed, seems in this work to be his favourite adjective. He was himself an austere man, and this austerity reflects itself in his style, for that is the man. Another favourite word is Fidelity, the quality he most admired in mankind and in ships. And he can be sardonic, too, as when he narrates numerous anecdotes of masters and mates to point his moral and adorn his tale.

It is in his attitude towards Nature that he rises to his highest peaks, and there are no more glorious passages in the literature of the sea than those dealing with winds and gales in the chapter "The Nursery of the Craft."

To Conrad a gale had both physiognomy

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and character. He endows a storm with personality. "Gales," he says, "are adversaries whose wiles you must defeat, and whose violence you must resist and yet with whom you must live in the intimacies of nights and days." "No two gales," he adds, "stamp themselves in the same way upon your emotions," for there is "infinite variety" in gales at sea, and he concludes the chapter with a reference to the most awesome sound known to seamen, "the peculiar, terrible and mysterious moaning that may be heard sometimes passing through the roar of a hurricane."

In thus endowing gales with personality, Conrad differs from the English seaman, to whom a gale is a gale, one like to another, differing only in their intensity and the extent of the damage they wreak. In these days of advanced scientific meteorology, unknown in the Victorian era, the cyclone, hurricane, typhoon have been reduced to an exact science, a matter of figures, graphs and isobars. Though they remain terrible there is no longer any "mystery" about them. Their origins, formation, movements, direction, speed and intensity have been placed within the reach of the navigator. With the additional aid of wireless and a world-wide

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system of storm warnings, the navigator is forewarned and therefore forearmed against these terrible visitations ; he is able to plot on the chart the position and course of the storm and the speed of his ship, and his ability to steer in any direction makes it possible for him to avoid the path of the storm.

Conrad was the first to point out that "in the orientation of the winds that rule the sea, the north and south direction are of no importance." (He refers, of course, to world-circulations, since all are aware of a north or south wind in a particular locality which is the subject of intense malediction or ardent desire.) "There are no north or south winds of any account upon this earth," he says. "They are but small princes in the dynasties that make peace and war upon the sea. They never assert themselves upon a vast stage. They depend upon local causes . . . and in the polity of winds, as among the tribes of the earth, the real struggle lies between East and West."

And then he proceeds with his brief but masterly dissertation upon the Kings of the East and the West. These pages commend themselves to seamen who are only too well acquainted with the might, majesty and

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dominion of these Sovereigns of the Seas. There are classic examples which will recur to the minds of Ancient Mariners still living—of the fruitless attempts to break through, past the Horn, in the teeth of an incessant Westerly and of the utter impossibility of regaining the meridian of Point de Galle if once swept to the eastward of that port.

In another chapter—"The Faithful River"—Conrad writes of the well-beloved Thames estuary, the bourne of all seamen in all ages. He loved the "strange air of mysteriousness which lingers about it to this very day" and "the mysterious vastness caused by the configuration of the shore."

To him indeed everything that smacked of mystery was inviting, tempting, and this perhaps explains his passion for oceans and seas, for whereas mankind has explored and made known every nook and cranny of earth, the mirror of the sea still conceals beneath its metallic brightness the mystery and profundity of the deeps.

To Conrad these mysteries held awful and terrible powers. "He who puts his trust in the friendship of the sea," he cries, "and neglects the strength and cunning of his right hand is a fool." The sea is an enemy, never a friend; always to be

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distrusted, implacable, the foe of all God-fearing men. "The Ocean," he cries again, "has no compassion, no faith, no law, no memory." And to combat the vices inherent in this absence of all virtues, only "undaunted resolution and sleepless, armed, jealous vigilance will prevail."

In one passage he sums up the whole story of the Sea from the dawn of mankind—and then sweeps it all away with a wave of the hand, as the sea has swept away—

"All the tempestuous passions of mankind's young days, the love of loot and the love of glory, the love of adventure and the love of danger, with the great love of the unknown and vast dreams of dominion and power. All these," he exclaims, "have passed like images reflected from a mirror, leaving no record upon the mysterious face of the sea."

In *The Mirror of the Sea*, Conrad has exhausted his theme. In it, the mariner will find all and more than all he has ever thought about his calling, his ship and the elements. It is a book of rapture for the seaman on which he will feast his eyes, ears and heart. There are thousands who have revelled in it; doubtless there are thousands of younger seamen who are yet

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unaware of this sublime "Seaman's Testament," which ends with that superb and majestic eulogy on the national spirit of England.

"Like a subtle and mysterious elixir poured into the perishable clay of successive generations, it grows in truth, splendour and potency with the march of ages. In its incorruptible flow all round the globe of the earth, it preserves from the decay and forgetfulness of death the greatness of our great men, and amongst them the passion and gentle greatness of Nelson, the nature of whose genius was, on the faith of a brave seaman and distinguished Admiral, such as to 'Exalt the glory of our nation!'"



## CHAPTER VI

### SHIPS AND SHIPPING

IN previous chapters some impression will have been gathered of the rapid evolutionary changes which took place between the launching of the *Great Britain* in 1843 and the end of the century, a period of fifty-seven years. But these accelerated changes were as nothing to the revolutionary developments during the first third of the present century (1900-33).

First, there was the ousting of sail by steam and its almost complete disappearance from the oceans. It is true that even to-day a few sailing ships still range the seas in search of occasional cargoes, but there remains not a single vessel under the British flag and very few under the ensigns of other nations.

Then, with the advent of the Great War, there was the sudden adoption by the British and other navies of oil fuel in place of coal. The ardent advocacy of oil fuel for the Navy

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by Lord Fisher was followed by its introduction into the Merchant Service, while the advent of the internal combustion engine still further reduced the demand for coal bunkers. This in turn led to the introduction of a new type of ship, the oil tanker, and the gradual disappearance of the old-time collier.

Hitherto, the great coaling depots established by many South Wales firms had been a prominent feature in all the world's ports, but now these immense stacks of coal began to be replaced by large circular oil tanks, refilled at regular intervals by the tankers, the numbers and tonnage of which increased rapidly.

Simultaneously with this revolutionary change in the propulsion and fuel of the world's shipping, there was also a great increase in the size of liners.

German shipbuilders were in the van in the building of these large ships, notably the *Vaterland*, *Bismarck* and *Imperator*. But other nations were also increasing the size of their liners, chiefly for the Atlantic trade, and a point was reached where the size was limited only by the facilities available at terminal ports on both sides of the Atlantic. To meet the demand for the increased length,

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draft and beam of these new great ships, port authorities were obliged to expend large sums in deepening the approaches to the various ports, enlarging the docking accommodation and lengthening the berths. The Great War temporarily checked the launching of further big ships, but in post-war years the tendency has been to build even larger vessels. An enormous increase in passenger traffic manifested itself and a period of cheap sea travel was inaugurated. Larger and more luxurious vessels were built to attract ever greater numbers, for numbers were necessary to make the new super-ships profitable. The speed, comfort and regularity of post-war shipping was a phenomenon which is largely responsible for the great growth in sea travel.

The schedule of sailings, arrivals and departures became as regular, as organized, and as certain as a railway time-table. Competitive rates brought sea travel within the reach of all ; the Grand Tour, formerly the exclusive privilege of the rich and the aristocrat, became the normal holiday of democracy ; the world was wide and it was thrown open not only to those with moderate incomes, but even to the clerk and the typist, so that a trip to the land of the Midnight Sun

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or to the glories of the Mediterranean was brought within the reach of nearly all.

The old "emigrant" class of ship was replaced by the "cabin" type of modern liner, carrying a great number of passengers in comfort, if not in luxury, at fares which in former days would have entitled them to endure "steerage" accommodation.

And this observation applies both to ships engaged in long passages and to shorter cruises nearer home waters.

The tremendous impetus given to passenger travel became the mainstay of most shipping companies during the great depression. It was found that large and expensive luxury liners, instead of being laid up out of commission, could be profitably employed on cruises, short or long, provided that a sufficiently large number of passengers could be attracted to take advantage of the unparalleled opportunities which were offered. The greatest and most famous lines embarked on this new venture in sharp competition with each other. The Atlantic, the North Sea, and the Mediterranean became the holiday grounds of pleasure and health seekers; very cheap passages were offered for the round voyage to the most distant parts of the globe, so that it became almost

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more economical to live on shipboard than on shore ; Round The World cruises were advertised by all the chief lines ; and the famous ships whose names were household words throughout the world were employed in short holiday cruises during which the passenger was surrounded by every luxury. The competition became so intense that the greatest shipping company of all was not averse to encourage potential passengers by advertising time or deferred payments, by which the balance of the fare, "in convenient monthly payments," could be made after the passengers' return.

There was, in short, no limit to the attraction of sea travel which rapidly developed into one of the world's great industries at a period when cargo freights became almost unpayable and when the world was glutted with shipping. A great proportion of this tonnage comprised such magnificent vessels as the *Bremen* and *Europa* (50,000 tons), the *Majestic*, *Berengaria*, *Olympic*, *Aquitania*, *Empress of Britain* (all over 40,000 tons), the *Italian Rex* and the *Conte di Savoia* (46,000 tons), and the great French ships *Ile de France*, *Paris* and *l'Atlantique*, and many others. Nor were the attractions of sea travel confined to the luxury liners. Shorter

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cruises in smaller but equally magnificent vessels, such as the Channel packets carrying the mails, are a feature of the time. These vessels are not only the fastest but the most luxurious of their type afloat. Their speed, the beauty of their lines, their capacity for keeping the sea in all weathers, and the regularity of their schedules, are revolutionary changes in comparison with the vessels in these services at the beginning of the century. Upper decks are enclosed in plate glass and form observation lounges, while self-ventilating cabins and the general atmosphere of extreme comfort and luxury combine to defeat the sole remaining terror of the seas for many passengers—sea-sickness.

Coincident with this remarkable development in passenger travel has been the rise and consolidation of entirely new trades in the shipping industry. Notable among these is the "fruit-boat" trade, which was made possible by improvements in, and the perfecting of, cooling machinery in ships' holds by means of which fruit is transported from the tropics to cooler climes in first-class condition.

In the West Indies, the fruit-boats account for a large part of the trade, conveying many million "stems" of bananas and other

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tropical produce in cooling chambers which, by being insulated, permit the fruit and other produce to be conveyed long distances at a correct temperature, between 56° and 60° F. Nor are the fruit-boat owners indifferent to the passenger traffic, and these vessels are favourably known all over the world for the comfort and luxury of their appointment and the beauty of the waters in which they cruise, for example along the Spanish Main.

Another revolutionary development since the beginning of the century has taken place in the South American export meat trade. Here, too, the perfecting of the refrigerating system has made it possible to transport chilled beef and other meats in cooled chambers to the British and other markets, and a splendid fleet of vessels equipped with refrigerated holds came into existence as a consequence. Still farther afield is the fruit trade from Australia, whence very large cargoes of apples, pears and other fruit, together with frozen lamb, mutton and butter, are transported, during a voyage of 13,000 miles, in cold storage.

But though these great and far-reaching changes have come about in the course of the past thirty years, it is worth noting in passing

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that there has been no revolutionary increase in the speed of ships. This is an important and significant factor which seems to indicate that speed is the most costly quality in sea transport.

This failure to add any appreciable increase to the general sea speed of the world's shipping is the more remarkable when the revolutionary changes in propelling machinery are considered. Before the end of the century, the fine British and German liners *Lucania*, *Campania*, *Oceania*, *Kaiser Wilhelm der Grosse*, *Deutschland* and *Kronprinz Wilhelm*, not to mention other ships of other nations, were maintaining a sea speed of 23 knots and over across the Atlantic, and a quarter of a century ago the *Mauretania* and *Lusitania* established speeds of 26 knots.

In the interval, fundamental changes have taken place in marine engines. The speeds attained by the first group of ships mentioned were made possible by the perfection to which the quadruple-expansion engine had been brought; the *Mauretania* and *Lusitania* were pioneers in the field of the Parsons turbine, but to-day, despite the immense advance in marine engineering, in methods of fuelling and feeding the furnaces, in improved under-water design and in pro-



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pellers, rudders, and so on, the sea speed of liners is but very slightly higher than in 1907.

The same observation applies in the case of the general run of cargo ships. In the old days 10 knots was a fair average speed and the most economical. To-day the modern cargo carrier, with her internal combustion engines and her oil fuel, is probably more economical and certainly more efficient; she requires fewer stokehold hands, her internal economy is based on labour-saving lines, and her earning capacity is relatively greater.

But her speed—her economical speed—is very little greater. The internal combustion engine has not increased speed but tended rather towards greater simplicity, regularity and smoothness of operation, economy in the stokehold, and, finally, it occupies less space. At the same time, it must not be forgotten that many large liners are being built with internal combustion engines of one type or another with a corresponding increase in speed to enable them to compete with steamships. Furthermore, the proportion of world shipping propelled by motor engines will continue to increase owing to the withdrawal from service of old tonnage, which is

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invariably steam driven, to be replaced in most cases by the motor ship, but it is doubtful if the motor ship will ever drive the steamer off the seas altogether. The increased competition between the two types of propulsion has already resulted in renewed efforts to improve steam machinery which have checked to some extent the triumphal progress of the motor vessel.

Much attention is being devoted to securing increased efficiency from turbine machinery by the use of higher pressures; developments in the turbo-electric drive have been introduced with marked success into the most modern liners; and the utilization of coal in pulverized form, and also mixed with oil, is being experimented with in various ships and with many indications of ultimate success. But it is improbable that coal in any form will seriously affect the demand for oil fuel for some years to come. It is purely a matter of economy depending on geographical considerations and the supply and cheapness of the respective fuels, factors which will always determine the attitude of the shipowner to this most important of all considerations in the conduct of his business.

## CHAPTER VII

### TRADE ROUTES

AMONG the most striking features of maritime commerce are the world's great trade routes, which have their origin in the gradual colonization and populating of far-distant lands. The real reason—the dominating urge which sent Columbus forth on his first voyage—was none other than the discovery of a passage to the East, a new trade route which should bring the Orient and its wealth nearer to Spain and not only shorten the route, but make it safer. The name “West Indies” remains to this day a sign and token of the fact that Columbus was unaware that he had discovered a route not to the East, but to the West, and he died without knowing that between those “Indies” and the East there lay not only a great continent, but a great ocean.

Within six years of the epoch-making voyage of Columbus, Vasco da Gama had found the true trade route to the East by

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way of the Cape, and his arrival at Calicut in his storm-beaten ships on May 20, 1498, was almost as pregnant an event as the Landfall of Columbus. Eight years after that of Columbus, Pedro Cabral, the countryman of da Gama, made another landfall. To avoid being becalmed off the African coast he took a course to the westward and was swept along into the South American current to the unknown coast of Brazil, of which he claimed possession for the King of Portugal.

Twenty years later Magellan threaded the strait which bears his name and reached the ocean which he named the Pacific.

In 1616 Captain Dirk Hartog, of the Dutch ship *Endracht* of Amsterdam, sighted the west coast of Australia while outward bound from the Cape to the Spice Islands, via the Straits of Sunda.

Thus, the winds and currents of the South Atlantic and the Indian Ocean dictated these major discoveries. Even Sebastian del Cano, who succeeded Magellan after the latter's death in the Philippines, continued the voyage home in the *Victoria*, by way of the Cape of Good Hope, because he had no choice.

All these navigators sailed at the mercy of wind and wave, and the great trade routes, both west and east, were determined

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by them. Their importance and significance was due to the fact that the rise and the decline of such great maritime powers as Spain, Portugal, Holland, France and others was almost entirely associated with the tremendous struggles to maintain these very trade routes, and to preserve them for the nationals of the particular country which happened to hold the sceptre of the sea at the time.

The idea of the Freedom of the Seas had not been promulgated.

Other great discoveries continued to be made and the voyages of the European seamen revealed more and yet more new territories whose existence had only been guessed at or was but dimly known. Cabot discovered the mainland of North America and with his second son Sebastian sailed as far as latitude 60 North along the American seaboard in an endeavour to find a north-west passage to the East, a search which was not finally consummated until our own time when the Norwegian, Raold Amundsen, succeeded in pushing his small vessel *Gjøa* through the ice-strewn channel, the first ship to pass from the Atlantic to the Pacific north of the Equator.

Meantime, the hardy Dutch navigators

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while seeking the best and shortest passage to the Dutch colonies in the East Indies stumbled unexpectedly on the west coast of Australia or "New Holland" as it was named, and their work in these distant Antipodean waters was subsequently extended by Abel Tasman, James Cook, Bougainville, and others.

Later, the main route to the Indies round the Cape was further explored and made known by the work of the East India Company, whose captains and hydrographers charted these waters and studied the winds and currents which prevailed. Yet another route—that known as the North-East Passage—continued to be the subject of lively speculation and endeavour until modern times, when it was found to be of little commercial value, with the exception that it resulted in the establishment of the late spring trade to and from the Kara Sea, Yenesei and Obi Rivers which now employs a considerable flotilla of ships.

The exploration and discovery of all these trade routes was conditioned by the fundamental fact that it was necessary to take into consideration and to take full advantage of the prevailing winds of the globe, which for their importance in this respect became

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known as the Trade Winds. For wind was the sole motive power of this Great Age and it was the existence of these Trade Winds, their regularity and strength, that was the determining factor in the trade of the world until the advent—and indeed for many years after the advent—of steam, and the opening of the Suez and later the Panama Canal.

This brief glance at the origin of the trade routes has been necessary to show that in their development each of the maritime nations took an honourable and leading part. The gallery of the great navigators of Europe includes the names of Columbus, the Genoese in the service of Spain; Magellan, the Portuguese, and his great countryman, Vasco da Gama; Cabot, the Genoese in the service of England; Drake, the first Englishman, and Bougainville, the first Frenchman, to circumnavigate the globe; Tasman, who penetrated farther than any man had sailed; Dampier, the freebooter, navigator, and hydrographer, whose *Voyage Round the World* remains his monument; and, greatest name of all, James Cook.

These were the mighty men of old, men of action, bold, daring and audacious but observant and reflective, who brought back from their distant travels a great mass of

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data, material and experiences. "They drew the world together and spread our race apart." From their log books and journals another group compiled in ordered array a mass of information for the guidance of future navigators in the form of charts and sailing directions, and made possible the tremendous expansion of maritime trade that followed swiftly on the opening up of the world. The work of these hydrographers ensured the certainty, speed and regularity with which the world's traffic was carried on during the great period of sail, and enabled fast passages to be made to the most distant quarters of the globe. But this great work had been barely completed when the age of steam arrived—an age that took full advantage of the labours of its predecessors.

It is possible that the navigator of the modern liner might smile were he to scan to-day the old-time sailing directions for making ocean passages. Nevertheless, the current editions of these same Directories still contain instructions regarding the best routes to be followed by low-powered vessels that, incidentally, are still obliged to avoid those adverse winds and currents whose movements and seasonal changes were so carefully observed in the past.



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It will be seen that the period of Discovery was followed by that of Exploration. Columbus discovered the western lands and his immediate successors explored them. So, too, Abel Tasman discovered Tasmania and New Zealand, which in turn were explored by Cook. Discovery and Exploration were followed by hydrographical work when the coasts and waters were delineated on the maps of the time, and this in turn was succeeded by the period of Colonization and Exploitation, the whole culminating during the last century in Fulfilment. To-day there remains little of the globe which is not thoroughly well known and charted, and this chapter in the history of the world may be considered as having been closed with the publication in 1930 of the last of the Admiralty Sailing Directions—The Antarctic Pilot—a compilation from the maritime exploration of many nations, a guide for traders to the Great South Land.

It has been earlier remarked that the rise and decline of the great Maritime Powers was almost entirely associated with the struggles necessary to maintain inviolate those great sea routes on which the trading nations depended. While they were being developed and opened up, and while the

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British Empire, as we know it to-day, was in process of formation and growth, a significant and fundamental change was taking place in the British Isles, where a limited and agrarian population was being transformed into a highly industrialized and rapidly increasing people. These many millions of mouths were almost entirely dependent for their food on cargoes brought from overseas and along those routes to which reference has been made. It became evident that to Britain, more perhaps than to any other nation, the integrity and freedom of these routes was of vital importance. To this fact, and to the fear of invasion only in a secondary degree, may be ascribed the traditional insistence upon a powerful Navy, the ancient bulwark of an island Empire dependent for its very existence upon sea-borne food supplies from the uttermost parts of the earth.

The peculiar difficulties of the defence and the wholly unexpected character of the attack on these 80,000 miles of trade routes was revealed in the Great War, when first enemy raiders and secondly enemy submarines were able to inflict damage and at length almost to cut off the nation's food supplies.

The old and foreseen danger of privateering appeared in a new form in the shape of

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German raiders which, though sighted over and over again, were able to sink many ships before returning safely to their own port, while the whole maritime strength of the Allies searched for them—in vain. But though such activities were extremely harassing and damaging, it was reserved for the unrestricted submarine campaign, waged at the termini of the various trade routes, or at points where they converged, to bring the world to a realization of the comparative ease with which the jugular vein of Britain could be cut. The grave danger was finally averted—but only just in time—by the adoption of the old method of convoy sailing. But the peak months of 1917, when the loss of merchant shipping rose to the most dangerous heights, will ever remain a stern memory to the British people, and an ever-present reminder of the imperative necessity for maintaining the freedom of sea communications, thereby assuring the safety of their food and raw material supplies.

## CHAPTER VIII

### SAFETY AT SEA

THE great increase, both in passenger traffic and in the size of ships, directed attention to the increased necessity for improved provision for the safety of the large number of passengers and crew. It was the loss of the *Titanic* in 1912 which first made evident to the world the magnitude of such disasters. It will be remembered that the *Titanic* (46,000 tons) struck an iceberg in the North Atlantic and foundered a few hours later with the loss of many hundreds of lives. This great calamity resulted in the first International Conference on Safety of Life at Sea, and also in the setting up of a Committee on Bulkheads and Watertight Compartments—the aim of both being to ascertain the highest possible degree of safety. The first Conference was succeeded in 1929 by a second Conference and the framing of a Convention which in effect forms an international Magna Charta of safety at sea.

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The dangers to which a ship is exposed come either from within or without—and while external dangers are necessarily vague and indeterminate, those within the ship can be guarded against by structural precautions, the provision of equipment and by the careful loading of the ship.

Structurally, the main safeguards in a ship are the effective subdivision by bulkheads into numerous watertight compartments, and the provision of a double bottom. The unsinkable ship has not yet been built, though during the discussion which followed on the sinking of the *Titanic*, two schools of thought appeared. One maintained that if the ship herself could be made unsinkable, no other factors need be considered; the other held that the unsinkable ship was an idle dream and urged that the prime problem was the provision of life-saving appliances while at the same time making the ship as safe as possible.

The importance of the fore and aft, and athwartship bulkheads was generally recognized, and very strict and numerous rules now govern their incorporation in vessels of every kind. Such bulkheads are made of steel plates, fitted and strengthened in such manner as to add to the strength of the ship,

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and also to withstand an inrush of water beyond the particular compartment which may be damaged. The simplest form is the transverse bulkhead fitted in the forepart, and known as the collision bulkhead. It is found in every ship, while in the most modern liners the subdivision of the vessel is carried to a greater extent even than the rules require, and sometimes beyond what is necessary, to ensure buoyancy and flotation power, though two or even more compartments may be holed and filled. The result is that to-day, owing to the stringent rules in force and the general desire of owners for safe ships, most modern vessels are as unsinkable and as safe as they can be made, and would remain afloat even with several compartments flooded. Despite all this care and skill, however, ships do founder after being damaged by collision or otherwise. It will be seen that the greatest safety factor at sea is the provision of numerous compartments, each shut off from the other, and each affording the fullest measure of its buoyancy to the vessel.

A ship having, for example, twenty athwartship bulkheads is divided into twenty-one compartments, which are again subdivided by longitudinal bulkheads. This division of

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the hull into numerous separate sections might be expected to hamper free movement within the ship, but this difficulty is met by the provision of numerous watertight doors.

These automatically-closing doors have become indispensable in every modern liner, the system generally in use being the Stone-Lloyd method, by which all the doors are operated from the bridge by means of a hydraulic main extending throughout the ship and communicating with every door. The whole operation of closing the doors can be carried out in a few seconds by the turning of the valve on the bridge and the ship thus made watertight from end to end. Miniature electric lamps indicate the position of each door, and whether closed or open; warning that the doors are about to close is given by an alarm gong; and there is no danger of anyone being trapped in a compartment, since those within have only to turn a handle to raise the door and effect their escape, the door itself closing automatically after them. The outstanding advantage of this system, and its control from the bridge, is that should the officer of the watch observe an unavoidable danger ahead, such as an impending collision with ice, or another ship, he can at once protect his own vessel by

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closing the doors, thus rendering her watertight throughout.

The importance of the North Atlantic steamer traffic was recognized in the Convention by the establishment of an Ice Patrol during the months of April, May and June. These patrol ships locate icebergs and field ice, and broadcast the intelligence. In addition they supply weather information, and also destroy any derelicts which may be located.

Another safety measure for the North Atlantic traffic had its origin in the brilliant researches of an American naval officer, Matthew Fontaine Maury, who, after being lamed for life, was appointed superintendent of the Hydrographical Office at Washington.

Maury, whose *Navigation* and *Physical Geography of the Sea* were standard textbooks in their time, studied the Gulf Stream, the winds, Atlantic currents and the vagaries of ice, fogs, derelicts and other dangers. He concluded that the safety of the growing number of large and fast ships on the North Atlantic route could be increased if certain lanes or routes were laid down for fast east- and west-bound traffic, while slower-moving craft would, in their own interests, give these routes a wide berth. It was a rational



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attempt at traffic control, but Maury was before his time and when the plan was first submitted in 1855 it was not generally welcomed. Forty-three years later, long after Maury's death in 1873, the whole of the trans-Atlantic companies agreed to follow the tracks he had laid down, and with minor modifications, the lanes have been followed to this day, the routes being changed in accordance with the seasonal movements of the ice.

While fog remains the navigator's greatest enemy, fire at sea has from time immemorial been the cause of terrifying disasters. The holocaust in the French liners *Georges Phillipar* and *L'Atlantique* is a reminder that the risk still exists, though fires at sea are far less frequent than formerly. The 1929 Convention of the International Conference on Safety of Life at Sea makes full provision for the carrying of fire-extinguishing appliances, and many oil-burning ships now carry froth, foam, carbon-dioxide and other apparatus—all designed to quench fires before they have time to spread. An additional safeguard necessitated by the general use of oil fuel is the installation of automatic fire indicators and alarms. Any compartment below the water-line which is on fire can be at once isolated from the

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rest of the ship by closing the watertight doors from the bridge, while, on the decks above the watertight compartments, fire-proof doors and fire screens give additional protection. Where the electric circuit is maintained in the various compartments by a special fuse connection, the rising of the temperature above a certain point causes a "blow-out" in the fuse, which rings a bell on the bridge, where an automatic alarm indicates the location of the fire.

The grouping together of several thousand people in a floating hotel makes the prevention of an outbreak of fire in any one portion of the vessel a matter of special importance and the measures taken to deal with such contingencies are accordingly of corresponding comprehensiveness. If one considers for a moment the fire appliances in a small town, and multiplies these many times, an idea will be gained of the immense network of fire mains, pumps, piping, hydrants, hosing, electrical alarms, sprinklers and other devices, all installed with the one object of confining an outbreak of fire on shipboard to its narrowest limits.

Both crew and passengers are exercised at frequent fire-drills, while numerous government regulations prescribe both the nature

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and extent of the minimum apparatus required. An immense amount of research work has been carried on in an endeavour to combat the menace of fire at sea, and the success which has rewarded these efforts, the efficiency and ease of operation of these fire-fighting and fire-alarm methods, is generally acknowledged. The latest invention is the "Rich" Fire Indicator, a pipe being carried from each hold to the bridge through which currents of air are drawn by electric fans. Any smoke accumulating in the hold will issue from the mouth of the pipe on the bridge, where it should be at once detected, while controls for releasing steam into the hold affected can be immediately operated, also from the bridge.

The general use of oil fuel in ships' stokeholds has been followed by the introduction of a fire-fighting device designed to overwhelm speedily an outbreak of oil fire. This is known as "Fire Foam" and resembles soap suds, its distribution being made by means of a system of piping throughout engine-room and stokehold. But the greatest safeguard is the scrupulous cleanliness in engine-room and stokehold now observed in all oil-burning vessels. The modern stoker is never "black," and the white-painted

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stokehold of to-day is a revelation to those accustomed to the old-time coal bunkers and may be likened to the contrast between the old Underground Railway and the New.

While ample provision is made to guard against dangers from within the ship, equal attention has been paid in recent years to add to the precautions against those external dangers such as storms, fogs, collisions, strandings and other dangers from which a ship at sea is never wholly immune, and which might necessitate the people having to abandon their well-found ship.

The chief reliance in such an emergency are the ship's boats, a very important, in fact, a vital part of every vessel's equipment. Although the art of boat-sailing and boat-handling flourished in an earlier period, modern steamship crews are not so unfamiliar with their boats as might be expected. In the days of sail, when ships lay at anchorage for long periods, there was a great deal of boat-work between ship and shore, and the crew and apprentices thus became expert boat-handlers in all weathers and in varying conditions in different parts of the world. To-day, however, the majority of ships lie alongside wharves or piers when they come

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into port, and there is consequently little or no boat-work in harbour.

Nor are the occasions at sea any more numerous. Consequently crews of modern ships would have been quite unfamiliar with their boats, and unaccustomed to handling them, had it not been for the very stringent rules prescribed by the various Governments for boat-drill and practice.

In the large liner of to-day, the string of lifeboats ranged along the boat-deck, fifty feet or more above the water, is a familiar feature. The fundamental difficulty with all boats at sea is that of lowering them safely and expeditiously into the water—not in the placid calm of a fine day, but in the middle of a dirty night when the ship herself is incapacitated and probably has a sharp list, and when the difficulties are intensified by the roughness of the waves and the inevitable undercurrent of haste, if not of panic, which characterizes most accidents at sea.

The problem of getting boats away from the ships has exercised many minds for many years, and has now been simplified to a certain extent by the rigid rules referred to above, which govern almost every detail of ships' boats, together with their equipment, their mode of lowering from the deck into

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the water, and the regular drills prescribed for the crew. The modern steel lifeboat differs from its predecessor in many respects. It is usually a steel hull with great flotation power and designed to carry up to 50 or 60 passengers in comparative safety if not in comfort.

The seamless steel boat, each side of which is formed of one sheet of steel, hydraulically pressed to the required shape, has many advantages over the wooden type. It does not shrink and warp and become leaky in hot or dry climates ; it is not necessary to have water in it to keep it tight and wet ; where a wooden boat would be holed or damaged if roughly handled, the steel boat, though it may be dented, remains water-tight ; it is fire-proof and is less liable to be smashed and holed when bumping against the ship's side. Furthermore, steel bulkheads may be fitted to increase its safety. Altogether the modern ship's boat of steel is a great improvement on its wooden predecessor.

The first principles governing lifeboats and all other life-saving appliances in a ship is that it should be possible to launch them safely and rapidly even if the ship herself has a list, and it should be possible to embark

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the passengers rapidly and in good order. As most large ships carry a large number of boats, and very often a double set on each side of the deck, the arrangement of each boat must be such that it will not interfere with the operation of other boats or rafts.

The operation of launching from davits has been much simplified in recent years by improvements to the old fixed type of davits. Notable among these modern developments is the Welin davit, which has succeeded in largely overcoming the previous shortcomings of the old-time davit, and now makes the operation of raising, swinging out and lowering one of great ease. The modern lifeboat itself is equipped in accordance with the regulations of each country, including food and water, lights, sails, oars and so on, and a later development has been the substitution of a manual system of propulsion which turns a propeller in lieu of oars, this method having the advantage that all persons may take a turn at the handle, even those who may not be able to handle an oar.

Familiarity with the operation of lowering of boats, the constant practice required by law, the fact that each member of the crew and each passenger is fully acquainted with his or her boat, and its precise location, are

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other steps which have been taken to reduce the confusion which might arise in a crowded ship, particularly at night-time. Emergency dynamos are fitted to enable the boats to be filled and lowered under the glare of the emergency lights in the event of the main lighting plant failing at a critical moment.

There is no difficulty in carrying out in perfect order the complete operation of "abandoning a crowded ship" in calm water in broad daylight. The practical difficulties arise when the sea is not calm, when the night is dark, and when passengers are frightened and inclined to lose their heads. Should the ship, as is most probable, develop a list to port or to starboard, a further problem arises, owing to the difficulty of lowering the boat on the high side, a difficulty which is increased by the great height at which the boats of large liners are necessarily carried. Most modern ships include among their lifeboat equipment a motor lifeboat which is designed to act as flagship, is able to take the other craft in tow and, being equipped with a short-range wireless transmitting set, is able to maintain communication with whatever vessels have been summoned to the scene of the disaster. In addition to the fleet of well-equipped lifeboats, all passenger



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liners carry a large number of Carley floats (named after the inventor), deck seats, rafts, and other buoyant apparatus all designed to maintain as many people afloat as possible until they can be picked up. A lifebuoy may be made of solid cork, capable of floating in fresh water for at least twenty-four hours with 32 pounds of iron suspended from it.

A lifebuoy may also be of hollow construction, providing that if it depends for its buoyancy upon air it does not require to be inflated before use. A common pattern nowadays is a hollow metal buoy. All lifebuoys must be fitted with life-lines. A certain proportion of a ship's lifebuoys must be fitted with efficient calcium lights which ignite on being thrown into the sea.

All lifebuoys and life-jackets must be suitably placed about the ship so as to be readily accessible to all persons on board. Not only this, but the position of the jackets and buoys must be clearly indicated by suitable notices.

In addition, a life-jacket of approved pattern for every person on board is required by law, the chief provision being that it should sustain a weight of 15 pounds for twenty-four hours.

Provided that the boats can get away

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safely from the ship's side, they can live in almost any weather and cover almost any distance. In fact, any well-equipped ship's boat is an adequate craft in which to circumnavigate the globe, if not in comfort, at least in perfect safety.

In olden times the mariner feared chiefly the fierce storms that swept down upon his small, unhandy, and unseaworthy craft. The traditional dangers of the sea were storm and tempest, as is well illustrated by the Forms of Prayer to be used at Sea, which contain prayers only for deliverance from the tempest, and Thanksgiving after a storm, there being no mention of other risks and dangers such as collision, stranding, and fire.

But in these times, well-constructed ships, the skill of the naval architect, the immense size of the modern steamer compared with the old wooden ships, the power and reliability of the engines, the great improvement in technical and scientific devices, the increased experience and the competent seamanship of the seamen have all combined to conquer the elements. The unsinkable ship is still but a theory, the risk from fire still exists, and ships still founder at sea or are wrecked on some uncharted danger. But even the fierce gales which sweep

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across the North Atlantic have lost their terrors for the great, well-found, powerful ships which now engage in that trade. It is true that, when westward bound, great liners are often forced to slow down, or even to heave-to, in the teeth of the gale and the great seas, but this is in order to nurse the vessel and not to strain her. When running with the gale astern, the ship is quite comfortable and dry. Modern skill has made it possible for these floating hotels to carry on their business in great waters irrespective of the weather, so that the hundreds of passengers are able to dress for dinner and dine in the gorgeous saloons to the music of the orchestra, while outside a storm may rage which would have sent the smaller ships of an earlier age flying into port for shelter.

There is, however, one danger which all the inventive genius of man has not yet been able to overcome—fog. It is the navigator's worst enemy and nothing has yet been invented to improve upon the old and tried precautions against fog—namely, a sharp look-out, a carefully regulated speed and the proper and timely use of the fog signals laid down by law, though experiments with infra-red rays seem to point to some

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solution of the problems of navigating in fog.

No precise standards as to what constitutes a fog has yet been laid down in a Court of Law, though there is a standard or scale of fog intensity which is generally recognized and adopted.

Rule 16 of the Collision Regulations requires ships in fog to proceed at "a moderate speed," a term which has been variously interpreted, but the generally accepted definition is "such a speed which, although one ship may be seen from another only at a short distance, time will still be left for each to take proper steps to avoid the other."

The interpretation of the term "moderate speed" depends in large measure upon the circumstances. What would be moderate speed in a broad and unfrequented ocean would be immoderate in the crowded fairway outside New York, for example, and "moderate speed" is not synonymous with "reduced speed," nor is "moderated speed" the same as "moderate speed."

Probably in no profession or walk of life is a keen and trained eyesight more important and of greater value than on the bridge of a fast-moving ship at sea. Many a ship has been saved from disaster by the sharp eyes

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of a look-out catching a glimpse of white breakers on rocks, or on ice. In Eastern waters native craft, which seldom carry lights, are a danger to be avoided only by watchful care, and on the Grand Banks off Newfoundland small craft are often unable to exhibit their navigating lights in bad weather. In every ship a look-out is stationed from dark to dawn, and the ancient practice of striking the bell and of hailing the bridge every half-hour with the cry "Lights are bright and all's well" is still carried on—a survival from the day when oil-lamps were exhibited from the fore-castle head and were consequently not visible from bridge or poop, and also an assurance that the look-out was both awake and alert.

Most seamen can see farther than shore folk and can pick up lights, land, or objects with great facility, which seems to show that distant vision can be improved by long years of practice. Very often a seaman will pick up the faint loom of land, particularly at night, when it remains invisible to the unpractised eye. Elderly captains have clearly perceived the land at night when junior officers have failed to detect it, though the vision of the latter is undoubtedly stronger and more penetrating. The art of this subtle

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detection seems to appear in looking at the loom of the land rather than in peering into it.

In the course of years, the value and importance of the Three L's (Lead, Log and Look Out) have been emphasized as the great safeguards against all maritime dangers. The Lead will warn the navigator if he be running into shallow water ; the Log is the instrument which tells him his speed ; and the Look Out is the most efficacious of all in preserving the safety of all on board and the ships in which they sail.

## CHAPTER IX

### AIDS TO NAVIGATION

IN the last chapter some description was given of the measures taken for the safeguarding of ships, internally and externally. In this chapter something will be said of the various aids to navigation which enable the seaman not only to take his ship in safety from one port to another and across the ocean, but to do so with a minimum of delay and a maximum of precision. The art of handling a ship is seamanship ; the art of conducting her across the seas is navigation. Charts are the first requisite for navigation. Ships without charts would be as much endangered as ships without rudders, though it must never be forgotten that Columbus, Vasco da Gama, Magellan, Cook, and the other great pioneers of navigation, traversed the oceans without their aid. But in these modern times charts are an imperative necessity, "the other brains," the silent comrade of the navigator, his guide, councillor and friend.

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Charts, or rather crude maps of the seas, date from ancient times. The map of the world by Ptolemy (A.D. 150) is well known. Like all early geographers, he took as his standard the meridian of the farthest point of the Canary Islands for the simple reason that that was the most westerly point of the world then known, a meridian which continued to be used nearly to our own day. The terms latitude and longitude are a survival of those early times when the known world—confined to the countries fringing the Mediterranean—was supposed to be one and a half times as long as it is broad, longitude being measured along the length of the chart east and west, and latitude along its breadth from north to south.

After Ptolemy's time, map - making declined until the introduction of the magnetic compass, which made possible the exploration of unknown seas out of sight of land, and the graduation of charts thus became necessary. Mercator, whose proper name was Gerhard Kramer, seems to have been the first to make a projection with parallel meridians on which the latitude increased proportionately with the longitude. This chart of the world (1569) was extra-



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ordinarily useful, but above  $40^{\circ}$  north the results were very crude.

In the sixteenth and early seventeenth centuries charts continued to improve both in accuracy and in scope. The Dutch took the lead in cartography, and produced very fine charts, and English explorers depended largely upon these until the time of Charles II, when under Pepys the Royal Navy was vastly improved in every respect, notably in hydrography. In 1693 Captain Greenville Collins, who described himself as Hydrographer to the King, published his *Coasting Pilot*, and thereafter the Admiralty constantly employed ships in exploration and survey. The Hydrographic Department was established in 1795, and from that time dates the modern period of chart-making, Alexander Dalrymple being the first Hydrographer.

The modern chart as issued by the hydrographic offices of all the maritime nations is a beautiful production, and in recent years has become more or less standardized, the International Hydrographic Bureau being established at Monaco in 1919 for this purpose. The primary function of a chart is accuracy, the exact determination of latitude and longitude being of the utmost importance to the navigator. Probably the first thing to strike

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a layman on looking at a nautical chart is the large number of figures dotted all over it, showing the depth of water at the spot indicated. Close examination by sounding is the only method by which marine surveys can be made, and the result is that the nautical chart is based chiefly on a very large number of soundings. In other words, a chart shows the floor of the sea in great detail, though an immense mass of other information is also

16	15	15	13	13	14	12	11	10	9
14	15	14	14	13	13	12	11	9	8
15	15	14	17	16	14	13	10	10	9
16	16	17	18	16	12	11	8½	9	10
18	17	15	12	9	7½	7½	7½	9	10
19	16	12	9	5½	4½	5½	6½	6½	9
22	19	16	10	3½	5½	6½	7½	8½	10
20	16	12	7½	5½	6½	6½	7½	8½	10
18	15	11	9	7½	7	7½	8½	10	11
20	17	14	11	12	10	9	10	11	13

included for the use of the navigator. The maximum number of soundings which can be shown clearly on a square inch of paper is one hundred.

On a scale of 1 inch to the mile, each sounding occupies an area equal to 8 acres of ground, while on a scale of 6 inches to the mile, each sounding represents little less than a quarter of an acre—about 100 feet square.

Even if soundings were shown as closely as this on a scale of 6 inches to the mile they

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would be 100 feet apart. Blank spaces between soundings indicate that none have been made. Except in plans of harbours that have been closely surveyed and examined, the 6-fathom contour line is usually considered as a caution line, while on rocky coasts and with ships of deep draft the 10-fathom line is to be regarded as a warning.

Charts are issued at periodic intervals by all the hydrographic offices of the world and new editions are constantly being published. All charts should, of course, be correct up to date, and this is achieved by the weekly issue of Notices to Mariners, such bulletins containing the latest information gleaned from all parts of the world. Every chart has its own number and title, and the great majority of charts are drawn on a true north and south meridian. Practically the whole of the coasts, seas, and oceans of the world have been charted, or are in course of being charted, but there would appear to be scope for the elimination of considerable overlapping and duplication, particularly in the case of the two largest Hydrographic Offices, those of Great Britain and the United States. These offices not only issue charts of the same areas but employ survey ships, if not in the

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same waters, at least in surveys which could be more economically and more efficiently carried out by joint endeavour rather than in national rivalry.

There seems to be no reason why all hydrographic work should not be placed on an international basis, the Bureau of International Hydrography already established at Monaco showing not only the need for international co-operation, but the feasibility of such a scheme. Bureaucratic and national jealousies will, however, prevent any such rational innovation, though it would undoubtedly be of a great advantage to the navigator, and to the taxpayers of all countries.

Over 4,000 charts have been issued by the British Hydrographic Office, and over 3,000 by the United States Hydrographic Office, these being exclusive of the very large number issued by the offices of the other nations. Thus, the industry of chart publishing embraces the provision of survey ships with their trained personnel, a great activity in all the waters of the globe which is continually going on ; the collection and collation of all the material gained ; the drawing of the charts on specially prepared paper ; the construction, compiling, drafting, engraving,

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and printing, of the charts. In addition, there is the care and correction of all copper and zinc plates; and the correction and maintenance of all these charts in an up-to-date form. All other hydrographic publications including Sailing Directions, Notices to Mariners, light lists, tide tables, and other publications, are included under the general term of hydrographical publications, designed primarily for the increase of maritime security.

It has been remarked in an earlier portion of this chapter that the introduction of the magnetic compass and the subsequent graduation of charts made navigation possible out of sight of land. When within sight of land, and particularly during the hours of darkness, the navigator relies very largely on the lights and other nautical guides established on the coasts of the world.

The earliest type of lighting apparatus consisted of an open coal or wood fire with other inflammable material, burned in a brazier on top of a tower. In the days of ancient Athens, beacon fires on the isles of the *Ægean* guided navigation. Beacon fires from the Lizard to Dover and thence to Flamborough Head told of the near approach of the Armada. Later on, an oil burner was employed, enclosed in a lantern with

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small panes of thick glass. The illuminant was fish or whale oil, and in Nelson's day sperm oil was in general use for lighthouses. But with the yearly diminution of the whale catch, it gradually increased in price until its use became prohibitive and mineral oils began to be extensively used, with a corresponding improvement in illumination. Smeaton's Eddystone Lighthouse of 1759 was lighted by twenty-four candles. To-day many lights exceed half a million candle-power, and so great has been the improvement in illuminating engineering that the distance from which the principal lights are visible is limited only by the horizon. Under certain atmospheric conditions, the glare or loom of the light, and even the light itself, may be visible far beyond its normal range, notably in the Red Sea, where lights are frequently seen at distances up to 80 miles.

The growth of the world's maritime traffic in the eighteenth and nineteenth centuries, together with the opening of new territory, and trade routes, and the general expansion of commerce, resulted in an enormous increase in the number of lights. Rapid advances have been made in recent years in the introduction of quick revolving lenses, throwing powerful light beams, oil vapour lights, auto-

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matic acetylene lights, lighted buoys with high focal plane, more powerful sound signals, radio fog signals, automatic gas fog signals, submarine signals, and improved lightships and lighthouse construction.

Many of the automatic unattended lights are now fitted with a device known as the Sun Valve. This ingenious mechanism is set in operation by the coming of daylight, the effect of the increasing light rays being to operate the valve which shuts off the gas. A small pilot valve remains lighted throughout the day. The fading of daylight at nightfall causes the reverse operation to take place, the valve opening and allowing the gas to pass through, where it is again ignited by the pilot flame. Briefly the Sun Valve extinguishes the light at sunrise and ignites it again at sunset, thus considerably reducing the acetylene gas consumption while at the same time permitting an unattended light to remain in operation for an extended period without re-charging.

In this widespread system of navigating lights, which covers the globe, and is maintained by all civilized countries, the developments of science and engineering are continually being applied in the fields of physics, optics, acoustics, and electricity, and of civil,

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mechanical, electrical, and marine engineering and naval architecture.

A complete list of the world's lights is contained in the Admiralty List of Lights which includes details of no fewer than 14,000 light-stations, 300 lightvessels and 1,700 fog signals—these figures excluding the Great Lakes of North America and all rivers above the limits of seagoing navigation.

This vast organization, international in its scope, is maintained by the Lighthouse Departments of the various countries concerned, with the exception of the coasts of England and Wales, the lighting of which is entrusted to that remarkable anachronism, Trinity House. This ancient institution was already a body of importance when Henry VIII granted its first charter in 1514, *inter alia*, "for the relief, increase and augmentation of the shipping of this Realm of England." Since that period the duty of erecting and maintaining lighthouses and other marks and signs of the sea has been entrusted to this honourable Corporation, composed of distinguished master mariners of long experience, Elder Brethren who, side by side with the most ancient and esoteric customs, maintain in ultra-modern fashion the most up-to-date inventions and improvements in the



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whole business of illumination and wireless communications at sea.

In Scotland, the lights are under the control of the Commissioners of Northern Lights, and in Ireland under the Irish Light Commission. The expenses of maintaining this world-wide system of navigating lights is borne by the shipowners—in England out of the General Lighthouse Fund provided by means of Light Dues paid by all ships using the ports of the United Kingdom. This practice is followed in most countries, with the exception of the United States, where the tonnage tax collected on vessels arriving in United States ports is paid into the Treasury as part of the consolidated revenue and is not specially earmarked for the lighthouse administration.

The modern lighthouse, with its foundations quarried out of solid sea-swept rock, and built so strongly and so firmly that it resists the worst of gales, is a marvel of civil engineering. The design and construction often present great difficulties, while the superstructure or tower demands great stiffness and rigidity, since excessive vibration would not only lead to weakness in the structure itself, but would be detrimental to the lamps and clocks of the illuminating apparatus. The modern illuminant is kero-

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sene, forced by compressed air into the vaporizer of the lamp, the whole, with its lenses and reflectors, being mounted on a steel base, floating in a mercury bath, thus eliminating the friction and the consequent generation of undue heat. Lights on a well-marked coast-line should be placed so that a vessel may always be in sight of one light, and in order to avoid confusion between lights, they are given distinct characteristics including fixed, flashing, and group flashing, while further diversification is obtained by the use of red and green screens.

In addition to lighthouses, lightships are employed in places where it is not possible or desirable to erect a fixed structure, many of these vessels being connected with the shore by wireless telephone. Further additional aids to navigation are provided by lighted buoys, lighted beacons, and other illuminated marks, most of which are now automatic and unattended. Other types of buoys are whistling and bell buoys, the latter celebrated by Mr. Rudyard Kipling :

I dip and I surge and I swing  
In the rip of the racing tide,  
By the gates of doom I sing,  
On the horns of death I ride  
A ship-length overside.

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Between the course and the sand  
Fretted and bound I bide,  
Peril whereof I cry  
Would I change with my brother  
A league inland?  
(Shoal! 'Ware shoal!) Not I!

But as fast as all these modern improvements in lighthouse illumination are being made, so fast is another agency coming into use, supplanting and possibly superseding altogether in the not distant future the ancient mode of guiding the navigator by means of illumination. It is possible that the modern lighthouse is now reaching its mechanical and optical zenith. At this juncture a new and unexpected rival is being rapidly developed so that its ultimate form cannot be foretold. The light beam is giving place to the wireless beam, and modern science is now experimenting with, and indeed perfecting, a beacon which sends out one or more wireless beams in the same way as the lighthouse sends out its light beam. These devices, which seem destined ultimately to supersede the lighthouse and lightship altogether, have this advantage over the existing institution—they are available and equally useful by day or by night, in clear weather and in fog, and they may be employed

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by the navigator at any distance, from 1 to 50 or even 100 miles. Distance is no bar. It is probable, therefore, that the present generation of navigators may see the lighthouse towers of to-day, their lanterns dismantled, fitted up as wireless beacons, while the picturesque figures of the old-time seamen-lightkeepers, legitimate descendants of the father of Grace Darling, give place to smart, alert Twentieth-Century artificers and electricians who knew not Joseph.

All this work of facilitating navigation, of charting the seas, of investigating winds and currents, of improving the instruments of navigation and of the numerous beneficent discoveries and inventions for the use of the mariner would not be complete without a passing reference to the great names for which seamen, navigators and mariners have an especial affection and respect.

Among those specially associated with early exploration and scientific surveys, Lieut. Charles Wilkes, United States Navy, takes a high place. In the 'thirties of last century he commanded the first scientific expedition provided and fitted out by Act of Congress. Wilkes's voyages covered an immense area, and resulted in the issue of eighty-seven engraved charts which have continued to

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serve up to the present time as the basis of charts issued by all the maritime nations.

Another distinguished American was Lieut. Matthew Fontaine Maury (1806-73), whose talents and inclination were essentially those of a meteorologist and oceanographer. He studied the winds of the globe with a view to minimizing the duration of ocean passages. The configuration of the ocean bed, the temperature, circulation, physical and chemical properties of sea water, the currents, tides, waves, navigation, hydrography, and marine meteorology were all subjects which came within the purview of this great naval scientist. He based his studies on the reading of a great number of ships' log books, and from this mass of data he constructed nautical, wind, current, pilot, track, thermal, storm, rain, and other charts. He also compiled eight large volumes of sailing directions and gave the world the *Physical Geography of the Sea*. His countrymen have honoured him with the title "Pathfinder of the Seas," and at the top of the United States Pilot Charts there appears the inscription: "Founded upon the researches made in the early part of the nineteenth century by Matthew Fontaine Maury while

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serving as lieutenant in the United States Navy."

Maury's great British contemporary was Admiral Robert Fitzroy (1805-65), collaborator with Darwin in the *Narrative of the Voyages of H.M.S. "Adventure" and "Beagle."* Fitzroy invented the mercurial barometer named after him, and instituted the system of storm warnings that developed into daily weather forecasts. The famous voyage of the *Challenger*, commanded by Sir George Nares, was largely due to the work of Maury. In her sailed John Murray, the eminent oceanographer, who was assistant naturalist to the expedition (1872-6) and who edited the Reports of the voyage. Murray amassed a fortune in other directions, and in his will bequeathed large sums for oceanographical investigations, one result of which is the despatch of the expedition (1933) to the West Indian Ocean and Arabian Sea.

Professor Georg Neumayer was the outstanding figure in Germany, and has been named the "German Maury." He was for many years the head of the Deutsche Seewart in Hamburg, and from those headquarters organized and directed much oceanographical activity. In the more limited field of the theory and practice of navigation, the names

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of Inman, Norie, and Raper are known the world over, chiefly for the epitomes of Navigation, and comprehensive Tables compiled by them. Nathaniel Bowditch (1773-1838) was a ship's clerk who later became a master mariner. His *Practical Navigator* and Tables were standard works in the United States for many years. His countryman, Thomas Sumner, first drew attention to the importance of the Position Line in navigation.

These are the names of but a few outstanding figures of a generation that is gone. They survive as witnesses to an age that is rapidly passing, to an art of seamanship and a practice of navigation that flourished for three centuries, but which the progress of science and invention seems destined to make as obsolete and as antiquated as the astrolabe of Columbus and the portulan chart of Magellan.

## CHAPTER X

### THE MASTER AND THE MARINERS

IN this tremendous kaleidoscope which we have endeavoured to depict of the great and ever-increasing changes which have passed across the sea scene, there remains the fixed and ever-present figure of the master mariner—the captain, the commander, the one human agent who from the time of Egyptian, Chinese, Phœnician, and Arabian sea trade has dominated the sea and the ship.

The shipmaster has been a great figure in the story of mankind, a lonely, solitary figure, neither a member of the crew nor a passenger, charged with responsibilities that he can share with no man and of which he can never for one moment unburden himself.

The term “Master” is an ancient and an honourable one, much prized and jealously guarded by the brothers of the cloth who, in England recently, formed themselves into



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a livery company of the City of London, under the title of the Honourable Company of Master Mariners.

“Master” implies one having the command of a ship and all that therein is. He was at one time law-giver, even law-maker, surgeon, parson and schoolmaster. Though in recent times he has been gradually divested of many of his former functions, he remains in the eyes of the law of all nations the supreme power in the ship from whose fiat there is no appeal, and to whom all men must render instant and unquestioning obedience. He is charged with the safety of the ship and cargo, and of the life and health of the passengers and crew; he is the navigator who must conduct the voyage with skill; the commander who must display justice, temper and consideration; the trusted servant who must act with prudence and judgment in the business of his employers; and who, in the hour of trial, must rise to the stern occasion with fortitude, the spirit of leadership and with high courage.

One endowed with such great responsibilities must enjoy also equal powers and privileges, particularly in circumstances where he may be unable to communicate with his owners, though such circumstances rarely

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arise in these days of telegraphic and wireless communication.

He could borrow money on the security of the ship, pledge his owner's credit, even sell the ship in emergency. Under the pressure of imminent danger he may throw portion of the cargo overboard, choosing what he pleases for the purpose; and to save his ship and the lives of those in her he may even throw the whole cargo overboard. In a foreign country he becomes the agent of the owners and of the freighters, an agency which devolves upon him by the law of his flag. The same law that conferred this authority ascertained also its limits, and the flag at the masthead is, and was, notice to all the world of the extent of the master's power. That flag, his command on board, the ship's papers, and all the circumstances that connect him with the vessel, isolate the master in the eyes of the world and proclaim his authority.

As the trusted servant of his owners, the master is bound to devote the whole of his time and attention to their cause, and the law allows of no custom which would give him an interest against his duty, though a perquisite known as the "accustomed primage" is a gratuity to which to this day he is

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entitled. In the old days of sail he was entirely responsible for the success of the adventure or enterprise in which the ship was engaged, for the owner was a merchant adventurer, and it was the master who made or marred that adventure. His arrival in foreign and in half-civilized or even barbarous countries often brought problems of great complexity. He might have to engage in barter ; if his ship were damaged he might be obliged to embark on extensive repairs, employing whatever means existed ; and he was forced to rely solely on his own efforts, for there were not then, as now, agents in every port.

The old terms " Respondentia " and " Bot-tomry " survive to indicate the means taken to deal with such contingencies before the introduction of modern currency and exchange systems which, together with the telegraph, enable the master to communicate immediately with his owners. In circumstances such as those referred to, the master was exposed to the machinations of unscrupulous persons ; there were numerous business hazards involved in the chartering and employment of his vessel, and it was necessary to appoint to the command not only a competent seaman and navigator, but one in whom implicit trust could be placed, and

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whose judgment and sound sense could be relied upon in any emergency that might arise in any part of the world where the adventure might take his ship. Very often the master was forced to rely on his own judgment, often in circumstances of great difficulty, and sometimes of great danger. The success of the venture often rested on his ability to secure a freight which would be profitable, and which would offer a fair opportunity of another profitable cargo at the port of discharge.

In these times, all such matters are the business of shore agents, though even nowadays the master of a tramp is often obliged to conduct the business himself, and text-books on *The Shipmaster's Business* and *The Sea Carriage of Goods* remain to attest the great scope of this one aspect of a master's responsibilities.

In preserving discipline on board, his powers are despotic, and he is responsible for the use of those powers only to the courts of the country. The English law likens his authority to that of a parent over his child, and to a master over his apprentice, with this difference—that the master must enter every punishment, and the offence for which it was inflicted, in the ship's official log.

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Many of his duties and qualifications are peculiar to his office, which is singular for the wide variety of functions and duties which it combines. His despotic powers are due to the necessity imposed by his situation as the supreme authority, and the necessity to suppress any evil effects of bad example in so small and inseparable a community, but he must exercise them with the utmost tact and good temper, especially as he lives in intimate contact with his subjects, individuals of every grade and of varied temperament, cut off from the rest of society.

There is one instance, and one only, where he may lawfully abrogate his supreme authority, but even then not wholly. A pilot supersedes the master in his control of the conduct of the navigation of the ship, and commands the prompt obedience of the master and crew. So long as the pilot remains in control of the navigation, so long must his authority and prerogative be respected, an acknowledgment of the skill and experience of the pilot, and of the necessity for unity of command. Even so, there remains the latent power in the master to take command if extreme necessity should arise, or in what has been picturesquely described as "the agony of collision."

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Pilots fill an important rôle in the hierarchy of the sea. In the old days they were usually local fishermen or seamen, familiar with the waters of their own ports and districts, who offered their services to the masters of ships arriving off the harbour. In the course of centuries this free-and-easy practice has developed into a world-wide system of regulated pilotage, and there are practically no ports of any size or importance where the pilots are not licensed and controlled by Local Pilotage Authority. Their duties, responsibilities, powers, pay and conditions of service are laid down in great detail and to be eligible for appointment to a pilot service a seaman must possess the highest credentials. In most of the great ports of the world the Pilot Service is an important and honourable institution. Chief among them is the Bengal Pilot Service for the navigation of that dangerous and difficult river, the Hooghly. This institution is one of the best-known pilot services in the world, and it is recruited from young officers who join as apprentices and spend their lives on the river.

Nowadays pilots earn very respectable incomes. In most ports their pay is based on fees calculated on a basis of draft and tonnage of the vessel. In most ports it is compulsory

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for a master to employ a pilot, but very few masters enter any port without taking a pilot unless they are regular visitors to the place, are familiar with the local conditions, and have been able to obtain a certificate exempting them from taking a pilot.

The pilot's prime duty is to navigate safely the vessel in his charge until she is clear of pilotage waters. The precise limits of his responsibility in relation to the ultimate authority of the master are somewhat vague. The latter, so long as he is master of the ship, must always be invested with a final and complete authority. In practice the master is in the pilot's hands. He must trust him to the last degree, but, if he be ignorant of the locality, his trust must necessarily be a blind confidence, particularly if the question be one of navigation, pure and simple. On the other hand, there may be, and often are, occasions when another ship is involved and the issue becomes one of local pilotage and navigation, plus the Rule of the Road. Such an issue is often complicated by bad weather, fog or darkness, and when a possible collision or a stranding is imminent, the master's responsibility in regard to the pilot becomes one of acute anxiety, particularly if, in these last disturbed

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moments, it suddenly appears that the line of action premeditated by the pilot differs from that which the master thinks should be taken. There is often little or no time for thought or discussion, and it is at moments such as these that the full weight of his responsibility bears upon the master.

From this brief survey of the master's position in ancient and modern times, the extent and nature of the responsibilities of his office will be plain.

“The skill and seamanship, and divining sagacity of the navigator; the vigilance of one who must rely on wind and sea with unceasing distrust and still hold human life and material wealth in his keeping; and the courage, self-possession and prompt decision of the mind that rules alone through storm and sunshine—such are the accumulated requisitions of this one office.” (Maclachlan's *Law of Merchant Shipping*.)

So, too, though in lesser degree, with the mate, or chief officer as he has more generally been styled in modern times. The mate is the fidus Achates of the master, his mate in the true sense of that term, and it is testimony to the importance and high sense of trust which the law reposes in these two officers that even down to this day the largest



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Atlantic liner may put to sea with but two certificated navigating officers—the master and the mate.

While the master, exercising his supreme authority, remains aloof from passengers and crew and only appears at meals, or when inspections are to be made, and on other occasions, the mate is the executive officer, the right hand of the master, his chief lieutenant. From his intimate knowledge of all that goes on in the vessel, he is able to maintain a close and comprehensive control of the numerous activities in progress, the care and maintenance of the ship, the responsibility for the safe stowage and delivery of the cargo and the work of the crew.

But perhaps the most significant change in the personnel of the ship has been the steady rise in professional eminence of the marine engineer.

The early days of steam-power as a motive force destined to supersede sails have already been sketched in an earlier chapter. The advent of this new power was received by the conservative seamen of the day with instinctive antagonism. It was viewed with suspicion and distrust. It brought with it the artificer, who became a new problem in shipboard life. He was not a mariner in the

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then accepted sense of the term. He was not a seaman, a navigator, an "idler" or a tradesman, and he knew nothing of masts, yards, canvas and cordage. His position in the internal economy of the ship was ill-defined. He was regarded as a supernumerary, had no executive rank and did not take his place in the captain's saloon. The frequent failure and breakdown of his "machine" exposed both the engineer and his machinery to the ill-concealed disdain of the true blue mariner. Coal, engines, furnaces, and oil, combined to introduce into the spotless atmosphere of the ship an element of filth and dirt.

The belching from the funnel of clouds of black smoke aggravated the nuisance; the process of coaling ship covered the vessel in an impalpable but none the less real coating of fine black dust; the vicinity of the engine-room was grimy and oily and the personal appearance of the engineer and his myrmidons of the stokehold was necessarily in striking contrast to the naturally spick-and-span sailors of these times. There was, too, a steady growth in professional jealousy. The seamen regarded the engineers with contempt; the engineers, confident that their day was at hand, returned the contumely in full measure,

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and there arose a rivalry and division between the two professions which exists to this day.

In the latter half of the nineteenth century the tremendous advances in marine engineering brought with it a corresponding improvement in the professional status and the standing in ships of the artificer, now become an engineer, which had been steadily advancing. When in the early 'nineties the struggle for the Blue Riband of the Atlantic began, the triumphant passages of the fine liners of the time reflected their glory on the engineers whose skill and technical knowledge made such fast passages possible. The successful conduct of the voyage, formerly the sole prerogative of the master and his mates, was now shared equally between bridge and engine-room, and within the past thirty years the profession of marine engineering has become quite as important, and has attained equal professional and social status with that of navigation and seamanship. In short, the position of the ship's engineer became so advanced that to-day he occupies a position in the ship vastly different from that of his grandfather.

Instead of being an unwelcome intruder and classified with the petty officers, the chief engineer has now become second only to the

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master, a position which he contests with the chief officer, usually to the discomfiture of the latter. He seeks and demands equality with the master, and does not admit that his duties, responsibilities, and privileges, are in any way inferior. Moreover, marine engineers, as a professional body, have shown themselves far more cohesive and united than their brethren of the seas, and far more forceful in asserting their rights and their position. The struggle for supremacy—for it is nothing less—has never been relaxed and the old saying that oil and water never mix is as true in its application to this professional rivalry as ever it was. Nor can the dispassionate observer but admit that in the modern sea carrier the engineer is justified in his claim—that he fulfils a function as vital as those of the mariners.

In the 'seventies and 'eighties of the last century there were occasions when a breakdown of the machinery gave the master and mariners the opportunity of asserting their ultimate supremacy. So long as a ship carried masts upon which an emergency spread of canvas could be set, she could be sailed into port when the occasion arose. But even this last privilege of the seamen has now been swept away. The modern steam and

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motor ship has no facilities for a display of canvas, and the fracture of a propeller shaft or the loss of the propeller gives the master few opportunities for a display of seamanlike qualities. He can but send out a wireless call for assistance and rely on the engine-room staff to make temporary repairs enabling the vessel to reach the nearest port.

He does not even fulfil his traditional rôle of being the last to leave the ship—the wearer of that halo in these days being the wireless operator, whose gallantry in remaining at his instrument, sending out the distress call with particulars of the ship's position while the vessel is sinking under him, has elevated many of these young technicians to the post of glory.

The great improvement in the professional status of the marine engineer has its counterpart in the conditions in which he works. The old-time engine-room, the stokehold, the black squad of firemen and coal trimmers, the grime, the sweat, and the toil of the past, have gone. In their place is the modern engine-room and the boiler-rooms with their white paint, shining brass, and spotless cleanliness.

While the status of the chief engineer has steadily advanced, the old-time conception

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of the master, as one who held in his hands the executive reins and directly controlled the life of the ship, no longer remains true in the large liners. There has been a great measure of decentralization, due to the physical impossibility of one man assuming such diverse and varied responsibilities. Nowadays the master of the liner finds his time fully occupied on the bridge, and seldom leaves the bridge deck where his cabins are located, except for occasional inspections, and to put in an appearance in the saloon at meal-time. A great part of his authority in respect to the passengers and crew is delegated to the Purser; he no longer exercises personal jurisdiction over the cargo, fuel and stores, the whole business affairs of the vessel being conducted entirely by the shore personnel.

A number of sub-departments, operating independently, all carry on the internal and external business of the ship, the details of which are practically unknown to the master—an interesting indication of the great changes which have become necessary since the days when ships carrying 100 passengers gave way to super liners carrying a total complement of 4,000 or more.

Nevertheless, the ancient link between the master, as the agent of the shipowners, and

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the crew remains. The agreement which contains the rate of wages, the scale of food, the conditions under which every member of the crew contracts to serve, is an agreement between the master and the crew. During the voyage the crew may receive advances of pay at different ports at the master's pleasure, and no mariner may be discharged and paid off except in the presence of a Government official known as the Shipping Master.

Any punishments or fines must be entered by the master in the official log, and be signed by him and by one of the officers, and this entry must be read to the offender "distinctly and audibly." The fact of the log entry having been read to him and his reply thereto must also be entered, the law in terms of the Merchant Shipping Act prescribing with great exactitude the precise mode of procedure which is to be adopted for the protection of both parties to the agreement.

The minimum scale of food to be supplied to every member of the crew is also laid down, and though many improvements have been made in recent years the old "pound and pint" still appear in the agreement. Thus, every man is entitled to 7 pounds of bread weekly, of which half must be soft (fresh bread) and half hard, i.e. biscuit or

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hard tack, but in port bread must always be issued in lieu of biscuit. Firemen and stokers are entitled to receive while the ship is under steam an extra quart of fresh water to the 28 quarts weekly to which each man is entitled, and also sufficient oatmeal to counteract the effects of excessive perspiration. At sea,  $1\frac{1}{2}$  pounds of fresh meat is considered to be equal to 1 pound of salt meat (salt horse) and  $\frac{3}{4}$  pound of preserved meat is regarded as equal to either, while 1 ounce of tea is considered as the equivalent of 2 ounces of coffee. All the provisions and water intended for the consumption of the crew are inspected by Board of Trade Officers, and since 1908 certified cooks are compulsory in every foreign-going ship.

If a ship be lost or destroyed at sea, the crew were entitled only to wages up to the date on which she was lost, but in recent years they have been paid up to the time of their arrival at their home port. No man is entitled to the rating of A.B. (able-bodied seaman) until he has served at sea for three years, during this period his proper rating being Ordinary Seaman.

The traditional qualifications of an able seaman were that he should be able to "hand, reef and steer," and though the term sur-



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vives, the qualifications have now passed away. An able-bodied seaman is no longer required to "hand" or furl sail, to reef sail, or to steer a ship under sail, and so revolutionary are the changes that in most modern ships there has now been introduced a self-steering device which automatically maintains the ship on a more perfect course than the best of human helmsmen.

So, too, with apprentices whose indentures couched in medieval style seem to have lost any actual application to the needs of the day. The vital clause is that the apprentice "should be taught to be a seaman and officer by being placed on board a steamer to learn to be a seaman." This has been held to mean that he should be given the actual sea service and instruction which both the parties to the indenture recognize as being necessary to enable him to qualify for a certificate as second mate—an undertaking fully and honourably fulfilled by most companies to-day, in striking contrast to the scornful neglect with which apprentices were previously treated.

The master, apprentices, pilot, passengers, and stowaways, are those whom the law does not recognize as seamen on the ship's article within the meaning of the Act.

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The passenger's ticket is the form of contract between the shipowner, in his capacity as a common carrier, and the passenger. The shipowner, by inserting conditions on the ticket, and by bringing these conditions to the passenger's notice, may relieve himself of responsibility for the passenger or his baggage.

If the passage money has been paid and the ship be lost before the commencement of the voyage, the passenger must be refunded his passage money. If the passage money has not been paid by the end of the voyage, the master has a lien on the passenger's baggage but not on the clothes which he is wearing. In an emergency the passenger may be called upon to perform any service which the master may require of him. He must, if necessary, work the ship and, should the occasion and the necessity arise, the master may even call upon him to fight the ship, though in these days such a contingency is not likely to arise.

It has been held that the presence of a particular passenger who might offend the susceptibilities of the other passengers does not justify a refusal to carry him. A notoriously bad character, if his passage has been booked, is entitled to a passage so long

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as he behaves himself. It must be remembered that shipowners do not guarantee or insure the safety of passengers, who are carried entirely at their own risk. The shipowner does not even guarantee the ship to be free from defects likely to be the cause of perils and dangers.

But though such a guarantee is not given, it is implicit in the splendid ships, the numerous rules and regulations, the extreme care and foresight, and the many safeguards now provided as the fruits of long experience.

## CHAPTER XI

### THE BUSINESS OF SHIPPING

DURING the sixteenth century—a century of discovery and exploration—the vessels in which this great work was carried on were nearly all of one type, though, in the course of the hundred years that passed, important changes and rapid advances were made in the art of ship design and rigging.

In the early part of the century, as may be seen from the few extant drawings and pictures, the ocean-going ship was small, ill-adapted for sailing, and an unhandy-looking craft. Even so, by the year 1500 Columbus had crossed the Atlantic, Diaz had doubled the Cape, da Gama had reached India, Cabral had discovered Brazil. It is clear, therefore, that their ships were a great advance on those of the early fifteenth century, which were entirely dependent on a fair wind and could not tack or beat to windward. The ships of the sixteenth century were built to carry both cargoes and guns; the height of deck was

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determined by the height of a man, and the design of the ship by the necessity for mounting guns on the forecastle, in the waist, and on the aftercastle. These three sections, bow, waist and stern, were the main features of the ship, and were more pronounced in the men-o'-war than in the merchant ships. The ships carried three masts. On the fore- and mainmast were set two square sails, course and topsail, while the mizzen lateen sail helped to keep the ship up to the wind.

Up to the opening of the sixteenth century ships could not sail against the wind. They could only go with it. It was the improvements in masting and rigging, and the introduction of yards, which enabled the sails to be braced up, pointing towards the wind; the improvement in the hulls, which were shorn of much of their top hamper and had a better grip of the water; and, above all, the introduction of the lateen sail, that made it possible for ships to beat up against the wind, and to tack. Hitherto it had been necessary to perform the manœuvre known as "wearing ship," with the wind, whereby much time and progress were lost. The ability to tack in the eye of the wind saved time and also made faster progress possible.

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This sail and rigging development reached its highest point with the clipper ships of the middle of the nineteenth century, which set as many as twenty fore-and-aft sails.

The introduction of the lateen sail on the mizzenmast—borrowed as it was from the Arab navigators—had a great influence on the early voyages, since it made it possible for Columbus, da Gama, and their successors, to sail fairly close to the wind, with their fore and main courses braced up, while da Gama on his voyage actually set a fore topsail above the fore course. The gradual transition from the three-masted ship of the sixteenth to the three-masted ship of the nineteenth century was merely a matter of slow evolution. Improvements were made in the position and rigging of the masts, more spars enabled an increasing spread of canvas to be set by the introduction of more sails; the cumbrous and unwieldy “castles” fore and aft gradually disappeared and, instead of being constructed in three separate longitudinal sections, the ship became a complete longitudinal structure, the aftercastle giving place to the poop, the forecastle remaining, though very much modified. “Clinker” or “clincher” building, by which each plank overlaps the next, gave way to the more

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staunch carvel build, in which the timbers are laid flush ; gun ports were cut in the ship's sides ; additional decks were added, the upper deck being flush, and with considerable sheer. About the middle of the nineteenth century with the advent of steam, iron hulls began to replace wooden hulls, new trades began to develop, and ships were built for specific purposes. Improvement in one direction was followed by advances in another, the spread of colonization brought new requirements by the various new territories ; there was not only a great increase in the size and carrying capacity of ships, but new products and new cargoes of a special type necessitated modifications in ships for their conveyance, and each " trade " developed a type of ship best suited to it. The result has been that the original " type ship " of the sixteenth century has been succeeded, through a long pedigree, by a host of descendants which bear no relationship whatever, and have no affinity in any detail, with the common parent from which they have all sprung. Save perhaps, in one respect, they are floating vessels capable of being propelled through the water.

To comprehend the diverse type of ships and the numerous special trades in which

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they are engaged, it is necessary to understand the inter-dependability of one country upon another for its communication and trade. The two most populous and most developed countries of the globe, England and the United States, are separated by a broad expanse of ocean, but that broad expanse only serves to link them closer together. To meet the ever-growing trade and communication between these countries, a vast steamship traffic grew up of a particular type of ship. It became known as the "Atlantic Liner" and was designed to carry a great number of passengers as well as cargo. But with the growth in the passenger trade, this aspect began to supersede even the importance of the cargo, with the result that to-day the modern Atlantic liner of 30,000 tons gross tonnage may have cargo space for less than 5,000 tons.

The mother of the modern liner was the celebrated—perhaps one should say the notorious *Great Eastern*—a vessel that was a generation in advance of her time. She was nearly as large as the modern liner, with her length of 660 feet and her tonnage of 19,000, and she introduced to the wonderment of the age the novelties of the luxury liner as we know them to-day, including the



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lofty saloons and dining-halls, the appointments of the state-rooms, the wide promenade decks, and an imposing appearance. Furthermore, the *Great Eastern* decided the fate of the paddle-wheel for ocean passages, her screw-propeller being generally adopted. Unfortunately she was not a financial success and, after a chequered career, she was broken up and sold for scrap, but for forty years she held the record of being the largest vessel built, and it was not until the White Star liner *Oceanic* was launched in 1899 that the size of the *Great Eastern* was exceeded. But even that *Oceanic* has long since become a relic of the past, and if we compare her with her successors, the great advances made are readily apparent.

The *Empress of Britain* was one of the most remarkable ships completed in 1931. She was built by Messrs. John Brown & Co. at Clydebank, her propelling machinery consisting of four sets of single-reduction geared turbines, giving a sea speed of about 24 knots. She has eight Yarrow-type water-tube boilers—all oil fired, the working pressure being 400 pounds per square inch and the temperature of the steam 725° F.

This vessel was built for the Southampton-Quebec service of Canadian Pacific Steam-

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ships, and she represents the finest type of luxury liner afloat. She is economical to run, fast, and magnificently equipped. Her passenger accommodation is large, providing for 465 first, 260 "tourist" class, and 470 third-class passengers, the total number of persons carried on board, including her crew, being 1,909. The chief feature of the *Empress of Britain* is her passenger accommodation, the average space per head being larger than in any other ship. The decoration of the various saloons and suites was undertaken by notable artists, including Sir John Lavery, R.A., who designed the ballroom, Sir Charles Allom the lounge, and Mr. Edmund Dulac, who designed the smoking-room, card-room and writing-room. The long gallery known as "The Mall" was by Mr. P. A. Staynes, and the American or "Knickerbocker" bar by Mr. Heath Robinson. In addition, there is an Olympian pool, children's playroom, sports deck, and other luxury features.

Altogether there are ten decks of great length, one deck running the full length of the ship.

A notable Italian ship is the *Rex*, now in service between the Mediterranean and the United States. The *Rex* is of 50,000 tons and is the largest ship built in

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an Italian dockyard. She is 880 feet long and has the very high speed of 27 knots. Her passenger space is enormous, providing for no fewer than 2,300 passengers and a crew of 1,000. Her accommodation is on the usual luxurious scale, including enclosed verandahs, gymnasium, a theatre complete with stage and dressing-rooms, and a chapel. Her propelling machinery consists of four sets of high-pressure geared turbines. A sister ship to the *Rex* is the *Conte di Savoia*, which runs in conjunction with the *Rex*. This liner has installed on board three Sperry gyro stabilizers, designed to lessen the movement of the ship and to check rolling, thus adding to the comfort of the passengers.

Some large liners have recently been completed in American shipyards, including two turbo-electric ships, *President Hoover* and *President Coolidge*, with refrigerated cargo space amounting to 60,000 cubic feet. The Matson Line has recently completed three modern liners for the American-Australian trade across the Pacific. They are the *Mari-posa*, *Monterey* and *Lurline*. Their propelling machinery consists of single-reduction geared turbines, taking steam from water-tube boilers.

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The United States Line has built two ships of 30,000 tons, 705 feet in length, with passenger accommodation for 1,300. These are the largest merchant ships ever built in an American yard, and compete in the Atlantic traffic between New York - Cherbourg - Southampton.

In the West Indies and Central American fruit trade, six new ships have recently been added, known as "The Great White Fleet," designed to carry large numbers of passengers in addition to tropical fruits. All the cargo space is insulated and is provided with refrigerated air for the carriage of bananas.

These vessels carry a large number of passengers on cruises to the West Indies and Caribbean Sea, with weekly sailings from New York. They visit Havana, Kingston, Panama City, Costa Rica, and other ports on the Spanish Main, and are noted for their luxurious appointments and attractive appearance.

One of the largest motor ships afloat is the *Reina del Pacifico* of the Pacific Steam Navigation Company, for service between Liverpool and the west coast of South America. Her propelling machinery consists of four 12-cylinder four-stroke trunk piston airless injec-

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tion Harland-Burmeister and Wain engines, with superchargers, an advanced type of engine. This ship exceeds 20 knots and her trunk piston Diesel engines are the largest installation of this kind afloat.

The Italians launched during 1931 the quadruple screw motor ship *Victoria*, which attained over 23 knots on her trials, the fastest motor ship of the year. The *Victoria*, though not so large as the Atlantic liners, being only 13,500 tons, is probably the most luxurious ship in service at this time.

These are but a few of the ultra-modern vessels recently placed in commission and are indications of the recent development in liner tonnage since the war, nearly all of which has been replaced by new vessels. Most of the large firms such as the P. & O., the White Star, the Canadian-Pacific, the Orient, and also the chief European and American lines, have replaced all their ships with new vessels, representing a capital outlay of many millions. As has been noted in an earlier chapter, the general introduction of oil fuel and the many improvements made in propulsion tended towards the construction of new and up-to-date tonnage, embodying all the latest inventions and developments. The use of oil fuel permitted these expensive and costly ships

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to be speeded up on their round voyages. It became possible to "turn round" very quickly at terminal ports, bunkering being very rapid without the accompanying dust and grime of coal. The large capital outlay on these great ships necessitates the reduction of expenditure to a minimum, and the earning of the largest possible revenue on each round voyage. The economics of the liner trade afford an interesting example of the necessity for extracting the maximum earning power from each unit of the fleet. Apart from interest, depreciation, insurance and other charges, the running costs are obviously very high. They include harbour dues, light dues, docking and maintenance charges, painting, repairs and renewals, the wages of crews totalling up to 800 men and including a very large deck and purser's staff. To cover this outlay there are only two sources of revenue, shipping freights and passenger fares. In theory, these should cover all outgoings and leave the owner or shareholder a margin of profit sufficient to provide a reasonable dividend. In practice, however, this desirable consummation has not been attainable of late years, and the world's shipping, as a whole, has been operating on a very small margin or at a loss.

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The many replacements and new building programmes entered upon prior to the onset of the great depression tended to force down freight rates to uneconomic levels, new ships being delivered at a time when there was insufficient employment for the vessels already afloat. Furthermore, these new ships were built at peak periods of construction costs. Even a wholesale withdrawal of tonnage from service failed to check the decline in freight rates and, during the depths of the depression, it became almost impossible for owners to make a net profit on a round voyage, in spite of the heavy reduction in operating costs.

Depreciation and insurance are serious items. The life of a modern steel ship is variously estimated at from fifteen to eighteen years, a limited period, not determined by the actual wear and tear of the vessel, but by the continual improvement and changes which, in the course of a few years, combine to force a ship into obsolescence, so that she ceases to attract passengers, or becomes uneconomical to run in the face of competition from newer, larger, and better ships.

In the luxury liner trade, the newest and latest ship possesses most attractions for the travelling public and, in an endeavour to

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retain this goodwill, liner companies are forced to maintain their fleets at a modern and up-to-date standard.

In this competition Britain has many European competitors. The French, Italian, Dutch, Swedish and Belgian liners have come prominently into the trade; German and Italian ships for the time being hold the Blue Riband of the Atlantic; and American companies are placing ships in commission which rival those of the chief maritime nations.

One result of the necessity for losing no opportunity of showing a dividend is that many of the larger shipping firms have kept the auxiliary operations of shipping in their own hands as far as possible, thus retaining any profits available. In this connection insurance, providoring, stevedoring, towage, docking, and even banking, have become subsidiary to the main business of the company, thus preserving the whole of the business within the organization itself.

Next in importance to the passenger and mail liner is the intermediate cargo liner, a type of ship which has come into favour with shipowners of recent years. The fast mail liner is intended mainly for the carriage of mails, passengers, and certain lines of special



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cargo. The intermediate ship carries both passengers and freight, one or other being of equal or greater importance according to the nature of the service. Intermediate liners employed in regular avenues of trade, run on the same routes year after year. Their size, speed and equipment entitle them to the term "liner," and they are as well known to shippers and the travelling public on their respective routes as the famous passenger liners. Most of them are twin-screw and capable of steaming up to 17 knots. Unlike passenger mail liners and tramps, they call at a number of ports, loading and discharging "parcels" of cargo at regular intervals and maintaining a regular schedule of sailings. They are able to stay longer in port than the fast liners and are popular with those passengers with whom speed is not of first importance and who desire comfortable, if not luxurious accommodation at lower fares than are charged in the more luxurious liners. Many of these ships are fitted specially for the conveyance of large numbers of cabin, tourist, third-class, and emigrant passengers, and also for the carriage of cooled or frozen cargo, which demands a higher speed than ordinary cargo. The intermediate type of ship is probably the most profitable of all, since both the large number

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of passengers and the cargo give a handsome return in normal times.

Even the layman who has never been to sea understands the difference between a liner and a tramp steamer.

The liner she's a lady, but if she wasn't made,  
There still would be the cargo boats for 'ome and  
foreign trade.

A tramp may be defined as a vessel employed by her owners in seeking freight wherever it may be found. The tramp is the backbone of the shipping industry—the real dividend earner—the proletariat of the sea, the worker that has carried the “old red duster” of England to every corner of the globe. The tramp is built for service on any sea in any trade; she carries the bulk of the world's heavy and miscellaneous cargoes and ploughs the Seven Seas in every direction, day and night, throughout the years, in the service of man on his lawful occasions.

As we have seen, the outstanding development in modern shipping has been in size and speed, but this does not apply with so much force to the tramp as to the liner. Modern tramp ships range from 2,000 to 8,000 tons with speeds varying from 8 to 10 knots. The most important factor in the economical run-

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ning of tramps is fuel consumption, and here many improvements have been made. Large cargo capacity, low initial and low operating costs are the directions in which builders and owners have concentrated. Furthermore, the tramp must be an all-round type of ship, capable of riding out a hurricane, penetrating Arctic and even Antarctic waters, ready at a week's notice to ship a cargo of grain, ore, coal, nitrate, or iron, and to proceed on her passage to a port of which the master may or may not have heard. The tramp master is from necessity the true seaman. He was, and is, a good navigator, ready to take risks in rounding corners to save fuel, full of resource, hard bitten, dauntless, and ready for any emergency. There still lingers at sea the old-time tramp skipper of Victorian days, with his hard billycock hat, his felt slippers and his uncouth speech. On his bridge he was master of all he surveyed. He was very familiar with his command, the forlorn-looking and despised craft in which he took a deep interest and for which he had a deep affection. He knew her whims and knew when to coax her in a heavy sea, when to force her, and how to handle her in narrow waters. This old-time figure is now passing, like his colleague of sail, and has given place to a new genera-

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tion of tramp skippers, a younger, smarter, better educated, and more intelligent officer, brought up in steam, familiar with the Diesel engine and its numerous offshoots, and accustomed to deal with his owners and agents by wireless. He is as smart a seaman as his predecessor and a better navigator. Probably he has an extra master's certificate, a document which certifies that he has passed creditably in many subjects of which the old-time tramp skipper never heard.

The design and details of his ship are receiving far more specialized attention than in the past. The tramp is no longer a steel box equipped with simple economical engines. Nowadays the form of a tramp steamer's hull is carefully worked out by model experiments. Stream-lined stern frames, with balanced "re-action" rudders, are fitted, so that the power required for propulsion is reduced to a minimum. High-temperature steam is employed with reciprocating machinery and coal-fired cylindrical boilers. Some of the modern tramp steamers have triple-expansion engines working at 225 pounds pressure, and others are fitted with quadruple-expansion engines working at 260 pounds. Steam temperatures rise as high as 600° F., a high degree of super-heating being efficiently utilized

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together with high temperature pre-heating and feed-heating. All these improvements have come about as the result of the increasing necessity for reducing the fuel bill in the case of the tramp steamer as distinct from the Diesel-engined vessel, the aim being to bring the steamer to a degree of efficiency where it will be able to compete effectively with the Diesel tramp ship. The fruits of such labours are seen in the fact that a deadweight cargo in a tramp steamer may now be carried with a coal consumption about 35 per cent. less than was required but a few years ago. The whole question revolves round the respective current prices of oil and coal which determine the issue, but a comparison between the modern steamer tramp and her Diesel-engined sister shows that the former is in a position to compete effectively with the latter so long as the gap between oil and coal prices is not too small.

The modern tramp is a more efficient, a smarter-looking, superior type of vessel to that of a generation ago. Great attention is now being given by designers and builders to increasing the general efficiency of this type of tonnage and some surprising results have been achieved, particularly, as noted above, in reduction of fuel consumption. The equip-

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ment of the modern tramp steamer includes also the latest improvements in wireless, gyro compass, echo depth sounder, improved cargo handling gear and other modern equipment.

The most spectacular addition to the world's shipping was the sudden appearance of the oil tanker, following on the almost general use of oil fuel. In 1914 the world's gross tonnage of tankers was but 1,500,000 tons ; in 1932 it approached 10,000,000 tons, but there are indications that this enormous expansion has now received a check. Tankers are ships specially designed for the carriage of oil and nothing else, their internal construction consisting of a series of tanks connected by pipelines through which oil is pumped or drawn when loading or discharging. The oil tanker can earn money only on a one-way basis, when she is carrying her cargo from the port of loading to the port of discharge. The return passage is necessarily made in ballast, but owing to the fact that the ship carries her own fuel, the quick loading and discharge, the constant demand and supply, and finally that most of the large oil companies own and control their own fleets of tankers, the trade is conducted on very economical lines.

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Reference has already been made to the expansion in the refrigerated cargo trade and in the rapid advances made in machinery installations for enabling meat, fruit and other cargoes to be carried without deterioration over long distances. Although there has been little change in the speed of freight-carrying ships, the application of science to the work of the refrigerating engineer has resulted in many and marked improvements. To-day it is possible to carry cargoes of butter, cheese, frozen mutton and lamb, apples, bananas, eggs, and other perishable products, from the most distant parts of the world in perfect order and condition, and important new developments in marine refrigerating installations are constantly taking place. Scientists working at the Low Temperature Research Station at Cambridge, and also in the model ship's hold erected at Malling in Kent, have been studying the effect of gas mixtures in cool or cold chambers with encouraging results. It was found, for example, that the presence of 20 per cent. of carbonic acid gas in chambers maintained at the temperature needed for the conveyance of chilled beef prevents the growth of moulds on the meat, even when the carcasses are retained on board for seven or eight weeks. Such a develop-

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ment will soon lead to the export of chilled meat from the Antipodes in competition with the Argentine, and the work of the physicist and the bio-chemist, allied to that of the refrigerating engineer, is leading to still further advances, so that it is rapidly becoming possible to carry almost any foodstuff over the oceans of the world without detriment to quality.

In this brief survey of the Business of Shipping, it has been possible to refer only to some of the outstanding developments in recent years, but even as these lines are being written further developments are in progress and new advances are everywhere being made in the great business of the carriage of goods by sea. In that business no factor is more important than the provision of a cheap fuel. We have seen how the great coal bunker trade has been largely superseded since the war by the overwhelming rivalry of oil fuel. As coal determined the type of boiler and engine, so has fuel oil, but there are signs that coal may come into its own again. While scientists are working in one direction to improve the facilities for the conveyance of perishable cargoes, others are busily engaged in investigating the possibilities of replacing oil fuel by coal, or of producing from coal a fuel which will not only



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revive the coal industry but will compete with oil fuel in price, ease of handling and combustion efficiency.

Experiments conducted in 1932 by the Cunard Company proved that it was possible to replace oil fuel by coal to the extent of 40 per cent. This very significant development was due to the resource and perseverance of Mr. R. A. Adam, assistant superintending engineer of the company, Mr. F. C. Holmes, chief chemist, and Mr. A. W. Perrins, combustion engineer, who experimented for three years to evolve a satisfactory mixture of oil and pulverized coal named "Colloidal." The solution to the main problem—the retention of the powdered coal in solution—has gone far to providing a fuel which has all the advantages of fuel oil, and which may lead at no distant date to an increase in the demand for coal to the extent of 30 million tons annually for ships alone.

The flood of oil which was the chief factor in destroying the coal industry in every country now appears to have been checked, and if Colloidal results only in the partial replacement of coal to the extent of 40 per cent., it may prove to be as valuable a discovery as that of new coal-bed seams, or an entirely new fuel. While this new step is being perfected

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similar improvements are taking place in marine engineering, navigation and ship-building, all designed to cheapen and facilitate maritime trade and to accelerate transport and communication between the countries of the world.

## CHAPTER XII

### THE SEAMAN AND HIS SHIP

IN addition to the liners and tramp steamers referred to in the previous chapter, there are numerous other types of ships designed for some special service, each having its own peculiarities and each developed along special lines to meet the demands of the trade in which it is engaged.

Among these mention must be made of the vessels on the Great Lakes of North America which, though not properly sea-going ships at all, are the largest bulk cargo-carrying vessels in the world. The Great Lakes trade is of a special type with special requirements, its most peculiar feature being that it is a fresh-water trade. Surrounded by immense grain-growing areas, rich iron ore deposits, and large coalfields, the Lakes form the natural highway for bulk cargoes of these commodities. They cover a total area of 90,000 square miles, and on their shores are situated large modern ports which form entrepôts for the

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ore deposits of Minnesota and the grain provinces of the west.

In the ore-carrying trade, the greatest development has been in the increasing size of the ships themselves and the rapidity with which the cargoes are discharged. Since the lakes are frozen over for nearly half the year, the summer season is one of intense activity and high pressure, the rates of loading and discharge being truly phenomenal.

Grain, iron ore, and coal, are the principal cargoes, and a full load of one having been discharged a full cargo of another is immediately loaded. The ships and the loading and discharging gear at the various ports are all designed to permit of the emptying and loading of the vessels at a tremendous rate, so that astonishing performances have been recorded. Among the means used for discharge are conveyers and mechanical grabs, the jaws of which take a "bite" of 12 or 15 tons every minute, a cargo of 15,000 tons being discharged by this method in eight or ten hours, leaving only a very small residue in the bottom of the hold to be shovelled out by manual labour. Ore-carrying vessels are also able to load wheat in bulk, the discharge of the cargo in this case being carried out by powerful pneumatic ejectors which suck the wheat from

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the holds, discharging it direct into the silos or grain stores.

The freighters themselves are great bluff-bowed ships, equipped with a score or more of hatches to facilitate loading and discharge. Vessels are moored alongside berths so that each hatch is abreast of the discharge chute of an ore bin. Right forward in the bows, the navigating bridge is erected occupying as little space as possible, while at the stern are the engines and boilers, the general effect being that of an enormous steam barge, the whole of the space between bow and stern being given over to cargo. These vessels attain a great size—up to 15,000 tons dead-weight—and have been known to load 10,000 tons of ore in half an hour and to discharge it in three hours.

The bulk of the grain trade on the lakes comes from Western Canada, via Fort William and Port Arthur to Montreal, through the Sault Ste Marie and Welland Canals. The ore trade is through the great port of Duluth at the western end of Lake Superior, bound for the large steel-works in Pittsburg district via Lake Erie ports, Chicago, Cleveland and Buffalo, while coal is shipped at the Lake Erie ports for Duluth and the West.

This important water-borne trade is both

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cheaper and more rapid than the railway, in spite of the fact that for many weeks weather conditions and ice prohibit navigation.

In addition, there is a large passenger traffic on the lakes, particularly on Lake Erie, where, as well as the night express services between the large centres such as Buffalo, Cleveland and Detroit, there is also an extensive and very active tourist and holiday traffic. Cruises on the Great Lakes are a feature of this densely populated region, the steamers taking very large numbers of passengers to various centres, including Duluth, Cedar Point, Sarnia, Port Arthur and other ports. Much of this traffic is carried on in very large paddle-wheel steamers, 500 feet long, with five or six decks, with room for 1,500 passengers and 4,000 tons of cargo, while other types of lake ships are semi-liners which vie in accommodation and speed with their big sisters of the Atlantic.

Though the lakes are completely land-locked, they have an unenviable notoriety for the severity of the storms which sweep across their surface, raising a short and wicked sea. This has led to the construction of ships not only of great size but of staunch workmanship and build, able to ride out the fiercest gales, though they are essentially inland water ships

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and not adapted to ocean trade. The traffic on the Great Lakes is one of the major phenomena of the world's shipping trade, and its importance to the United States may be gauged from the fact that nearly half of the water-borne commerce of the Great Republic is to be found in this region.

Another special type of ship is the modern whaler, very different from the early wooden vessel in which the Arctic hunters carried on their arduous work. The modern whaler, specially designed for the industry in the Antarctic, is a floating factory accompanied by a flotilla of "catchers"—small vessels equipped with wireless telephones enabling them to communicate with the mother ship. This mother ship is a large vessel often exceeding 20,000 tons, and is fitted with large oil cargo compartments, and having a specially designed oak-sheathed skidway opening, cut into the cruiser-shaped stern of the ship, through which the whale carcasses are hauled up to the flensing deck.

The blubber, meat, and bones are all treated aboard the floating factory, high-pressure boilers and extraction apparatus being fitted on board for the various processes employed in cutting up and rendering down the carcasses of the whales. These floating fac-

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tories are entirely self-contained and act as depot ships for the flotilla of small chasers which accompany them, and which carry out the actual whale-hunting. Each chaser kills and marks with flags its whales, and communicates by wireless telephone the number and location to the mother ship, which then proceeds at her leisure to collect the carcasses. These large ships carry fuel for an extended cruise and are able to remain at sea for ten months, providing extensive accommodation on board for the ship's personnel, the factory hands, catchers and gunners.

Cable-laying ships, ice-breakers, fast cross-channel packets, the great flotillas of fishing boats including the modern steam trawlers which operate as far north as the Arctic circle, and small local craft employed in various trades each having its distinctive national or racial appearance and design, are among the other branches of maritime trade activity. This enormous aggregation of vessels employs many hundreds of thousands of seamen of all types and nationalities, each engaged in winning a livelihood from the sea, or from work upon the sea. They range from Chinese junks to the fishing craft of the Mediterranean, and from the canoes of the Malays to the cod boats of the Newfoundland Banks.



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There is, in addition, the large carrying trade on the world's rivers, such as the Mississippi, the Irrawaddy, the Ganges and Brahmaputra, the Indus, Nile, Yangtse Kiang, Plate and Amazon.

Shipping is international, and the highways of the world are essentially the seaways of the world, though much of the maritime trade of the globe is purely local in extent, and in this category must be included the coastwise trades of the various countries. Yet though sea trade is a world-wide organization, it does not move altogether free and unmolested, even in times of profound peace. In recent years there has been a tendency for the Governments of various of the leading maritime nations to encourage and support their own shipping industries by means of subsidies designed either to win back trade lost in the past, or to retain trade which is in danger of being lost to ships sailing under other flags.

The principal means by which shipping companies are thus assisted is by the loan of Government funds at a low rate of interest, and by the payment of subsidies.

The increasing competition thus brought about, the severe freight depression of recent years and the immense amount of tonnage laid up for want of profitable employment

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has introduced many complex factors which have never before arisen.

The immense ramifications of the industry and its peculiar importance to the British people are well known. There is approximately 70 million tons of shipping afloat, a figure which represents a gradual and steady increase over a long period of years. In 1913 the world's shipping totalled 47 million tons; ten years later (1923) it had risen to 65 million tons, and now is rather more than 70 millions, of which Britain owns 20 millions, or two-sevenths of the whole. The second largest owner is the United States with 11 million tons of sea-going ships. This country is making great efforts to establish a mercantile marine worthy of her status as a maritime nation, the Jones-White Bill which became law in 1928 having in view the permanent establishment of such a marine. This Bill was probably the most important legislative instrument ever forged with the definite purpose of building up a great national industry upon modern lines.

It was found that the competition from European lines necessitated the building of modern ships to meet modern demands for fast, regular, and dependable transport. Under the Jones-White Bill no fewer than

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forty-four contracts were made for the carriage of American mails in American ships, half of these operating from Atlantic coast ports. These mail contracts provided also for the construction of entirely new ships, in addition to reconstruction and modernization of existing vessels, the programme adopted providing for the addition of seventy modern vessels to the United States merchant fleet during the decade following the passage of the Bill. Many of these ships are already in service and others are in course of construction, the result being that the United States has now become a powerful competitor in her own foreign carrying trade, both on the Atlantic, Pacific and in other waters.

The building of this immense Armada revived the shipbuilding trade in American yards; it enabled a great expansion to be made in the foreign trade in regions where the American flag was now seen for the first time, and, despite the keen competition of European lines, American ships have succeeded in capturing an increased share of both cargo and passenger revenue.

All this, however, was not accomplished without criticism of the methods adopted to build up the industry.

In 1914 only  $4\frac{1}{2}$  per cent. of the world's sea-

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going tonnage was under the American flag ; to-day it has jumped to 16 per cent. and is still rising. Much of this large increase was due to the great "boom" in shipbuilding during the war when America rose to be the greatest shipbuilding country in the world, having at one time over 4 million tons of new construction in hand. Unfortunately after the war this huge tonnage could find no profitable use or outlet. A huge fleet had accumulated for which there was no demand and which, even with the effluxion of time, could not be absorbed in the freight market. It became necessary to scrap a large proportion and efforts were made to dispose of all State-owned shipping, with the result that the tonnage left on the Government's hands was rapidly reduced, even if at unprofitable prices.

Subsequently the Jones-White Bill was passed to enable the United States Merchant Marine to be established with modern ships, able to compete effectively with foreign nations, which were building and operating vessels at costs below those of the United States. To meet this competition, cheap money was made available to American builders and mail subsidies were granted to offset the lower running costs of foreign com-

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petitors. In return, the United States Government requires the maintenance of essential services with regular sailings over a period of years, suitable vessels and provision for replacements, all designed to give permanency of operation and to establish the American merchant marine on a firm basis.

In striking contrast to this system of State-aided ships is that in Britain where no such assistance is afforded. Indeed, British ship-owners are first and foremost in condemning any such methods, demanding only free competition, untrammelled by legislative restrictions. A remarkable instance of the determination of the British Government not to give financial help in any form to the industry was its refusal to assist the Cunard Company to continue the construction of the new Cunard super-liner when work on that vessel was discontinued owing to financial stringency, though the Government had previously made the construction of the vessel possible by undertaking in part the immense insurance risk involved.

Competition for world trade is increasing year by year and is intensified by the replacement in certain trade routes of new and up-to-date ships which displace vessels much too valuable to be scrapped or sold, and for

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which other employment must therefore be found. Transfers of ships from one route to another only serve to intensify existing competition, so that shipowners of whatever nationality are faced with the problem of filling their new ships and finding cargo and passengers for their second best.

The chief trade routes of the world are already catered for by the high-class ships now in operation. The main trade route, that across the North Atlantic, is the scene of intense competition symbolized by the struggle for the imaginary trophy known as the Blue Riband of the Atlantic; on the important South American run there is an abundance of fine modern fast ships; the long route to the Antipodes is served by a dozen lines, all of which have modern vessels of the liner class in service; and on other routes, whether world, coastal, or cross-channel, the same observation applies.

So far as the travelling public is concerned, ships have fallen victims to Fashion, and the very latest, the smartest, the most spectacular is demanded. Ships, in fact, are no longer ships in the sense in which the term was understood up to a generation ago. Appearance, accommodation, the number of funnels, the reputation for steadiness, the

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personality of the captain, the scheme of interior decoration, the variety and number of the "attractions" offered are nowadays the criteria which determine their popularity, and hence their dividend-earning capacity. The tendency now is to disguise from the intending passenger the fact that he—or she—is in or "on" a ship at all. Cabins have given way to bedrooms; saloons to banquet halls; decks to promenades and "Malls"; and the modern steamship advertisement contains some such list of attractions as: Morning health parade, morning concerts, get-together dinner, Vaudeville artists, masquerade ball, amateur theatricals, professional plays, country fair, gala night, sports contests, boxing bouts, lectures, motion pictures, swimming pools, beaches, and other diversions. This condition of affairs may be reaching its climax, and a trend in another direction is already manifesting itself.

One interesting and curious sidelight on this change is the recent action of the few owners of sailing ships now left, who have fitted up accommodation in their vessels with the hope of attracting back passengers who still wish for the experience, the pleasures and the trials, of this form of sea voyage in contrast to the modern mode. Most of

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these sailing ships are now confined to the Australian wheat trade, and, owing to the absence of outward cargoes, the passage is necessarily made in ballast and is therefore unprofitable. To offset this, it is hoped to attract a limited number of passengers whose fares will in some degree recoup the ship-owner. There are not wanting signs that there is still a number of people who would gladly turn from the de luxe mode of sea travel to the more simple, if less comfortable, sailing ships which a former generation knew.

But whether this limited effort will bring back the romance of sea travel is doubtful. The old order changeth, yielding place to new, and those who sigh for the "good old days" might well reflect on the numerous and beneficent changes which have come about, even in the course of the past century.

To-day, it is possible that the shipping industry, and those employed in it, suffer from a superabundance of legislation and bureaucratic regulation. Artificial restrictions have brought about many evils. There has been a tendency to concentrate the ownership of large fleets of ships in the hands of ambitious and often unsound financial amalgamations which were overcapitalized, and



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which lacked the personal touch that was so large an element in the successful building up of the industry in past days. The great shipowners of the past were men who, if they had not themselves previously commanded ships, were fully acquainted with the whole business of shipping, who knew their vessels, their captains, and their crews, and were masters of the business in which they invested their all. They were, in the real sense of the term, merchant adventurers, but there were others who built up large fortunes and highly prosperous fleets in conditions and in circumstances which became almost a national scandal.

Less than a century ago a Committee appointed to enquire into the cause of wrecks reported that the frequent incompetency of masters and mates was admitted on all sides ; that there were no examinations to test their knowledge, experience, and skill ; that ports and harbours were small, congested, and shallow ; and that navigation was in a crude and rudimentary state.

The recruiting of seamen was carried on without any system, and was subject to the evils arising from crimps who preyed unchecked on the crews. There was no legislation to protect the seaman either in respect

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to his engagement, his food, his accommodation or his wages. In many ships there was gross cruelty and tyranny, and there was no law to prevent unsound and leaky vessels leaving port. The industry was disorganized, unregulated, and at the mercy of owners to many of whom the object was to make as large a profit as possible out of the ventures in which they were engaged. And yet such conditions prevailed during the very era known to a later generation as "the glorious days of sail." They were days when an able seaman received a wage of two, and later of three, pounds a month. A round voyage lasting two years would bring him, as recompense, a maximum sum of fifty pounds, but as he was often fleeced by the master during the voyage and fell into the hands of crimps at the end of it, this small sum usually dwindled to a few pounds which rapidly disappeared in drink. His accommodation in the fore-castle was so bad that it was below even the level of the workhouses of the time; the food was of such poor quality that even when starving he was often unable to stomach it; the daily conditions of his existence were so severe and monotonous that it can be likened only to a long term of hard labour. His days and nights were divided into

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watches, four hours on deck and four hours below, so that he seldom enjoyed an unbroken night's rest, except when in port. Racked by rheumatism, subject to scurvy, ill nourished, bullied and betrayed, cheated and woefully maltreated, this victim of the times and the customs of the day was the bold, breezy, rollicking tar of story and of song.

The crews of the celebrated American ships were in like case though better fed, and indeed these conditions applied to the seamen of all nations, during an era when "Freight was the Mother of wages" and nought else was of any account. Such conditions were too bad to endure when brought to the notice of an enlightened Parliament. Joseph Hume, Samuel Plimsoll, James Murray and Thomas Gray are names of men who were foremost in drawing attention to the scandalous conditions of the time, and in pressing for reform. In 1850 the Marine department of the Board of Trade, to which reference has already been made, was established. In 1873 the Merchant Shipping Act of that year legalized the Plimsoll Mark as a protection against "coffin ships" and overloading, but even so the law permitted, if it did not actually exhort, the shipowner to buy his ship as cheaply as possible, equip

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her as poorly as possible, load her as deeply as possible, and then send her to sea.

But important and far-reaching reforms were introduced in subsequent years, and in 1894 the Merchant Shipping Act of that year consolidated the various measures which had been brought into operation to mitigate, even if they did not wholly eliminate, the evils. To-day it is probable that the pendulum has swung too far in the opposite direction. The shipowner of to-day, unlike his predecessor, is now at the mercy of the law, the trade unions, and of unrestricted competition. The wheel has come full circle, but there are many seamen yet living whose memories go back to the days when men were driven or tricked into coffin ships, very much like those slaves whom Hawkins and his contemporaries three centuries earlier had driven into the holds of their small and overcrowded vessels.

The description of the roaring, reckless life which has come down to a later generation through the medium of sea songs and shanties has been grossly overcoloured. The seaman was not a roaring, jovial soul by any means. He was often half drowned and always half starved; morose, bitter and always labouring under a sense of burning injustice.

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We poor sailors standing on the deck  
With the blasted rain all a-pouring down our necks ;  
Not a drop of grog would he to us afford  
But he damned our eyes at every other word.

In his misery he turned to the crudest sentiment. His thoughts dwelt on the delights of women and liquor ; he was for ever lifting up his poor voice in shanties which dwelt on the pleasures which should be his as soon as his ship reached port ; he had but one thought—to leave her.

O, the times are hard and the wages low,  
Leave her, bullies, leave her,  
I guess it's time for us to go,  
It's time for us to leave her.

And yet, despite the hard life, the shocking conditions, the haphazard and unregulated manner in which these seamen of a day that is gone eked out their hard and perilous existence, they have handed down a heritage of skill, daring, initiative, and endurance, which is the glory of England. Poor Jack was poor in everything except spirit ; he was reckless, ignorant, foul-mouthed, and devoid of any moral sense. In this he was the legitimate descendant of his forefathers of Elizabethan days, for there was no great difference between the sailors of Drake and Hawkins, and those of good Queen Victoria

### THE SEAMAN AND HIS SHIP

But now that has all passed away. The last lingering echoes of those days are heard no more—only a few old sailors survive whose memories go back to the time when poor Jack was Poor Jack indeed.

## CHAPTER XIII

### THE REGULATION OF SHIPPING

#### *The Board of Trade*

THE shipping industry throughout the world is controlled and administered by numerous Government and semi-Government departments and institutions, which are responsible for the regulation and safety of the services. Chief among them in Britain is the Marine Department of the Board of Trade, which first came into existence in 1850 after the repeal of the Navigation Laws. The Mercantile Marine Act of that year gave much attention to the personnel of the merchant service. A system of compulsory examinations for masters and mates was instituted and shipping offices for the engagement and discharge of seamen were opened.

From then on, numerous Acts were passed all designed to give the Department a greater measure of control over shipping and seamen. The field of State supervision has been steadily increased, the statute law relat-

## THE REGULATION OF SHIPPING

ing to merchant shipping being consolidated in the Act of 1894 and in a number of amending Acts, the most important of which is the Merchant Shipping Act of 1906.

As a result of all this legislative activity, there is very little connected with shipping and seamen which is not now subject to Government regulation and control. The same applies to all the maritime countries, most of whom have followed the British practice in this matter. It would be impossible to give a detailed account of the numerous activities of the Board of Trade in connection with shipping and seamen, but the following list will give an idea of the principal matters dealt with by the Department and its officers.

Registry of ships, tonnage, measurement of ships.

Survey of ships, and ships' equipments and life-saving appliances.

Grain cargoes, timber cargoes, carriage of dangerous goods.

Seaworthiness of ships, overloading, undermanning.

Emigrant ships.

Examination and certification of ships' officers.

Supervision of the engagement, discharge, and payment of seamen.

Protection of seamen from crimps, and transmission of seamen's wages.

Repatriation of seamen discharged abroad, and relief of distressed seamen.



## SHIPS AND SEAMEN

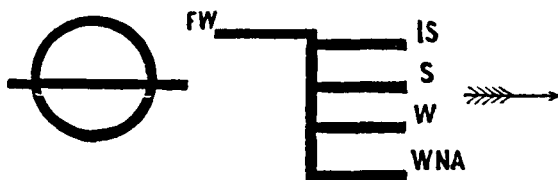
- Inspection of provisions, certified cooks.
- Language test for seamen, continuous discharge books, failure to join ships, desertion.
- Health of seamen, medicine chests, medical guide.
- Wrecks and casualties, rocket life-saving apparatus, rewards for saving life.
- Inquiries into wrecks, casualties, misconduct of officers, deaths at sea.
- Naval courts.
- Inquiries into boiler explosions on land and sea.
- Testing of anchors and chain cables.
- International conventions for the unification of maritime law.
- International conventions for regulating fisheries and fishing vessels.
- International regulations for preventing collisions at sea.
- International code of signals.
- Questions of foreign and colonial shipping legislation, subsidies and bounties, shipping rings, and miscellaneous shipping questions.

The assignment of a ship's load line is one of the Board's most important functions, measurements of the ship being taken by the surveyors, and calculations made to determine the capacity of the vessel and her safe draught. This work is also performed by the surveyors of the principal classification societies—namely, Lloyd's Register of Shipping, the Bureau Veritas, and the British Corporation for the Survey and Registry of

## THE REGULATION OF SHIPPING

Shipping. The marking of this Load Line\* or "Plimsoll Mark" as it is generally known (in honour of Samuel Plimsoll, who was chiefly instrumental in obtaining its adoption for all British ships) is a means of preventing the overloading of ships. The Load Line is compulsory for all British ships except small coastal and fishing craft, and is uniform in its markings.

The position of the disc and the horizontal line passing through its centre, as also the lines to be used in connection with the disc, are shown in the diagram:



The disc must be 12 inches in diameter and the horizontal line drawn through its centre must be 18 inches in length. The disc is

\* Under new Rules which came into force on January 1, 1933, the load line marks have been slightly changed by the addition of a tropical fresh water load line, and the substitution of a tropical load line for that previously assigned to Indian Summer.

## SHIPS AND SEAMEN

marked amidships on each side of the ship, and the various lines shown in the diagram indicate the maximum load line in different circumstances, and at different seasons. These lines are 9 inches in length, the meaning of the lettering being as follows :—

- FW = The maximum depth to which the vessel may be loaded when she is lying in fresh water.
- IS = The maximum depth to which the vessel may be loaded for voyages during the fine season in the Indian sea between the limits of Suez and Singapore.
- S = The maximum depth to which the vessel may be loaded for voyages during the recognized summer months.
- W = The maximum depth to which the vessel may be loaded during the recognized winter months, namely October to March.
- WNA = The maximum depth to which the vessel may be loaded for North Atlantic voyages during the winter.

It will be seen that the weather in the North Atlantic is regarded as being worse than that in other parts of the world, and the WNA line is therefore placed lowest on the hull, the result being that a vessel, when loaded to this draught, has a greater free-board or clearance above the water.

The arrow points in the direction of the ship's head.

## THE REGULATION OF SHIPPING

Another important function of the Board of Trade is the surveys of the hull, equipment, and machinery, of passenger vessels, including life-saving appliances, lights, signals, compasses, passenger accommodation, and the certificates of the officers.

Every British ship carrying over twelve passengers is classed as a passenger ship and must be surveyed at least once a year. The remarkable developments in recent years, the increase in the size and speed of ships, and the advance of modern marine engineering has made this branch of the Board's work of special importance. Nor is it limited to British ships, for every foreign steamship carrying twelve or more passengers to or from the United Kingdom is liable to similar surveys, though foreign certificates are accepted and reciprocal treatment given in foreign ports to British ships holding Board of Trade certificates.

Stringent regulations are also in force for vessels carrying grain and timber cargoes. The mode of stowage, the provision of shifting boards to prevent the grain from shifting in the holds, and the quantity of grain loaded being carefully supervised, while in the case of timber-carrying ships, precautions are prescribed to be taken in the winter months

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by ships carrying deck cargoes and for the security of the crews.

Specified tests of anchors and cables are also made. No anchor or chain cable over 168 pounds in weight may be sold for use in a British ship unless it has passed these tests, which are carried out at licensed establishments. The tests are prescribed by the Act, all anchors and cables being marked after having been "proved."

Special attention has also been given to remedying the old abuses, referred to in a previous chapter, under which seamen were engaged and discharged. Very stringent conditions regulate these matters. It is illegal for a sailor to be signed on a ship's articles except in the presence of a Shipping Master ; seamen's lodging-houses at the various ports are licensed ; so called " crimps " are warned off vessels ; the seamen's wages are protected, as far as possible, and the supply of seamen and the boarding of ships by unauthorized persons is illegal. Detailed arrangements were made for the regulation of seamen's accommodation on board, the food supplied and its cooking, medical treatment, and the prevention of such diseases as scurvy and beri-beri which, though they once ravaged ships' crews, have now been almost totally overcome.

## THE REGULATION OF SHIPPING

But probably the most important of all the Board's functions is that of making a formal enquiry into the causes of any shipping casualty.

The object of such Formal Inquiry is to investigate all the circumstances leading up to and connected with the casualty, with a view to discovering the cause, and ascertaining by what means such an accident may be prevented in the future.

Every accident to a ship is the subject of a preliminary enquiry, and the report and depositions at this enquiry are considered in order to decide whether a formal investigation is necessary. These investigations are held before a Court of Summary Jurisdiction consisting of a magistrate and two or more nautical assessors. The Court may punish officers who are found in default, by the suspension or cancellation of their certificates. In foreign countries such investigations into the causes of casualties to British ships are held by what are known as "Naval Courts," holding similar powers to those of the Courts of Inquiry held in the United Kingdom.

Apart from its statutory duties, the Marine Department of the Board of Trade is entrusted with the general superintendence of all matters relating to the British Mer-

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cantile Marine, involving many matters with international ramifications including conventions for the unification of maritime law, for preventing collisions at sea, and for the code of signals. There are, too, many other questions affecting foreign and colonial shipping legislation, subsidies and bounties, shipping "rings," and miscellaneous matters relating to shipping which increase in complexity and scope each year. The Board of Trade also administers the Coastguard, and exercises control over the principal lighthouse authorities. In addition, it collects and publishes statistics of maritime trade, shipping and navigation, and is the chief governing authority in all matters relating to the merchant service.

### *Lloyd's*

Perhaps the most famous of all institutions connected with, and indeed vitally concerned in the shipping industry, is Lloyd's, the great Corporation with world-wide ramifications which has grown from the original gathering in a coffee-house of groups of men interested in shipping and marine insurance.

The coffee-shop was kept by Edward Lloyd in the last years of the seventeenth century and became the chief resort of those interested

## THE REGULATION OF SHIPPING

in shipping and marine insurance. From this coffee-house coterie there has gradually evolved the now famous Corporation.

In 1774, under the guidance of one of the leading members, John Julius Angerstein, Lloyd's moved into the old Royal Exchange, where it remained until 1838 when the building and most of the records were totally destroyed by fire. In 1884 it entered upon a tenancy of a part of the rebuilt Royal Exchange, and here it remained until it moved into its present headquarters, opened by the King in 1928.

Lloyd's was originally and primarily an institution for marine insurance, carried on by individuals who also engaged in other business. Those seeking insurance would go from office to office and obtain the subscriptions of such substantial men as were available. But in the course of time the business gradually centred in the group known as Lloyd's, which was incorporated in 1871 under Lloyd's Act, after having existed as an unincorporated society of underwriters for two centuries.

The Society itself does not issue or assume any liability under policies, all the underwriting being conducted by the individual members of the Society. Each member



## SHIPS AND SEAMEN

carries on his own business for his own account and risk, the general practice being for several members in association, but not in partnership, to carry on their business through an agent who underwrites and acts for the whole group. The insurance of ship and cargo is an ancient business, and there is preserved at Marseilles a marine policy dated 1584, much of which is couched in similar phraseology to the policies now in use. Modern marine insurance covers a ship against all the perils of the sea and may be either for a specified voyage or for a specified period (time policy).

The cost of insurance is a serious item in a shipowner's disbursements. Many of the larger companies have adopted the policy of setting aside the premiums to a special fund which, in course of time, should be sufficiently large to replace the value of any single ship that might be lost. When owners thus "run their own risk" the system may be adopted gradually until the percentage of premiums is up to the full value, but even in these cases owners may also take out policies to cover special risks such as collision.

Although Lloyd's was originally an institution confined to the business of marine insurance, it is now a market for all forms of

## THE REGULATION OF SHIPPING

insurance excepting life, and it is said that there is no risk against which cover may not now be obtained.

As part of its marine business, Lloyd's also publishes *Lloyd's List and Shipping Gazette*, which dates back to 1734 and is therefore the oldest London newspaper with an unbroken existence to this day. Lloyd's List contains a complete summary of shipping movements the world over, including casualties of every kind, and the latest shipping and marine intelligence from all parts of the globe.

Other publications issued include *Lloyd's Weekly Shipping Summary*, *Daily Index*, *Weekly Casualty Reports*, *Loading List*, *Law Reports*, *Confidential Index*, the annual *Lloyd's Calendar*, and the famous *Register*.

This remarkable compilation was begun in 1774, when Lloyd's collected full information with regard to the construction and characteristics of every ship. This information was issued in volume form under the title of *Lloyd's Register*. It is now an immense work in two volumes, Part I containing full details of all ships, steam, motor and sail, while Part II contains a mass of information relating to shipping and shipowners. It is in this volume that the classification of ships

## SHIPS AND SEAMEN

may be found, based on the well-known phrase "A1 at Lloyd's" which, incidentally, is inaccurate. In the old days, when Lloyd's was in existence, but before the establishment of a Register for classification, the standing of a ship was known by her classification at Lloyd's, but nowadays the Corporation no longer classifies ships, a work which is undertaken by Lloyd's Register of Shipping, a separate establishment altogether with its own headquarters, though the Corporation is largely represented on the Committee of the Register.

The correct phrase is therefore "(Classed) A1 by Lloyd's."

The *Register* is issued annually to all subscribers and is kept up to date by regular supplements printed during the year.

Another beneficent work undertaken by Lloyd's was the establishment of Signal stations at many important points on the coasts of Great Britain and abroad, and there is also a Lloyd's Agent or sub-agent at every port in the world. In modern times, with the introduction of wireless, arrangements were made whereby British and foreign wireless stations furnish shipping intelligence to Lloyd's, and there is thus a world-wide network of communication by means of which any vessel, whether in home or in far-distant

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waters, may be communicated with, without loss of time.

An important part of the work of Lloyd's is the survey and salvage of damaged cargo or ships undertaken by the Salvage Association, an organization for dealing with shipping casualties, salvage operations, survey of damaged ships and goods, and all the problems which arise from marine casualties. Among these is the question of compensation known as "Average."

Average is a term which requires some explanation since it relates to the compensation to be paid in the case of Average, or loss occasioned by the sacrifice of some interest in order to secure the general safety. Thus, if it becomes necessary in the course of a voyage to cut away masts and rigging, or to slip anchor and cables, or to jettison cargo in order to lighten the vessel, or to flood a hold in order to extinguish a fire, the sacrifice incurred by one or more parties having an interest in the venture is to be shared by all the parties, in the proportion of their respective interests in the venture.

A simple example will show how this is effected.

A fire breaks out in a particular hold in which various consignees have parcels of

## SHIPS AND SEAMEN

cargo. It becomes necessary to pour water into the hold, the result being that a number of packages is damaged, though it is to be noted that packages which have been on fire do not receive any allowance in General Average though they may have been water-damaged also.

Upon the termination of the adventure—which means the arrival of the ship in port—the value of the ship and the value of each separate shipment of cargo is ascertained and the amount of the average, plus incidental expenses, is then apportioned pro rata between the shipowner and the cargo owners; a highly technical and involved computation carried out by professional average adjusters.

When a vessel arrives in port having suffered a casualty of this nature, she is said to be “under average.” In order to expedite the delivery of the cargo in a ship “under average,” consignees usually pay a deposit against their share of their estimated liability and sign a general average bond by which they undertake to supply all necessary information for their assessment. All bills of lading make provision for general average which is quite independent of, and has no relation to, marine insurance.

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Particular Average is a partial loss due to purely accidental causes such as stranding, fire or collision, and it is borne by the owner of the property damaged, ship or cargo, as the case may be.

Particular Average is an accidental loss which concerns only the owner of the property damaged and/or his underwriters, whereas General Average is the result of a voluntary act, and the loss must be borne by all in proportion to the extent of their interest in the venture—for every voyage is a venture.

If the port of adjustment be in a foreign country, all questions of average are dealt with according to the law and custom of that country which differs, more or less, from the British practice. But there are generally recognized codes or rules governing these matters, and it is now an almost universal custom to observe the code known as the York-Antwerp Rules. These rules were the result of consultation between British and foreign shipowners, merchants, underwriters, and average adjusters, and represent the successful effort to evolve by agreement a uniform system of General Average for all maritime countries, operating as a uniform and international code and adopted at Stockholm in 1924.

## SHIPS AND SEAMEN

As has been pointed out in a previous chapter, the master, as agent of the ship-owner, is in supreme control over both ship and cargo, and nothing less than a special power can take away this control. But the master may appoint an agent to act on his behalf, and it is here that Lloyd's accredited agent becomes of great value and assistance to him, particularly if he be involved in matters relating to an accident or casualty to ship or cargo.

### *Lloyd's Medal*

Reference must be made to Lloyd's Medal for saving life at sea, and also the medal for meritorious services.

The former, authorized in 1836, has been struck in gold, silver, and bronze, and is highly prized by the numerous seamen who have been recipients during the century which has elapsed since it was first awarded. The gold medal has only once been awarded, to Captain (now Admiral) E. R. G. R. Evans, R.N., the silver and bronze medal on many occasions. The recital of the deeds which earned these medals is an epitome of the history of the gallantry of the sea over a hundred years. The award of the medal is not confined to British subjects. Its re-

## THE REGULATION OF SHIPPING

cipients include all ranks and ratings, from admiral to able seaman, from master to deck-hand. Nor is it confined to sailors, but has been awarded to clergymen, civilians, pilots, scout masters, fishermen, soldiers, and stewardesses. It is thus an international and universal means of recognizing heroism in any form at sea or in sea rescue.

The latter medal, for meritorious service, was authorised in 1893 for award to "ship officers and others who by extraordinary exertions have contributed to the preservation of vessels and cargoes from perils of all kinds."

The medals of the Royal Humane Society are also highly prized by seamen. One is struck annually in gold for the bravest deed of the year, and, needless to say, it has on many occasions been awarded for some outstanding act of gallantry by seamen. This is the Stanhope Medal.

### *Trinity House*

An institution connected with ships and seamen even older than Lloyd's is the Honourable Corporation of Trinity House.

"The Corporation of Trinity House at Deptford Strond" is no longer located at Deptford as formerly. Since 1795, the Cor-



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poration has had its headquarters at Trinity House, Tower Hill, where it overlooks "The Pool."

It has had a long and interesting history, dating from the time of Henry VIII, who gave the corporation its first charter and entrusted it with the direction of the new Royal dockyard at Deptford. Elizabeth conferred on the corporation authority to erect beacons and other seamarks for the guidance of seamen round the coasts of England, and in the reign of James I a select class was formed, rejoicing in the title of "Elder Brethren," other members being styled "Younger Brethren." The sole management of the business of the Corporation was vested in the Elder, while the Younger were given a vote in the election of Master and Wardens.

Many ancient practices are due to the by-laws of the Elder Brethren, including that requiring an agreement in writing between the master and the crew.

The Corporation consists of a Master, Deputy Master and thirteen Elder Brethren. It is the sole survivor of five maritime societies, the other four having been situated at Leith, Hull, Newcastle-on-Tyne, and Dundee, but these have dwindled away, while the

## THE REGULATION OF SHIPPING

London Society has increased in prestige, power and responsibility throughout the years.

The practical duties which are discharged by the Elder Brethren consist in the maintenance of the whole of the lighthouses, buoys, beacons, lightships and other navigating marks around the coasts of England, and for this purpose large establishments, both afloat and ashore, are necessary.

By an Act of 1836 the Elder Brethren received powers to purchase from the Crown and from private owners all interest in coastal lights and beacons, for the maintenance of which tolls were levied, the surplus being devoted to the relief of old and indigent mariners. Since 1853 the control of the funds collected by the Corporation, chiefly in the form of Light Dues, has been vested in the Board of Trade, but the Corporation remains the chief authority in all matters connected with the English coast lights and beacons, and exercises also an indirect influence over the proposals of the Northern Lights Board and the Irish Lights Commissioners.

In addition to the lights, Trinity House also has the care and supervision of Trinity pilots.

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A further function of the Elder Brethren is that of acting as nautical assessors in the Court of Admiralty in cases where questions of seamanship or navigation may arise.

The distinctive uniform of the Elder Brethren is familiar to most people since, as a mark of honour, persons of rank and influence are admitted as honorary Elder Brethren and frequently wear the uniform at public functions.

Vacancies in the ranks of the Brethren who are all experienced seamen are filled by themselves. The lofty traditions, the great influence, the privileges and responsibilities, and the emoluments of the members are such as to attract as candidates the most highly qualified and experienced masters from the Royal Navy and merchant service.

It will be seen that the views on nautical matters expressed by the Elder Brethren must necessarily carry great weight, and in this respect the Corporation is probably the most influential body of nautical experts in existence.

### *Honourable Company of Master Mariners*

Although practising the most ancient and honourable of crafts, British master mariners had not until recently any association or

## THE REGULATION OF SHIPPING

society similar to those which have for many centuries been distinguished as the City Guilds (Livery Companies) of London.

This omission was rectified in 1930 when the Honourable Company of Master Mariners was incorporated by Royal Charter, and in 1932 the Court of Aldermen approved the grant of Livery to the Company, the Prince of Wales being the first master.

“The craft of a master mariner is a skilled craft, and by default of competency therein the lives of the King’s subjects or of others may be imperilled.” Consequently only those are eligible for admittance to the Company who have held for not less than five years a certificate of competency, as master of a foreign-going vessel, granted by the Board of Trade.

The aims and objects of the Company are to provide for the senior officers of the merchant service a central body, qualified to represent them on all matters affecting the status and prestige of the service and its officers.

The Company also seeks to maintain the best traditions of the service and to encourage a high and honourable standard of practice, proficiency and professional conduct among the cloth, and to provide for the discussion

## SHIPS AND SEAMEN

and study of the innumerable matters relating to their profession. The immense scope of such questions is indicated by the following :

Marine meteorology, hydrography, tides, estuaries and navigable rivers, stability, salvage and handling of ships, the stowage and chemistry of cargoes, heavy lifts and mechanical gear for discharge of cargo, cable laying and repairs, ocean towage, wrecks and casualties, wireless, medical and customs requirements, whaling, sealing, maritime history, jurisprudence, dry docking, company and insurance law, Average, ice and inland navigation.

Other matters prescribed for discussion and study include lifeboats, the training of crews, the instruction of passengers, the safety and preservation of seamen, passengers, ships and cargo, the education, training and qualification of young seamen, cadets, and apprentices, the provision and maintenance of beneficent institutions for necessitous Master Mariners and their dependents.

The Company has the same charter as other City Companies and enjoys the distinction of being the youngest of these old-established guilds. Its Court is composed of twelve of the most distinguished master

## THE REGULATION OF SHIPPING

mariners, and its membership includes ship captains both on the active and retired list whose names command the confidence of the profession and of the travelling public.

### *Conclusion*

Our survey of shipping and seamen is now concluded. It will be seen that of late years the standard and prestige of this greatest of all industries has been considerably raised, its efficiency increased and the professional status improved of "The Cloth" and all connected with it. There is, however, still great scope for further improvement in every direction.

The people of England have in the past been notoriously ignorant of the sea, shipping and seamen. But of late years this attitude has changed, landsmen are becoming more alive to the vital importance of the King's Merchant Navy as the "jugular vein of the nation."

The Royal Navy has been described as "A sure shield," a shield that serves as a bulwark, guarding all those who pass on the seas. That the great organization engaged in peaceful trade may in the future be permitted to pursue its lawful occasions, unhampered by

### SHIPS AND SEAMEN

blockade and unharassed by the horrors of warfare, must be the earnest prayer of all who remember the terrible experiences of the Great War.

## APPENDIX

### FAST SHIPS

#### 26 knots

<i>Rex</i>	.	.	.	Turbine	.	Italian
<i>Bremen</i>	.	.	.	Turbine	.	German
<i>Europa</i>	.	.	.	Turbine	.	German

#### 25 knots

<i>Mauretania</i>	.	.	.	Turbine	.	British
<i>Majestic</i>	.	.	.	Turbine	.	British
<i>Leviathan</i>	.	.	.	Turbine	.	United States

### CHANNEL PACKETS

<i>Anglia</i>	.	.	.	Turbine	.	British
<i>Cambria</i>	.	.	.	Turbine	.	British
<i>Hibernia</i>	.	.	.	Turbine	.	British
<i>Scotia</i>	.	.	.	Turbine	.	British

#### 24 knots

<i>Empress of Britain</i>	.	.	.	.	.	British
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### CHANNEL PACKETS

<i>Paris</i>	.	.	.	Turbine	.	British
<i>Versailles</i>	.	.	.	Turbine	.	French



APPENDIX

23 knots

<i>Aquitania</i>	.	.	Turbine	.	British
<i>Berengaria</i>	.	.	Turbine	.	British
<i>Ile de France</i>	.	.	Turbine	.	French
<i>Monticello</i>	.	.	Turbine	.	United States
<i>Mount Vernon</i>	.	.	Turbine	.	United States

22 knots

<i>Olympic</i>	.	Turbine and Recip.	British
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LARGE BRITISH LINERS

<i>Majestic</i>	.	.	.	56,621	Tons	Gross
<i>Berengaria</i>	.	.	.	52,226	"	"
<i>Olympic</i>	.	.	.	46,639	"	"
<i>Aquitania</i>	.	.	.	45,647	"	"
<i>Homeric</i>	.	.	.	34,351	"	"
<i>Mauretania</i>	.	.	.	30,696	"	"

LARGE GERMAN LINERS

<i>Bremen</i>	.	.	.	51,656	Tons	Gross
<i>Europa</i>	.	.	.	49,746	"	"
<i>Columbus</i>	.	.	.	32,565	"	"

LARGE UNITED STATES LINERS

<i>Leviathan</i>	.	.	.	59,957	Tons	Gross
<i>George Washington</i>	.	.	.	23,788	"	"

## APPENDIX

### LARGE FRENCH LINERS

<i>Ile de France</i>	.	.	.	43,153	Tons	Gross
<i>L'Atlantique</i>	.	.	.	40,945	"	"
<i>Paris</i>	.	.	.	34,569	"	"

### LARGE ITALIAN LINERS

<i>Augustus</i>	.	.	(Motor)	32,650	Tons	Gross
<i>Roma</i>	.	.	(Turbine)	32,583	"	"

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*The Sailing Ship* by R. and R. C. Anderson is a valuable technical treatise, while the student will find much material in the yearly issues of Brassey's *Naval Annual* which contain sections devoted to merchant shipping. *The History of the Merchant Navy during the Great War* by Sir Archibald Hurd is a semi-official publication of great historical interest. There is also a mass of interesting material dealing with ships and seamen in the publications of the Hakluyt Society, the

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