THE BRITISH MERCHANT SERVICE

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BEING

A HISTORY OF THE BRITISH MERCANTILE MARINE

From the Earliest Times to the Present Day

BY

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WITH ILLUSTRATIONS

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PREFACE

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R. J. CORNEWALL-JONES.

London, 1898.

CONTENTS

CHAPTER I.

CHAPTER II.

CHAPTER III.

CHAPTER VII.

CHAPTER VIII.

CHAPTER IX.

CHAPTER X.

CHAPTER XIX.

CHAPTER XX.

CHAPTER XXI.

CHAPTER XXII.

CHAPTER XXIII.

CHAPTER XXIV.

CHAPTER XXV.

CHAPTER XXVI.

CHAPTER XXVII.

CHAPTER XXVIII.

CHAPTER XXIX.

LIST OF ILLUSTRATIONS

THE
BRITISH MERCHANT SERVICE

CHAPTER I.

Early history of British shipping—The boats of the Britons—The ships of the Veneti—Invasion of Cæsar, B.C. 55—Shipping during the Roman occupation—The Saxon vessels—The ships of the Danes—Ancient Danish ship recently discovered in Denmark—The ships of Alfred the Great—Naval action between the British and Danish ships in 897—Shipping under Ethelred—Port of London in Ethelred's reign—Shipping under the Normans—The fleet of the Conqueror—The Cinque Ports—Ships furnished by the Cinque Ports—The Crusades—The fleet of Richard I.—The fleet in the Mediterranean—The Shipping Code of Richard I.—Nautical punishments.

From the insular position of Britain the first rude outline of a Mercantile Marine must have been, in this country, coincident with the dawn of civilization itself. The necessity for some kind of vessel to be employed for the purposes of fishing would doubtless be the first thing to make itself felt, whilst the next would be the want of some means of transporting commodities from one place to another; and the land being to a large extent either dense and impenetrable forest, or boundless morass, the water would naturally suggest itself as affording the readiest means of communication. In any case, long before the Christian era the Britons appear to have understood the arts both of building and of navigating vessels.

Cæsar speaks of the vessels of the Britons as being of the slightest possible construction, having the keel and the ribs of wood, and being covered over with skins; whilst Lucan describes them as constructed of osiers, twisted and interwoven with each other, the whole being then covered with strong hides. In these fragile craft the early British mariners not only constantly crossed from Britain to Ireland, and to France, but they even ventured into the Bay of Biscay, at least as far as the River Garonne. The Britons must, however, have possessed, even at that remote period, some vessels of more importance than these slight boats, because we know that one of the primary objects of the invasion of this country by Julius Cæsar, in the year 55 B.C., was to punish the Britons for sending help in *ships*, as well as in men, to one of the Gaelic tribes, the Veneti, with whom he was then at war.

Cæsar * thus describes the ships of the Gaulish Veneti, the probability being that some of the vessels he so describes were British ships which had been lent to the Veneti:—

"Their bottoms were somewhat flatter than those of our vessels, their prows were very high and erect, as likewise their sterns, to bear the hugeness of the billows and the violence of the tempests. The body of the vessel was built entirely of oak. The benches of the rowers were made of strong beams about a foot in breadth and fastened with iron spikes, the thickness of one's thumb. Instead of cables they secured their anchors with chains of iron; and made use of skins and a sort of thin pliant leather by way of sails, probably either because they had no canvas or because they imagined that canvas sails were not so proper to bear the violence of tempests, and the rage and fury of the winds, and to govern ships of that bulk and burden. The attack of our fleet with these vessels was of such a kind that it had the advantage in swiftness only, all other things were more advantageous and favourable for them than for us, for neither could our ships injure them with their beaks, so great was their strength and firmness, nor could we easily throw our darts, because of their height above us, which also was the reason that we found it extremely difficult to grapple the enemy, and bring him to a close fight."

Cæsar's ships, we know from a variety of sources, were large and powerful vessels, and we have absolute record of one Roman galley, built more than two thousand years ago, which is said to have been propelled by three tiers of oars, and was 110 feet long, and 11 feet broad. After the fall of the Roman Empire little or no progress appears to have been made in the building of ships for many centuries;

* "Cæsar's Commentaries on the Gallic War," Book iii. 13.

yet in the tenth century galleys of from one to two thousand tons burthen were occasionally to be found in the Mediterranean.

Shipping must, however, have increased in Britain during the century immediately succeeding Cæsar's first invasion, for in A.D. 43, when the Romans under Claudius ultimately subdued Britain and made it a Roman colony, London is described by Tacitus as being a port of some considerable trade, and a chief residence of merchants. Clausentum too, which was either Southampton, or the present village of Bitterne, on the Itchen, near to Southampton, and Rutupi (Richborough) near Sandwich, were even then commercial ports of some importance, and were occupied by traders who dealt largely with Gaul, and even with Rome itself; British vessels laden among other things with British oysters, a delicacy much appreciated by the Romans, occasionally finding their way to the Imperial City.

Hitherto the ships of the Roman conquerors of Britain had merely crossed the Channel to and fro, and it was not until the time of the Governorship of Agricola, A.D. 78–85, that they first sailed entirely round the whole country—an undertaking, at that time, in the entire absence of lights, beacons, buoys, or charts, fraught with no inconsiderable amount of difficulty and of danger.

Little is known of the actual state of Britain under the Roman rule until towards the close of the fourth century, when we find the Saxons invading the country on the east and on the south coasts, coming in their skin-covered boats, called in Saxon, Ceol or Ciol, from which has come the English word "keel," a description of barge which has been long in use in the north of England, and more especially on the Tyne, where to the present day the name survives in vessels built to hold exactly twenty-one tons four hundredweight, or a "keel," of coals.

At this early period there probably would, in a country like Britain, be no very marked distinction between vessels employed for the peaceful purposes of commerce, and those used for the more serious operations of war, and under ordinary circumstances the self-same vessels would doubtless be employed for both purposes; being used for the most part in commerce, and when fighting had to be done, instead of carrying merchandise, being filled with soldiers. After the departure of the Romans from Britain, which Bede places at just before the siege of Rome by Attila, A.D. 409, the shipping interest in this country would appear to have materially declined, so that when the Jutes and Saxons first, and after them the Vikings and the Danes, came and made repeated incursions into the country, there was no adequate maritime force to oppose them.

The Vikings and the Danes, who were the most formidable maritime enemies of Britain, were themselves thorough seamen, and were the possessors of far larger and much more powerful ships than the Britons; but the only Danish vessels of which any authentic accounts have come down to us, may probably be regarded more as fighting ships than as merchantmen, yet, as bearing to a certain extent on the vessels with which we are more immediately concerned, a brief notice of them will not be out of place.

The principal vessels of the Danes were of two classes—the Drakers, and the Holkers; the former, so named from their carrying a dragon on their bows, being the larger vessels. The Holkers were smaller, probably more in the nature of canoes, as they are said to have been, not built, but hollowed out of trees. From these latter the word "hulk" has evidently been derived. The Danes, with most of the Scandinavian nations, had also another kind of vessel which they called a Snekkar (Serpent), apparently shorter in proportion to her breadth than either of the former classes, and furnished with a mast, and therefore not unlike the ordinary Dutch galliot of the sixteenth and seventeenth centuries.

In 1865 the remains of an ancient vessel were discovered in Denmark, which competent authorities have pronounced as probably a Draker of the fifth century; and which may therefore fairly be taken as a type of the kind of vessel used by the Danes against the British. The remains were sufficiently complete to permit of the entire re-construction of the vessel as it floated.

It was evidently a row-boat, there being no arrangement for help from canvas, yet it was seventy-seven feet from stem to stern, and proportionately rather broad in the middle, rising considerably both at the bow and at the stern, which were precisely alike. The vessel was clinker-built, and the peculiarities of its structure testified to the abundance, both of material and of skilled labour. The timbers and the heavy planks, for instance, instead of being simply sawn into boards of equal thickness throughout, were cut thin where thinness was desirable; but where greater strength was required they were thicker, so that they could be mortised into the crossbeams and gunwale, instead of being merely nailed. She had thirty rowlocks—fifteen on either side—and these, as well as the helm, were reversible, so as to permit of the vessel being rowed with either end forward.

The Danes appeared first in the north of Scotland, and gradually worked their way to the south; and when Alfred the Great came to the throne in 871, he found the whole country entirely overrun by them. Convinced that their expulsion could never be effected by purely military operations, he at once turned his attention to the formation of a fleet, and caused a number of ships to be built, twice the size of the largest vessels that had hitherto been seen; built on new principles, and in a new form, after models said to have been contrived by himself, so that they astonished the enemy as much by their appearance as by their strength. They were galleys, generally with forty oars, but some had even sixty oars, on each side; and they were longer, deeper, and wider than the Danish ships, and did not roll in a sea-way as much as they did.

The new ships first appeared in 897,* and their first service was against six Danish vessels, off the Isle of Wight. Nine of the new ships were sent out, with instructions to get between the enemy and the shore; but on the first appearance of the British ships, three of the Danish ships, alarmed at their

* This account is taken from that given in a Saxon chronicle among the Cottonian MSS. written during the lifetime of Alfred. It is especially interesting as giving at once a concise and an intelligible account of a naval engagement of very early times, being, as a matter of fact, a battle fought exactly a thousand years ago.

formidable proportions, in trying to get away, ran aground. The remaining three, despite the superior swiftness of the British ships, desperately resolved to engage them, but were soon overpowered. Two of them were taken, and all the men in them killed; the third Danish ship with some difficulty escaping. In the meantime those ships that had run aground, the tide having now risen, got off; but they had previously been so much damaged by Alfred's ships, and by the fact of getting aground, that two of them became unmanageable, and again went ashore, and were lost.

After the death of Alfred the Great, which occurred in 901, his son Edward followed his father's example in the care he bestowed upon his fleet; and although he was continually in conflict with the ever-encroaching Danes, yet he was able, during his reign, to equip and keep up a hundred ships to protect British trade, and to guard the coasts: a line of policy which his successor, Athelstan, continued to carry out. Athelstan was a great encourager of maritime commerce, and was indeed the first English monarch who made commerce a road to honour; one of his laws enacting that if any merchant or mariner should successfully accomplish three voyages on the high seas, with a ship and cargo of his own, he should thenceforth be advanced to the dignity of a Thane, and be entitled to all the privileges attaching to that rank.

Even during the desolations of the reign of Ethelred II., some attention was still paid to maritime commerce, and a law was passed ordaining that every owner of 310 hides of land should furnish a ship for the protection of the realm, the result being a larger naval force than had ever been collected before; but in spite of this greatly increased number of ships, the Danes were every year making further and further inroads into the country, one chronicle informing us that in the year 980, "Southampton was ravaged by a ship-force, and that the most part of the townsmen were slain, and led captive;" and that in 981 "there was much havoc done everywhere by the Danes along the sea-coast, as well among the men of Devon as amongst the men of Wales."

At this time many fresh regulations were made with reference to the coasting-trade, particularly with regard to the port of London. Pennant, in his "London," says—

"Before the Custom House was established, the principal place for receiving the duties was at Billing's Gate. As early as 979, or during the reign of Ethelred, a small vessel was to pay at Billing's Gate one halfpenny, as a toll; a greater vessel, bearing sails, one penny; a keel or hulk, fourpence; a ship laden with wood, one piece of the wood, for toll; and a boat laden with fish, one halfpenny; or a larger boat with fish, one penny. There was, even at that time, a considerable trade with France for its wines, for mention is made of ships from Rouen that came here and landed their wines, and freed them from toll, that is, paid their duties, but what they amounted to, I cannot learn." *

With the accession of Canute to the English throne the long-continued feud between England and Denmark came to an end, and maritime trade began again to flourish in Britain, whilst the number of ships required for the protection of the country was proportionately diminished, and from henceforward the Saxon and the Danish immigrants may be regarded as forming part of the one great English or Anglo-Saxon family.

When William, Duke of Normandy, determined to invade England, and to dispute the possession of the crown with Harold, he collected a large army on the coast of Normandy, and in August, 1066, set sail for England. His fleet is said by some chroniclers to have numbered as many as three thousand vessels; whilst others, the French authorities among them, put the number at eight hundred, which is probably the more correct estimate. It was, however, in all probability a mere collection of coasting vessels, specially requisitioned for this particular service, no doubt supplemented by some ships presented by the great barons, but probably without one single ship of complete warlike appointment to convoy them. Even the largest ships engaged could not have been of any very great value, as the whole fleet were, by William's orders, burned and destroyed as soon as the army had disembarked, in order first to stimulate the valour of his men by the fact of cutting off all retreat, and also, as a second

* Pennant's "London."

reason, to save the cost of maintaining the vessels. A representation of these vessels is given in the famous Bayeux tapestry.

King William had no sooner thoroughly established his power in this country than important changes were introduced in maritime affairs, and over-sea commerce experienced greatly increased security and stability. The Danes, however, still restless, were preparing another fleet for the purpose of another invasion, which obliged the Conqueror to summon to his aid the whole of the naval resources of the country, Dover, Sandwich, Romney, Winchelsea, and Rye being specially called upon to furnish ships; these towns being then, probably for the first time, styled the Cinque Ports, by which distinctive title they have been known ever since.

The Cinque Ports were incorporated and endowed with many and very substantial privileges, not only with the view of promoting the commerce of the country, but also of defending it. To this end a Warden of the Cinque Ports was appointed, who, upon any sudden invasion by the enemy, was to be ready, at a short summons, to oppose him with the united strength of these towns and of their dependencies; other smaller towns being now associated for this purpose with the five original ports. The force to be raised and kept in readiness for this service was "57 ships, each ship to be furnished with twenty-one men, able, fitly qualify'd, and well armed, and one boy. The Master of each Ship and the constables were to receive a salary of sixpence a day, and each vulgar mariner was to have threepence a day, and thus they were to attend the King."

The fleet thus provided by the Conqueror was so fully maintained by William Rufus, his son and successor, that Selden dates England's maritime supremacy from that early period. But for all that, for more than a century after the Conquest British ships but seldom ventured beyond the Bay of Biscay on the one hand, and the entrance to the Baltic on the other; and there is no record of any extended voyages by English ships until the time of the Crusades.

The Holy City fell into the hands of the famous Sultan, Saladin, in the year 1187, and at once a new Crusade was projected. Richard Cœur de Lion, on ascending the throne, threw his whole energies into the scheme, and with the aid of Philip II. of France, and other princes, succeeded in raising a large force for the purpose of rescuing the Holy Land from the infidel. Towards the close of 1189, two fleets, to a large extent composed of merchant ships, had been collected; one at Dover, to convey the king and his more immediate followers across the Channel; and the other, which was the larger fleet, at Dartmouth, for the conveyance of the great bulk of the Crusaders to Marseilles, where King Richard was to join them.

The Dartmouth fleet, under the command of Robert de Sabloil, and Richard de Camville, sailed from England towards the end of April, 1190, and after a disastrous voyage arrived at Lisbon, where they remained some time to refit. Leaving that port, the fleet reached Marseilles on the 22nd of August, only to find that the king had gone on to Messina. Following him, the whole of the ships assembled in the Straits of Messina on the 14th of September, the king being on board a ship called the *Trenche-le-Mer.**

It was not, however, until the April of the following year, 1191, that the fleet actually got under way for the Holy Land, it then consisting of one hundred large ships, and fourteen smaller vessels, called "busses." Each of the larger ships had a crew of fifteen sailors, and was able to carry forty soldiers, forty horses, and provisions for a year. The commander of each of these ships was also assisted by fourteen other picked men, called "slaves," who acted as rowers. These numbers must, however, be received with caution, as in all early accounts of shipping and maritime matters but little reliance is to be placed in figures.

The fleet left Messina in regular formation; three large ships forming the van, then the other ships in parallel lines, and the king with his galleys bringing up the rear; the whole forming the most imposing maritime spectacle that had ever yet been seen on any sea. The lines of ships were

* Peter Langtoft.

sufficiently close for signals by trumpets to be heard from one to the other; and each ship was near enough to her consort on either side to communicate by hailing. This formation in close order did not, however, last long, as a gale springing up when off Etna, the fleet was immediately dispersed, the crews being "sea-sick, and frightened." Three of the ships were totally lost, and their crews drowned, together with the Vice-Chancellor of England, whose body was ultimately washed ashore, with the Great Seal of England tied round his neck.

After the successful capture of Acre, and a truce having been arranged with Saladin, Richard set sail again for England; but meeting with bad weather in the Adriatic, his ship was wrecked off the coast of Istria, and the king was taken prisoner; he ultimately reaching this country in 1194, and landing at Sandwich on the 13th of March in that year. One of the effects of this expedition was the opening up of British trade with the Levant, resulting in a largely increased activity in English shipping, and the first formation of a regular British Shipping Code.

Sir Travers Twiss, in his edition of the "Black Book of the Admiralty," has examined very fully the real or supposed claims of Richard to be the author, or the editor, of the Shipping Code known as "Les Rôles d'Oleron." In doing so he quotes a memorandum of 12, Edward I. (A.D. 1284), stating that these laws "were made by Lord Richard, formerly King of England, on his return from the Holy Land, corrected, interpreted, and declared, and were published in the Island of Oleron, and were named in the French tongue 'La Ley Olyroun.'"

This Shipping Code, established by Richard Cœur de Lion, is extremely interesting, as being the first attempt to place English maritime affairs upon a sound legal footing. Previous to the time of Richard I., it had not been thought safe or prudent to entrust any one with the command of a ship, unless he were part owner of the vessel, or a freeman. These restrictions were now abolished, and the qualifications and the duties of the Master were, for the first time, defined by statute. This Shipping Code extended to about fifty clauses, and dealt with all matters relating to Mercantile shipping. The following presents a brief outline of each successive clause:—

By the First Article a Master had power, with the advice of his mariners, to pledge the *tackle* of the ship for necessary provisions, but he could not sell the *hull* without special authority from the owners. Everything on board was placed under the care of the Master, and he was held responsible for it. He was required to understand thoroughly the art of navigating his ship, in order that he might control the Pilot, who, on board a merchantman, was next in command to the Master; the third person of importance being the mate, and the fourth the factor, or supercargo. After these came the surgeon, the steward, the cook, the gunner, and the coxswain; and last of all the crew.

By the Second Article, if a vessel lay in port waiting for the weather, or for a wind, the Master was instructed, when the time for departure had arrived, to call together the ship's company and to inquire what they thought of the wind and the weather; and should there be a difference of opinion, he was bound to be guided by the majority. It was, in fact, a standing rule for the Master, in everything, to act with the advice of the majority of his ship's company, and of the merchants, if there were any merchants, on board.

The Third Clause provided that, if the ship's crew should not, unless under compulsion, do everything in their power to save the vessel and the cargo from shipwreck, they should forfeit their wages. If the vessel were wrecked, but they did succeed in saving some part of the cargo, then they were to be sent home by raising money on the goods so saved.

The Fourth Clause related to Salvage; an allowance of one-half, one-third, or one-tenth of the articles saved going to the salvors; such share being regulated by the depth of the water out of which the articles were raised.

The Fifth Article provided that, when in port, no sailors should leave the ship without the consent of the Master. The sailors were carefully to look after everything that related to the preservation of the ship and of the cargo; and if, by reason of their absence without leave, any damage accrued, they were to be punished with a year's imprisonment, and were to be kept on bread and water. If, through their absence, any accident happened so as to cause death, then they were to be flogged. They might also for desertion be branded in the face with a red-hot iron, so that they might be recognised as long as they lived.

The Sixth Clause made drunkenness, fighting, and quarrelling, severally punishable; and mutinous sailors were to forfeit their wages.

The Seventh Clause provided that, in case any one of the crew was seized with illness, he was to be sent on shore, with a ship's boy to attend upon him.

The Eighth Article prescribed the regulations affecting the throwing overboard of any of the cargo in order to save, or lighten the ship.

The Ninth Article referred to the destruction of the masts or sails, with the same object.

The Tenth Article relates to all damage to the cargo arising from imperfect dunnage, and bad stowing, for the which the Master and the mariners were to be held liable to the merchant in the event of any injury to his goods arising from this cause.

Article Eleven also refers to the damage of goods, leakage of wines and similar commodities, arising from bad stowing.

The Twelfth Article prescribes the mode in which good order was to be maintained on board the ship. The Master having hired his crew, was required to keep the peace among them. If any one called another a liar at table where there was wine and bread, he was to be fined fourpence; but if the Master himself so offended, he was to be fined double. If any sailor impudently contradicted the Master, he was to be fined eightpence. If the Master struck him, whether with his fist, or with his open hand, the sailor was required to bear the stroke; but if the Master struck more than one blow, then the sailor might defend himself. But if the sailor struck the first blow, he was either to pay a hundred *sous*, or lose his hand. The Master might call the sailor opprobrious names; and in such

ANCIENT DANISH VESSEL.

[To face page 4.

case the sailor was advised to submit, and to hide himself from the Master's sight, in the forecastle; but if the Master followed him there, then the sailor might stand on his defence, for the Master ought not to pass into the forecastle after him.

The Thirteenth Clause provided that, if any differences arose between the Master and a sailor, the Master ought to "deny him his mess" (that is, make him go without his meal), thrice, before he turned him out of the ship.

The Fourteenth and Fifteenth Articles relate to the regulations for mooring the ship; and to injuries resulting from one ship fouling another.

The Sixteenth Article required the Master, when the ship was ready to load, to ask the crew, "Will you freight your share yourselves, or be allowed for it in proportion with the ship's general freight?" And the sailors were bound, then and there, to answer, and to make their choice.

By the Seventeenth Clause, the sailors from Brittany were to have only one meal a day from the kitchen; but those from Normandy were to have two meals; and when a ship arrived in a wine country the Master was to provide the crew with wine.

The Eighteenth Article related to the payment of the wages of the sailors; and it was held that the whole of the wages was not due until the ship was safely brought back to her destination.

The Nineteenth Article provided that, if the engagement between the Master and the sailors was broken off by war, pirates, or the command of the king, the seaman was entitled to have a quarter of his wages for the whole time of his engagement.

The Twentieth Clause enacted that, when in a foreign port, only two sailors from the ship might go on shore at one time; and they might take with them one meal of victuals, "as much as they can eat at once," but no drink. They were bound to return to the ship so that she should not lose a tide; and they were to be held responsible for any damage resulting from their default in this respect.

The Twenty-first Clause related to detentions, and to the payment of demurrage.

The Twenty-second Clause relates to the selling of goods from on board to provide for the ship, in which the laws of bottomry (or borrowing money on the security of the ship) were enforced.

The Twenty-third Clause enacted that if a pilot, or a "lockman" (a term applied to harbour pilots), undertook to take a vessel into port, and the vessel miscarried through his ignorance, and he had no money to make recompense for the damage, or otherwise to render full satisfaction, then he was to lose his head: and—

The Twenty-fourth Clause gave to the Master, or any of the mariners, or to the merchants on board, full power to cut off the head of the offender, without being bound in law to answer for it.

The Twenty-fifth Clause provided that all pilots, who in connivance with the Lords of the coast, or who, to ingratiate themselves with such Lords, ran a ship on shore, should be "hung on high jibbets near the place where these accursed pilots brought the ship to ruin: and which said jibbets are to abide and remain to succeeding ages in that place, as a visible caution to other vessels that sail thereby."

The Twenty-sixth Clause provided that the Lord of the place who should permit such crimes, or who should assist others in such villainies, so that he may have a share in such wrecks, shall be apprehended, and all his goods confiscated and sold, in order to make restitution; and "he himself shall be fastened to a post or stake in the midst of his own mansion-house, which, being fired at all the four corners, all shall be burned together: and the walls of the house shall be demolished, the stones pulled down, and the place made into a market-place for the sale of hogs and swine only, to all posterity."

Article Twenty-seven relates to losses from any accident which might result from the ship being badly found.

Articles Twenty-eight, Twenty-nine, and Thirty, adjust the respective shares in fishing-boats, when worked in partnership: and also relate to the salvage from shipwrecked vessels, in which the right of all shipwrecked persons to their own goods is fully maintained.

The Thirty-first Article provides that any wreckers who plundered a ship, and who, to gain possession of the goods, "should murder and destroy poor shipwrecked seamen, should be plunged into the sea till they be half dead, and then drawn out from the sea and stoned to death."

The remaining Articles deal with such matters as goods washed ashore, wrecks, and so forth. The Forty-fifth Clause is quaint. It provides that a ship, having to cut her cables and proceed to sea through stress of weather, is still entitled to the cables and anchors; and "any person detaining them from their lawful owners, shall be reputed a thief and a robber."

The Forty-sixth and Forty-seventh Articles apply to the timbers of wrecks, when the crews should be all lost, or perished. The pieces of the ship were declared still to belong to her original owners, notwithstanding any custom to the contrary, "and any participators of the said wrecks, whether they be bishops, prelates, or clerks, shall be deposed, and deprived of their benefices"—and if lay people, then they were to incur the penalties previously recited.

Swearing and gambling would seem to have been, from quite early times, weaknesses to which seamen were particularly prone. In Richard I.'s expedition to the Holy Land, he ordered that if any seaman on board any of the ships should be found playing at dice, or any similar game, he should be plunged into the sea, three mornings successively, as a punishment.

Swearing, on board ship, in the middle ages had reached such a pitch that Pope Paul III. issued, in 1543, a decree prescribing the most severe penalties for "this most damnable custom," which penalties were renewed in another decree issued, in 1582, by Pope Gregory XIII.

Moncenigo, in 1420, flogged every common sailor guilty of blasphemy, or even of swearing; and fined "every sailor of the poop, steersman, officer, or gentleman, a hundred *sous*, who should be guilty of a like offence." Many offences of seamen were, in the middle ages, punished by the whip, or the cat-o'-nine-tails; but receiving a ducking overboard three times successively was, perhaps, one of the most common forms of punishment. This mode of punishment was first used by the English in the twelfth century; the offender being, by means of ropes, lowered down on one side of the ship, passed under the bottom, and hauled up again on the other side. This was known as "keel-hauling," a name which has survived till the present day.

CHAPTER II.

British shipping under the Plantagenets—The action off Sandwich in 1217—Pirates in the Channel—Letters of Marque—The Great Fleet of Edward III., 1340—List of the ships—The coal trade of the north—Shipping under Richard II.—Navigation Act—Defence of the country by the merchant ships, 1406—Maritime affairs under Henry V.—The fleet for the invasion of France—Important change in the Mercantile Marine during the reign of Richard III.

DURING the thirteenth and fourteenth centuries the English monarchs, constantly engaged in continental wars, had entirely to rely on merchant ships for fighting purposes; but as the office of the ship was simply to convey the archers and the other soldiers who were the real combatants, the particular kind of vessel employed was of no very great moment. It was such a fleet—composed, for the most part, of ordinary merchant ships—that engaged the French ships off Sandwich in 1217. On the 24th of August in that year a fleet of eighty large vessels, under the command of a famous pirate, known as Eustace the Monk, put to sea from Calais with reinforcements for Prince Louis, who then was in England.

Hubert de Burgh, a resolute and able man, with an English fleet of forty sail, left Dover, and met the enemy off Sandwich, the English commencing the attack by "a dreadful discharge of arrows from the crossbow-men and the archers." The British ships rushed against the enemy's vessels with their iron beaks, sinking many of them; and the sailors, "availing themselves of their position to windward, threw pulverised quicklime into the French ships, whereby their men were blinded." *

In this celebrated action the ships contributed by the Cinque

* Matthew Paris.

Ports so distinguished themselves that, as a recompense, these ports obtained still further privileges, being accorded permission to "annoy the subjects of France, and all they met of whatever nation," or in other words, to plunder any foreign merchant ship that they might come across. This, however, was a line of policy that very soon found imitators, and it was not long before the whole Channel swarmed with pirates—English, French, Scotch, and Irish—all endeavouring to prey upon each other, until the evil had grown to such an enormous extent that the most stringent measures were found necessary to sweep the seas of these marauders. In spite, however, of the trouble given by these pirates, English maritime commerce was steadily increasing, there being a large export trade in wool, chiefly to Flanders; the king obtaining a revenue of £80,000 a year from the export duty on this article alone.

King Edward I. did much to encourage maritime commerce, among other things granting a fresh charter to the Cinque Ports. He still fixed the number of ships to be provided by these ports at fifty-seven, which number was afterwards increased to eighty, thus establishing the nucleus of a national Navy.*

It was during the reign of Edward I. that "letters of marque" appear to have been granted for the first time. A merchant of Bayonne, at that time a port of the English dominions in Gascony, had shipped a cargo of fruit from Malaga, which, on its passage along the coast of Portugal, was seized and carried into Lisbon by an armed cruiser belonging to that country, although Portugal was then at peace with England. The King of Portugal, who had himself taken one-tenth

* Hakluyt, vol. i. p. 21, gives the following: "In the 22nd year of Edward I. the particular charge of the Cinque Ports is set down in this manner:—The Port of Hastings ought to find three ships: the town of Pevensey, one: Bulverhithe and Petit Iahn, one: Bekesbourne in Kent, seven: Grenche at Gillingham in Kent, two men in armour, to go with the ships of Hastings: the town of Rye, five (to it was Tenterden annexed in the time of Henry the Sixth): the town of Winchelsea, tenne: the Port of Romney, four: Lydde, seven: the port of Hithe, five: the Port of Dover, nineteen: the town of Folkestone, seven: the town of Feversham, seven: the Port of Sandwich, with Stonor, Fordwich, Deal, &c., five ships. These ships they ought to find upon forty days summons, armed and arrayed at their own charges: and in each of them twenty men, besides the Master of the Maryners."

part of the property, refused either to restore the ship and cargo or to make good the loss; whereupon the owner of the ship, and his heirs, were granted license, by King Edward's Lieutenant in Gascony, for five years to seize the property of the Portuguese, and more especially that of the inhabitants of Lisbon, until he had made good his loss to the extent of what had been taken from him. After this letters of marque were by no means uncommon, and a species of legalized piracy was again established. When Edward III., in the summer of 1338, commenced the war with Philip VI. of France, known since as the Hundred Years' War, and when he had determined upon the siege of Calais, he ordered a roll to be prepared of all the ships that might be available for the blockade and for the siege; and it is from this roll that we obtain the first reliable information with regard to the extent of the mercantile shipping of this country.

Philip had collected a vast number of ships in the harbour of Sluys, at the mouth of the Scheldt; and to oppose this fleet, as well as for the projected operations against Calais, a large English fleet, composed for the most part of merchant ships, was got together, great numbers of soldiers and archers were embarked, and early in June, 1340, the expedition sailed.

When Edward arrived off Sluys, "he saw," as Froissart tells us, "so great a number of ships that their masts seemed to be like a great wood." The naval battle that ensued was long and fierce, the first English success being the recapture of a large ship named the *Christopher*, which had been taken by the French in the preceding year. The fighting on both sides was very severe; but after the lapse of several hours victory declared itself for the English. Over two hundred French ships—that is to say, more than one-half of Philip's fleet—were taken, and some two thousand men are said to have been slain.

The following is a list of the ships and men as supplied by the various ports of the country, and not a few interesting facts may be adduced from its perusal. If the ships supplied by the king be taken as representing the Royal Navy it will be seen that the naval force formed but a very insignificant portion of the whole—not a twentieth part of the entire fleet —which thus almost exclusively consisted of ships of the mercantile marine.

The relative importance of the different ports, in the reign of Edward III., may be inferred from the numbers of the ships that they supplied, and the results are not a little curious. Thus London would appear to have been at that time by no means the most important port of the realm, being largely exceeded in importance by Dartmouth, Plymouth, Fowey, and Yarmouth; the latter port contributing many more ships, and nearly three times the number of men that London did. On the other hand, many ports that are now important maritime centres, were at that time but exceedingly insignificant places, or, indeed, in some instances, did not exist at all. For instance, Cardiff and Swansea sent only one ship each; Portsmouth sent only five ships; Hartlepool, five; Grimsby, five; and York, which, however, could scarcely perhaps be considered as a port, was only represented by one ship and by nine men, whilst Liverpool is not even heard of at all.

List of the Ships of the Great Fleet of King Edward III.

From the *Harleian MSS.*

"The Rolle of the huge ffleete of King Edward iii. before Callice to be seen in the Kinge's great Gardrobe in London: whereby appeareth the wonderfull strengthe of England by Sea in those dayes."

The South Fleete.

	Shippes.	Maryners.		Shippes.	Maryners.
The King	25	419	Lyme	4	62
London	25	662	Seton	2	25
Ayleford	2	24	Sydmowthe	3	62
Hoo	2	24	Exmowthe	10	193
Maydestone	2	51	Tegnmowthe	7	120
Hope	2	59	Dertmowthe	32	756
Margate	15	160	Portesmowthe	5	96
Nonehethe	5	49	Plymowthe	26	603
Montormont	2	23	Looe	20	315
Feversham	2	53	Yalme	2	47
Sandewich	22	504	Fowey	47	770
Dover	16	334	Bristol	22	608
Wighte	13	220	Tenmowthe	2	25
Wynchelsey	21	396	Hastinge	5	96
Waymouthe	15	263	Romney	4	65

THE SOUTH FLEETE—*continued.*

	Shippes.	Maryners.		Shippes.	Maryners.
Rye	9	156	Swansey	1	29
Hithe	6	122	Ilfrecombe	6	79
Shoram	20	329	Poterikstowe	2	27
Seforde	5	80	Polerwan	1	60
Newmowthe	2	18	Wadworthe	1	14
Hannilhoke	7	117	Kerdiffe	1	51
Hoke	11	208	Bridgewater	1	15
Sowthampton	21	576	Caermarthen	1	16
Leymingeton	9	159	Colechesworth	1	12
Poole	4	94	Mulbroke	1	12
Warham	3	59			

Somme totall of the Sowthe Fleete—

Shippes ... 473
Maryners ... 9307

THE NORTH FLEETE.

	Shippes.	Maryners.		Shippes.	Maryners.
Bamburghe	1	9	Scarborowghe	1	19
Newcaster	27	314	Yarmowthe	43	1950
Wolriche	1	12	Dornewiche	6	102
Hertilpoole	5	145	Orforde	13	303
Hulle	16	466	Ipswiche	3	62
Yorke	1	9	Merrye	13	303
Ravenser	1	27	Brightelensey	14	283
Wodhowse	1	12	Colchester	12	239
Storkehithe	1	10	Whibanes	1	6
Barton	3	30	Derwen	5	90
Swynfleete	1	11	Boston	17	361
Saltfleete	2	49	Malden	2	32
Grymsbye	5	96	Swynhomber	2	32
Lemyce	19	382	Barton	5	61
Blackney	2	38			

Somme totall of the Northe Fleete—

Shippes ... 234
Maryners ... 5624

Somme totall of all the English Fleete—

Shippes ... 707
Maryners ... 14931

SHIPPES AND MARYNERS OF FORRAYNE COUNTREYES IN THIS AYDE.

	Shippes.	Maryners.		Shippes.	Maryners.
Bayonne	15	439	Flanders	14	133
Spayne	7	184	Gelderland	1	24
Irelande	1	184			

The full nomber of the said strangers shippes and maryners—

Shippes ... 38
Maryners ... 964

Various monarchs, even previous to the reign of Edward III. at the beginning of the fourteenth century, did undoubtedly possess ships which appear to have been built and employed solely in the public service; but more generally when ships were required for the transport of troops, they were merchant ships, either provided by the principal ports, or hired for the occasion.

Edward IV. had several ships of his own, which he employed sometimes in war, but perhaps more often in trade, in which he was largely engaged; so that it is evident that down to that time the line between Naval ships and ships of the Mercantile Marine was exceedingly ill-defined—the same vessel being at one time a merchant ship, pure and simple, and at another time what we should now designate an armed cruiser.

Until the time of Edward IV., the general type of ship had remained pretty much the same for centuries; the vessel rising considerably both at the stem and the stern, and being fitted with a single mast in the centre, which served to sustain a square sail, on which depended the only means then used of conveying the vessel across the ocean at times when it was considered inconvenient, or unadvisable, to make use of the oars.

During the reigns of the Plantagenet kings a new maritime industry was gradually springing up in the north of England. Although it is certain that the Romans worked coal to some small extent in the north, it was not until the reign of Edward III. that the opening of the great coal-fields near Newcastle took place, and employment was found for a largely increased number of ships. The use of coal found favour, however, with foreigners much more rapidly than it did at home, and for some time after its discovery the consumption of coal was thought by the English to be so unhealthy, that a Royal edict prohibited its use in the City of London, whilst the Queen resided there, in case it might prove "pernicious to her health."

But while the use of coal was thus restricted in England, large quantities were shipped abroad, France sending her vessels laden with corn to Newcastle, and taking in coal as their return cargoes—indeed, the French were the first to take English coal to foreign countries, the number of French and other foreign vessels attracted by this trade increasing every year.

During the reign of Richard II. the merchants, becoming alarmed at the large number of foreign ships entering English ports, and fearing that sooner or later all the carrying-trade of the country would pass into the hands of foreigners, petitioned Parliament to restrict the privileges of foreign ships; and the First Navigation Act, passed in the fifth year of Richard II., was the result. It, however, very soon became a dead letter, for in the October of the next year, 1382, permission was given to English merchants in foreign ports to ship their goods for England in foreign vessels as before, "if they could not find sufficient English ships."

It was during the same king's reign that the English Government passed the first law on record whereby dues were levied on all merchant ships frequenting English ports; the amount of the dues so levied being used for the purpose of restoring and maintaining an efficient Royal Navy. The only exceptions made were those in favour of ships bringing merchandise from Flanders to London, and of the traders from London to Calais with wool and hides; whilst all other vessels leaving the Thames were required to pay a charge of sixpence a ton.

The Navy, for whose benefit this tax was levied, was no sooner created, however, than the fleet, under the command of John of Gaunt, Duke of Lancaster, instead of being employed in guarding the shores of England, was sent to besiege St. Malo; while the French ships, in the meanwhile, came and ravaged the coast of Cornwall; and, in the absence of the English fleet, a combined squadron of French and Spanish ships sailed up the Thames as far as Gravesend, burning and destroying all the towns and villages as they came.

Here, again, the merchant service came to the timely aid of the State. The ships of the Royal Navy being engaged at St. Malo, a fleet of west-country merchantmen, who had united for their own defence, boldly attacked the French and Spanish ships, and, although the English ships were much smaller than those of the enemy, yet by dint of superior seamanship they managed successfully to repulse them.

After the deposition of Richard II., Henry IV. exerted himself to get together, and to keep up, a regular Navy; but so far was he from being successful that the entire guardianship of the sea, from May, 1406, until September, 1407, was entrusted to merchant vessels, the law requiring ship-owners "to maintain certain ships on the seas;" and they were further empowered to select out of their body two fit persons, to whom the king should grant commissions to act as Admirals. In return for these services, certain privileges were conferred upon the owners of the ships, such as dues on wines, and other merchandise imported; and this system of the protection of the shores and of the maritime commerce of the country, by the merchant ships themselves, prevailed for very many years.

The gallant, accomplished, and energetic Prince Henry of Monmouth came to the throne as Henry V. in 1413, being then in his 26th year; and in 1414 he determined upon a war with France. A large army was raised for the purpose of the invasion, and for the transport of this army across the Channel every British vessel of 20 tons and upwards was pressed into the service, and ordered to assemble, either at London, Sandwich, Winchelsea, or Bristol, previous to proceeding to Southampton to embark the troops.

But all the ports of England put together were unable to supply the king's requirements, and consequently commissioners were appointed to hire ships in the Low Countries, whilst three large vessels, the *Trinity*, the *Grâce de Dieu*, and the *Holy Ghost*, were built for the king at Southampton, specially to compete with the large vessels that the French had hired from the Genoese and the Spaniards. Henry also built two royal yachts, the *King's Chamber* and the *King's Hall*, which were magnificently fitted up, and had sails of purple silk, emblazoned with the arms of England and of France.

The fleet, when collected, assembled in the Southampton water and in the Solent, and consisted of no less than fifteen hundred vessels, for the most part merchant ships, both English and foreign; the ships being manned by crews, to a very large extent obtained by the instrumentality of the pressgang.

On Saturday, August 10, 1415, Henry embarked on board his own vessel, the *Trinity*, then lying between Southampton and Portsmouth. The ships of this large fleet, varying in size from 20 to 300 tons, on Sunday, August 1, set sail, and Tuesday's noonday sun saw the royal ship entering the mouth of the Seine, the whole fleet coming to anchor about three miles from Harfleur. With the results of the campaign itself, with the siege of Harfleur, and the great victory of Agincourt, we are not concerned; but after landing the troops the fleet was sent round to Calais, to await the king's arrival, and ultimately it returned to England in the November following.

King Henry V. enjoyed but a brief reign, dying in 1422; but before the close of his reign, with a view to any future requisition of ships, an Act was passed requiring all vessels to be measured according to certain prescribed forms in order to ascertain their tonnage or capacity. By a clause of this Act, the barges, or "keels," then employed in the conveyance of coals from the colliery-wharves to the ships in the Tyne, were also required to be measured, and marked by the Crown; and from that day forth every keel contained exactly 21 tons 4 cwt. of coals; and the capacity of a ship on the Tyne was better understood by the number of *keels* she could carry than by her tonnage.

The short reign of Richard III. was marked by one very important change in a matter intimately connected with the mercantile marine of England. Until about this time English merchant ships had but rarely ventured beyond the coast of Portugal, only a few of the more enterprising having occasionally found their way into the Mediterranean; but it was during the reign of Richard III. that there commenced a regular trade with Italy, which steadily increased year by year. It was from this period that dates a most important era in the annals of British shipping, the distinction being now made, for the first time, between the business of the shipowner and the business of the merchant, many ships being engaged in this trade with Italy as carriers alone, deriving their profits entirely from the amount of the freight they carried, apart from any consideration of the profits or otherwise as derived from their cargoes.

CHAPTER III.

Shipping in the fifteenth century—Maritime discoveries—Bartholomew Diaz—Vasco da Gama—Christopher Columbus—The North-West Passage—Cabot's expedition—The maritime achievements of Spain and Portugal—The discoveries of the English—Shipping under Henry VII.—Improvements in the art of ship-building—The Merchant Adventurers Company—The expedition under Sir Hugh Willoughby—Sir Hugh Willoughby's own account of it.

THE fifteenth century was pre-eminently the age of maritime discovery. In 1418 Madeira was discovered by the Portuguese, and was at once added to the possessions of Portugal; in 1446 the mariners of the same country discovered the Cape Verde Islands, and three years afterwards, the Azores. By 1463 the full knowledge of the West African coast had been pushed southwards as far as the Equator; and the project of reaching the Indies by sailing round the continent of Africa, was seriously occupying the minds of the Portuguese.

In 1487 Bartholomew Diaz determined upon making the attempt, and actually succeeded in doubling the Cape of Good Hope, and in reaching the neighbourhood of Algoa Bay, near the mouth of the Great Fish River, where he found the coast-line trending away to the north-east. He did not continue his voyage farther, but returned home again by the Cape, which, from the constant succession of bad weather that he experienced whilst rounding it, he named the Cape of Storms. Upon his return, however, to Portugal, John II. bestowed on it the name of Cabo de Bona Esperanza, or the Cape of Good Hope, by which name it has ever since been known.

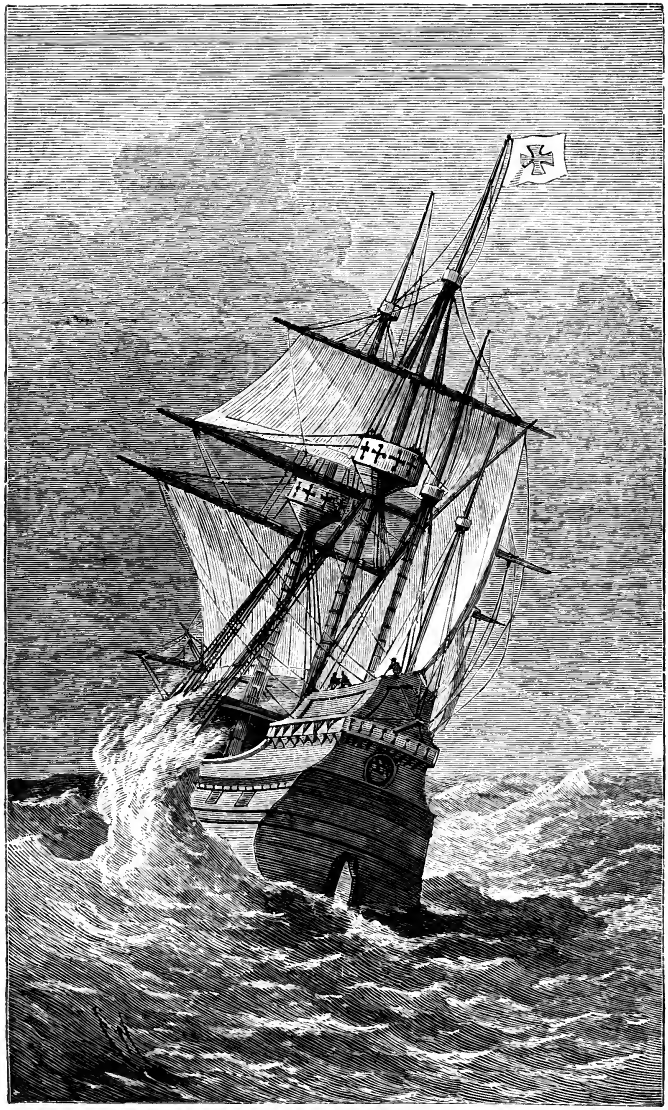
Ten years later Vasco da Gama also sailed round the Cape, and landed at what is now known as Natal, ultimately succeeding in reaching the East Indies at Calicut, on the coast of Malabar.

In the spring of 1497, three stately ships were built at Lisbon, called respectively the *St. Raphael*, the *St. Michael*, and the *St. Gabriel*. These ships were to form the squadron of Vasco da Gama in his voyage to the East. Besides taking out with him numberless presents wherewith to propitiate such potentates as he might meet with, Gama shipped six great marble monuments, on which were engraved the arms of Spain and other devices, to set up in such countries as he could persuade their too credulous rulers to grant him permission, so that afterwards he might perhaps return and claim these countries as annexed. He also showed his astuteness by taking on board a number of convicts sentenced to death, *enfans perdus*, who should be put forward on any dangerous or forlorn service that might turn up. We know that they actually were so made use of on occasions, and once or twice were left behind as incipient colonists; and it does not appear that they made any very serious objections to these experimental uses.

Vasco da Gama doubled the Cape without knowing it, by the simple expedient of beating out to sea for two whole months, when he fancied he was opposite to it. Here he had considerable difficulties with his crew, having to put the pilots in irons, and throwing their quadrants into the sea, to encourage the rest to trust wholly in him. Steering a northerly course again, he made the land, and ran into a timely harbour, which he called the "River of Mercy," to repair damages, where his crew suffered the first known outbreak of scurvy.

Having completed his repairs, Vasco da Gama sailed up the African eastern coast, and commenced negociations with sundry potentates at Mozambique, Melinde, and elsewhere, always displaying considerable diplomacy, and setting up his landmarks where he could. At Mozambique he left ten of his *enfans perdus*, "as," he naïvely remarked, "if they lived they might be of advantage to him when he came again."

In landing at any strange port, Gama invariably obtained hostages before entrusting any valuable personage on shore.



THE "SAN GABRIEL," BUILT IN 1497.

[*To face page* 28.

A moorish pilot, or a convict or two, were sometimes risked to open communications, and negociations were encouraged by paying the people handsomely for the fruits and vegetables that they brought off, and by giving presents, such as red cloth and mirrors, the latter of which seem to have been highly effective. Everywhere Vasco proclaimed the greatness of the King of Portugal, what he would do to his enemies, and what advantages would accrue to his allies. Then with a salvo of artillery and a great blowing of trumpets, he used to impress his words, and occasionally to enforce his arguments.

The opening of the ocean route to India, by way of the Cape of Good Hope, as a result of these discoveries, and the discovery of the West India Islands by Christopher Columbus, in 1492, gave an immense impetus to English maritime affairs, and as a consequence made the reign of the first Tudor king, perhaps, more important to English shipping than any reign preceding.

It would seem, indeed, to have been, to a certain extent, the result of a mere accident that Christopher Columbus himself did not make his great discoveries whilst sailing under the British flag, rather than under that of Spain; for being at first but coldly received in that country, he had, as a matter of fact, approached King Henry VII. of England upon the subject, the particulars of which are thus given by Hakluyt, who wrote during the reign of Henry VIII. He says—

"Christopher Columbus, fearing lest if the King of Castile in like manner (as the King of Portugal had done) should not condescend unto his enterprise, he should be forced to offer the same again unto some other prince, and so that much time should be spent therein. He therefore sent into England a certain brother of his, which he had with him, whose name was Bartholomew Columbus, who albeit he had not the Latin tongue, yet nevertheless was a man of experience, and skilful in sea causes, and could very well make sea cards, and globes, and other instruments belonging to that profession, as he had been instructed by his brother. Wherefore after that Bartholomew Columbus was departed for England his luck was to fall into the hands of pirates, which spoiled him, as also the rest of them which were in the ship he went in. Upon which occasion, and by reason of his poverty and sickness, which cruelly assaulted him in a country so far distant from his friends, he deserted his embassage for a long while, until such time as he had gotten somewhat handsome about him with the making of sea cards. At length he began to deal with King Henry the Seventh, the father of King Henry the Eighth, which reigneth at this present, unto whom he presented a map of the world. After the King had seen the map which Christopher Columbus had sent unto him, he accepted the offer with a joyful countenance, and sent to call him into England. But because God had reserved the said offer for Castile, Columbus was gone in the mean space."

Christopher Columbus sailed on the 3rd of August, 1492, with three small ships, from the harbour of Palos, an insignificant Atlantic port of Andalusia. On October 12 he set foot on one of the Bahamas, afterwards discovering the islands of Hayti and Cuba. On March 15, 1493, he was back again at Palos. In a subsequent voyage he visited the mainland of the new continent, but it ultimately took its name from that of the Florentine mariner Amerigo Vespucci, who first saw it in 1499, when he landed on the territory now called Surinam. Vespucci made two other voyages in the service of the King of Portugal, and then became "Chief Pilot and Hydrographer" to the King of Spain, his duties being to prepare charts and to prescribe routes for voyagers to the New World. He was on friendly terms with Columbus, and is in no wise responsible for the injustice done to the great discoverer in the name bestowed on the Western Continent. The error is said to have been due to a German geographer, who, writing in 1507 of the new continent, first termed it "America." The name was adopted by other writers, and so became popular, and in the end universal.

The news of the discovery of America by Christopher Columbus in 1492 soon spread throughout the whole of Europe. It produced an immense excitement everywhere, and nowhere perhaps more than in England, where it gave rise to a long succession of voyages of discovery.

As it was the project of Columbus to reach the Indies by sailing to the westward that resulted in the accidental discovery of the West India Islands, and ultimately in the discovery of America itself, so the idea still pursued the merchants and sailors of this country that there must certainly be a way to India and to China by sailing either to the north-west or to the north-east. Although parts of the coast of America had by this time been discovered, yet the general configuration of the new continent, and the fact that it extended to within the Arctic Circle, were utterly unknown to the civilized world; and the probability, or at least the possibility, of a north-west passage to India occupied the minds of men for three whole centuries.

The voyages of discovery initiated by England at the close of the fifteenth century all tended in this direction, and whilst they were all consequently unsuccessful in their immediate object—that of finding a north-west passage to India—yet, on the other hand, they were eminently successful in opening up many new branches of trade, and in greatly extending the knowledge of navigation.

The first expedition that sailed from England was fitted out at Bristol, under the authority of a charter from King Henry VII. dated the 5th of March, 1495, by John Cabot, a Venetian, and his three sons. They were by this charter authorized to subdue and occupy all such countries unknown to Christians as they might find, on condition of paying one-fifth of their gains to the king; and, as a further inducement to the adventurers, it was agreed that any goods that they might import from such new countries should be exempt from customs; and to encourage the merchants of Bristol the more freely to advance the money needed for the enterprise, it was specially stipulated that Bristol should have the exclusive privilege of receiving all that was imported.

Cabot sailed from Bristol in May, 1497, in a ship called the *Matthew*, and crossed the Atlantic in a higher latitude than that followed by Columbus, sighting Newfoundland about five o'clock in the morning of the 24th of June, 1497—St. John's Day—hence the name, St. John's, Newfoundland. Instead, however, of finding the kind of land that had been described by Columbus, they found a cold, bleak, and inhospitable country, but still one whose shores swarmed with fish of every kind, with seals, walruses, and whales. After staying some little time to examine the coast of Newfoundland, they proceeded on their voyage, and landed on the shores of Labrador, somewhere between latitude 56° and 58°, on the 1st of August, 1497.

After the discovery of Labrador, Cabot retraced his steps, and, passing again round Newfoundland, sailed down the coast of North America as far as Florida, from whence he returned to Europe.

Some years later—namely, in 1534—the French sent out an expedition under the command of Jacques Cartier, who explored the coast of New Brunswick, and sailed many hundred miles up the St. Lawrence.

Spain and Portugal, the two great maritime powers of that time, were not slow to avail themselves of the new discoveries, and the former at once monopolized the West Indies, Mexico, and large tracts of South America, from whence an uninterrupted stream of gold and treasure poured into Spain. The Portuguese, to whom had fallen other portions of the shores of South America, were perhaps less successful than the Spaniards in the search for gold and silver, but were far more successful in the raising of sugar and other tropical produce.

In the reign of Queen Elizabeth, Pernambuco, which then belonged to the Portuguese, was the most flourishing place on the coast of Brazil. It contained three thousand houses, and around it were no less than seventy sugar factories all worked by slaves; besides which it supplied a large amount of Brazil wood and cotton. Bahia, too, contained a thousand houses and forty sugar factories, and large quantities of cotton were grown in the neighbourhood. Rio de Janeiro at this time had not more than three hundred houses and only three sugar factories; whilst at Santos were some four hundred houses and three sugar factories.

During the whole of the sixteenth century, therefore, the Portuguese and the Spaniards divided between them the entire trade of America. They possessed almost exclusively the commerce and the government of Africa, and they were absolute masters in the East Indies. Meanwhile, the English attempts to settle in North America were entirely unsuccessful. A moderately profitable trade in salt fish was about the only consequence to England of the discovery of Newfoundland; and the reports of the immense wealth that was accruing to Spain and Portugal from their rich and splendid settlements rendered the English dissatisfied with their barren discoveries, and were continually urging them to endeavour to reach the spice islands and the rich countries of the East by voyages either to the north-west, round the northern shores of America, or to the north-east, along the coasts of Norway, Lapland, and Siberia. So long as they were deluded by this *ignis fatuus*, they entirely neglected the fine regions of North America which were open to them; and it was not until repeated failures had at length induced them to abandon the search for gold that they began to direct their energies to the great and practicable object of colonizing the coast of Virginia.

Henry VII., like some of his predecessors upon the English throne, was himself a great merchant, and he not only owned and fitted out many ships on his own account, simply for commercial purposes, but he endeavoured to promote in many ways the interests of maritime commerce. That the particular means that he adopted to this end were not always the best means in the long run, was to a great extent attributable to the spirit of the age, the principle not having then been recognised that it is impossible successfully to bolster up a declining commerce by any measure of protection. Thus, in his first parliament a protectionist law was passed absolutely prohibiting the importation of Bordeaux wines in any but English, Irish, or Welsh bottoms, and these ships were to be manned entirely by men of the countries owning them. This law was afterwards still further extended, so that no wines from Gascony or Guienne were allowed to be imported into England except in ships belonging to the king—that is to say, in his own merchant ships—or in ships belonging to his subjects, and any such wines imported in foreign ships were to be forfeited.

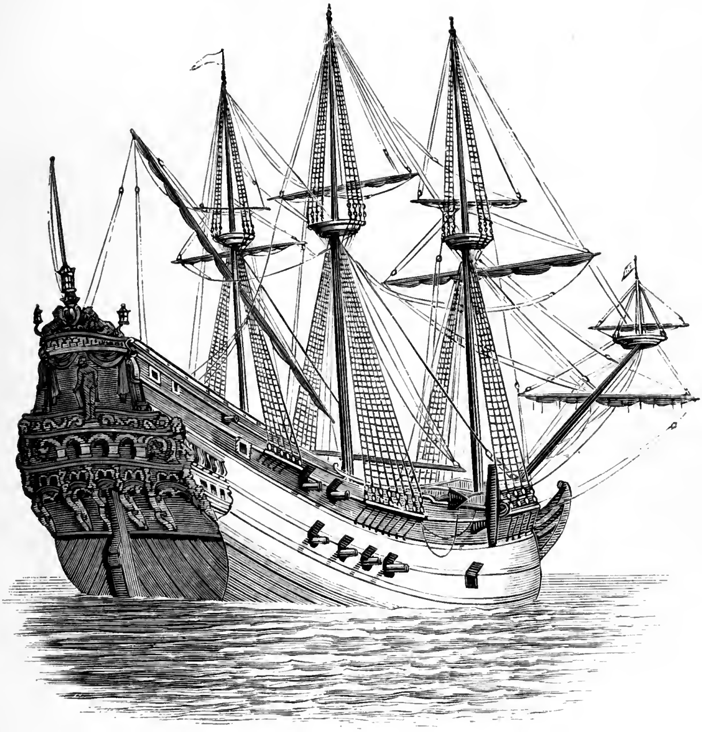
With a greater use for ships came necessarily many improvements in the construction of the vessels themselves, and by the year 1500, shipbuilding, particularly in the Mediterranean, had made an immense advance. The possessors of the most important vessels afloat, either for warlike or for mercantile purposes, at that time were the Venetians and the Genoese, and their vessels, known as "carracks" and "galleases," would even at the present day be considered of by no means contemptible dimensions. Their magnitude occasionally extended to a thousand or fifteen hundred tons burden; * they carried three masts, with lower masts and topmasts, were square-rigged on the fore and main masts, and carried a lateen sail on the mizen; and they had a bowsprit, raking at an angle of about 45 degrees, carrying a large square spritsail. The stern was raised up to a great height above the waist of the ship, with quarter-deck and poop, and was elaborately ornamented with carving and gilding. This artistic treatment of the stern and quarter galleries came down to much more recent times, excellent pencil designs for such work by eminent artists like Vandervelde and others being still extant.

The Venetian galleys of this age are said to have carried, on an average, some 500 tons of cargo under hatches, besides a considerable deck load. Their crews often consisted of as many as two hundred men, of whom a hundred and fifty were necessary to work the sails and the oars. Twelve of the smartest seamen were selected to steer the vessel—quartermasters, in fact, under the direction of the pilots, of whom there were two to each vessel. These twelve men were required to take the lead in all the duties of seamanship, especially in going aloft to set or take in the sails. They bore the name of "gallants," whence doubtless the term "top-gallant" sails.

Before the end of Henry VII.'s reign similar ships belonging to London, Bristol, and Southampton, were trading to Sicily, Candia, and sometimes even to Cyprus, Tripoli, and Beyrout; as an outward cargo taking, for the most part, woollen and cotton goods, skins, and so forth; and bringing back silks, wine, oil, Turkey carpets, and spices. Hakluyt mentions one vessel employed in this trade, called the *Holy Cross*, which was of 160 tons burden. After her last voyage to the Mediterranean, which lasted a twelvemonth, he says—

> "She, with great danger returned home, where upon her arrival at Blackwall, her wine and oil casks were found to be so weak that they were not able to hoist them up out of the ship, but were constrained to draw them off as they lay, and to put the wine and oil into new vessels, and so unload the ship,

* It must be borne in mind, however, that the Venetian "ton" represented only about ten hundredweight, so that practically the tonnage of these vessels should be divided by two.



A GENOESE "CARRACK" OF 1542. [*To face page* 34.

which was so shaken in this voyage, and so weakened that she was laid up in the dock, and never made voyage afterwards."

Another vessel of the same period, of which Hakluyt gives some particulars, was the *Matthew Gonson*, of 300 tons burden. Her crew consisted in all of one hundred men, and she seems to have been well found, carrying three boats, a pinnace, a long-boat, and a skiff. The pinnace was—

"a great boat which was able to carry ten tons of water, the which at our return homewards we towed all the way from Chio until we came through the Strait of Gibraltar, into the main ocean."

Furnished with better ships than heretofore, the spirit of adventure and of discovery took a still stronger hold on the minds of British mariners and British merchants; and Sebastian Cabot, who for some years had relinquished all maritime enterprises, and had left the country, now returned, and became the head of an association known as the "Merchant Adventurers' Company," the object of which was to be "the search and discovery of the northern parts of the World, to open a way and passage to Cathay for our men to travel to new and unknown kingdoms."

The first ships despatched by the Company consisted of a squadron of three vessels commanded by the gallant Sir Hugh Willoughby, with Richard Chancellor as his second in command, which sailed from the Thames in the May of 1553, to seek for the North-East Passage through the Polar Seas. Separated by a storm off the Lofoden Islands, the consorts parted company, never to meet again. The fate of two of their number forms a fitting prologue to the long tragedy of the Arctic ice, for their crews, sixty-two all told, including the leader of the expedition, perished to a man of scurvy on the desolate shores of Russian Lapland, where the ships, manned by the dead, were found by native fishermen in the following spring.

This disaster was counterbalanced by the success which attended Chancellor's voyage. Entering the White Sea, he wintered near the spot which is now occupied by the port of Archangel, journeyed to the Court of Ivan the Terrible at Moscow, and obtained from him those commercial privileges for England which led to the formation of the Muscovy

Company, and laid the foundations of the trade between this country and Russia.

Chancellor, however, did not live to reap the fruits of his labours, as upon his return, having the Ambassador to England from the Russian Court on board, he was overtaken by a furious gale off the Scotch coast, and his ship was lost at Pitsligo, when in his praiseworthy and successful endeavours to save the life of the Russian Ambassador, he most unfortunately lost his own.

The expedition consisted of three ships, the *Bona Speranza*, of 120 tons, which was the admiral's ship, and was commanded by Sir Hugh Willoughby; the *Edward Bonaventure*, of 160 tons, commanded by Captain Richard Chancellor; and the *Bona Confidentia*, of 90 tons, Cornelius Durfooth, master. Each ship had with it a pinnace and a smaller boat.

In Hakluyt's "Voyages" the log of the Commodore's ship, written by Sir Hugh Willoughby himself, is given, and it is so interesting, and puts before us so vividly the mode of procedure on board ship three centuries and a half ago, that no apology is needed for transcribing it. Hakluyt says—

"These foresaid ships being fully furnished with their pinnaces and boats, well appointed with all manner of artillery, and other things necessary for their defence with all the men aforesaid departed from Ratcliffe, and sailed unto Deptford the 10 day of May 1553.

"'11 May. About two of the clock, we departed from Deptford, passing by Greenwich, saluted the King's Majesty,* he then being there, shooting off our ordnance, and so sailed unto Blackwall and there remained until the 17 day of May: and that day in the morning we went from Blackwall and came to Woolwich by nine of the clock; and there remained one tide, and so the same night unto Herith.

"'The 18 day from Herith unto Gravesend; and there remained until the twentieth day, that day being Saturday: from Gravesend unto Tilbury Hope, remaining there until the two and twentieth day.

"'The 22 day from Tilbury Hope to Hollie Haven.

"'The 23 day from Hollie Haven till we came against Lee, and there remained that night by reason the wind was contrary to us.†

"'The 24 day the wind being in the South-west in the morning, we sailed along the coast, over the Spits, until we came against St. Osyth, about six of the clock at night, and there came to an anchor, and abode there all that night.

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* This was King Edward VI.

† Thus being a fortnight getting down to the mouth of the Thames.

"'The 25 day, about ten of the clock, we departed from St. Osyth, and so sailed forward unto the Nase, and there abode that night for wind and tide.

"'The 26 day at five of the clock in the morning, we weighed our anchor, and sailed over the Nase, the wind being at the South-west, until we came to Orwell wands, and there came to an anchor, and abode there until the 28 day.

"'The same day, being Trinity Sunday, about 7 of the clock before noon we weighed our anchors, and sailed till we came athwart Walsursye, and there came to an anchor.

"'The 29 day from thence to Holmhead, where we stayed that day, where we consulted which way, and what courses were best to be holden for the discovery of our voyage, and there agreed.

"'The 30 day of May at five of the clock in the morning we set sail, and came against Yarmouth, about three leagues into the sea, riding there at anchor all that night.

"'The last of May, into the sea six leagues North-east, and there tarried that night for the wind blew very sore.

"'The first of June the wind being at North, contrary to us, we came back again to Orwell, and remained there until the 15 day, tarrying for the wind, for all this time the wind was contrary to our purpose.

"'The 15 day being at Orwell, in the Latitude of 52 degrees, in the morning we weighed our anchors, and went forth into the wands, about two miles from the town, and lay there that night.

"'The 16 day at eight of the clock we set forward, and sayled until we came athwart Aldborough, and there stayed that night.

"'The 17 day about five of the clock before noon we went back unto Orfordness, and there remained until the 19 day.

"'The 19 day at eight of the clock in the morning we went back to Orwell, and abode there three days tarrying for the wind.

"'The 23 day of June, the wind being fair in the South-west we hailed into the seas to Orfordness, and from thence into the seas ten leagues North-east: then being past the sands, we changed our course six leagues North-north-east: about midnight we changed our course again, and went due North, continuing in the same unto the 27 day.

"'The 27 day about seven of the clock, North-north-west, 42 leagues, to the end to fall in with Shotland: then the wind veered to the West, so that we could lie but North and by West, continuing in the same course 40 leagues, whereby we could not fetch Shotland: then we sailed North 16 leagues by estimation, after that North and by West, and North-north-west, then South-east, with divers other courses, traversing and tracing the seas, by reason of sundry and manifold contrary winds, until the 14 day of July: and then the Sun entering into Leo, we discovered land Eastward of us, into the which we sailed that night as much as we might: and after we went on shore with our pinnace, and found little houses to the number of thirty, whereby we knew it was inhabited, but the people were fled away, as we judged, for fear of us.

"'The land was all full of little Islands, and that innumerable, which were called (as we learned afterwards) Ægeland, and Halgeland, which lyeth from Orfordness, North and by East, being in the Latitude of 66 degrees. The distance between Orfordness and Ægeland 250 leagues. Then we sailed from thence 12 leagues North-west, and found many other Islands, and there came to anchor the 19 day, and manned our pinnace, and went on shore to the islands, and found people mowing and making of hay, which came to the shore and welcomed us. In which place were an innumerable sort of Islands, which were called the Isles of Rost being under the dominion of the King of Denmark: which place was in Latitude 66 degrees and 30 minutes. The wind being contrary, we remained there three days, and there was an innumerable sort of fowls of divers kinds, of which we took very many.

"'The 22 day the wind coming fair, we departed from Rost, sailing North-north-east, keeping the sea until the 27 day, and then we drew near unto the land, which was still East of us: then went forth our pinnace to seek harbour, and found many good harbours, of the which we entered into one with our ships, which was called Stanfew, and the land being Islands, were called Lewfoot or Lofoot, which were plentifully inhabited, and very gentle people, being also under the King of Denmark: but we could not learn how far it was from the main land: and we remained there until the 30 day, being in Latitude 68 degrees, and from the aforesaid Rost about 30 leagues North-north-east.

"'The 30 day of July about noon, we weighed our anchors, and went into the seas, and sailed along these Islands North-north-east, keeping the land still in sight until the second day of August: then hailing in close aboard the land, to the intent to know what land it was, there came a skiff of the Island aboard of us, of whom we asked many questions, who showed unto us that the Island was called Seynam, which is the Latitude of seventy degrees, and from Stanfew 30 Leagues, being also under the King of Denmark, and that there was no merchandise there, but only dried fish and train-oil.

"'Then we being purposed to go into Finmarke, inquired of him if we might have a pilot to bring us into Finmarke, and he said that if we could bear in, we should have a good harbour, and the next day a pilot to bring us into Finmarke, unto the Wardhouse, which is the strongest hold in Finmarke, and much resorted to by report.

"'But when we would have entered into the harbour, the land being very high on every side, there came such flaws of wind, and terrible whirlwinds, that we were not able to bear in; but by violence were constrained to take the sea again, our pinnace being unshipped.

"'We sailed North and by East, the wind increasing so sore that we were not able to bear any sail, but took them in, and lay adrift, to the end to let the storm pass over. And that night by violence of wind and thickness of mists, we were not able to keep together within sight; and then about midnight we lost our pinnace, which was a discomfort to us.

"'As soon as it was day, and the fog overpast, we looked about, and at the last descried one of our ships to leeward of us: then we spread an hullock of our foresail, and bare room with her, which was the *Confidence;* but the *Edward* we could not see. Then the flaw something abating, we and the *Confidence* hoisted up our sails the fourth Day, sailing North-east and by North, to the end to fall in with the Wardhouse, as we did consult to do before, in case we should part company.

"'Thus running North-east and by North, and North-east, 50 leagues, then we sounded and had 160 fathoms, whereby we thought to be far from land, and perceived that the land lay not as the Globe made mention. Wherefore we changed our course the sixth day, and sailed South-east and by South, eight and forty leagues, thinking thereby to find the Wardhouse.

"'The 8 day much wind rising at the West-north-west, we not knowing how the coast lay, struck our sails, and lay adrift, where we sounded, and found 160 fathoms, as before.

"'The 9 day the wind veering to the South-south-east, we sailed North-east 25 leagues.

"'The 10 day we sounded, and could get no ground, neither yet could see any land, whereat we wondered: then the wind coming at the North-east, we ran South-east about 48 leagues.

"'The 11 day the wind being at South, we sounded, and found 40 fathoms, and fair sand.

"'The 12 day the wind being at South and by East, we lay with our sail East, and East and by North, 30 leagues.

"'The 14 day, early in the morning we descried land, which land we bare with all, hoisting out our boat to discover what land it might be: but the boat could not come to land, the water was so shoal, there was very much ice also, but there was no similitude of habitation, and this land lieth from Seynam, East and by North, 160 leagues, being in Latitude 72 degrees.

"'Then we plyed to the Northward, the 15, 16, and 17 day.

"'The 18 day the wind coming at the North-east, and the *Confidence* being troubled with bilge-water and stocked, we thought it good to seek harbour for her redress: then we bare room the 18 day, South-south-east, about 70 leagues.

"'The 21 day we sounded, and found ten fathom; after that we sounded again, and found but 7 fathom, so shoaler and shoaler water, and yet could see no land, whereat we marvelled greatly: to avoid this danger we bare roomer into the sea all that night, North-west and by West.

"'The next day we sounded, and had 20 fathoms, and then shaped our course, and ran West-south-west until the 23 day: then we descried low land, into which we bare as nigh as we could, and it appeared to us uninhabited. Then we plied Westward along by that land, which lieth West-south-west and East-north-east, and much wind blowing at the West we hailed into the sea, North and by East, 30 leagues. Then the wind coming about at the North-east we sailed West-north-west; after that the wind bearing to the North-west, we lay with our sails West-south-west about 14 leagues, and then descried land, and bare in with it, being the 28 day, and finding shoal water bare in till we came to 3 fathom, then perceiving it to be shoal water, and also seeing dry sands, we haled out again North-east along that land until we came to the point thereof. That land turning to the Westward, we ran along 16 leagues North-west: then coming into a fair bay, we went on land with our boat, which place was uninhabited; but yet it appeared unto us that people had been there, by crosses and other signs: from thence we went all along the coast Westward.

"'The 4 day of September we lost sight of land, by reason of contrary winds; but the eighth day we descried land again. Within two days after, we lost sight of it; then running West and by South about 30 leagues, we got the sight of land again, and we bare in with it until night, then perceiving it to be a lee shore, we gat us into the sea, to the end to have sea room.

"'The 12 of September we haled to shoreward again, having then indifferent wind and weather: then being near unto the shore, and the tide almost spent, we came to an anchor in 30 fathoms water.

"'The 13 day we came along the coast which lay North-west and by West, and South-east and by East.

"'The 14 day we came to an anchor within two leagues of the shore, having 60 fathoms.

"'There we went ashore with our boat, and found two or three good harbours, the land being rocky and high; but as for people we could see none.

"'The 15 day we ran still along the coast until the 17 day, then the wind being contrary unto us, we thought it best to return into the harbour which we had found before, and so we bare roomer with the same, howbeit we could not accomplish our desire that day. The next day being the 18 of September, we entered into the Haven, and there came to an anchor at 6 fathoms.

"'This haven runneth into the main about two leagues, and is in breadth half a league, wherein were very many seal fishes, and other great fishes: and upon the main we saw bears, great deer, foxes, and divers strange beasts, as guloines, and such other as were to us unknown, and also wonderful.

"'Thus remaining in this haven * the space of a week, seeing the year was far spent, and also very evil weather, as frost, snow, and hail, as though it had been the deep of winter, we thought it best to winter there. Wherefore we sent out three men, South-south-west, to search if they could find people, who went three days' journey, but could find none: after that we sent other three, Westward, four days' journey, which also returned without finding any people. Then we sent three men, South-east, three days' journey, who in like sort returned without finding of people, or any similitude of habitation.'

"Here endeth Sir Hugh Willoughby his notes which were written with his own hand.

"These two following notes were written upon the outside:—

"'(1) The proceedings of Sir Hugh Willoughby after he was separated from the *Edward Bonaventure*.

"'(2) Our ship being at anchor in the harbour called Sterfier, in the Island of Lofoote.'

"The river or haven wherein Sir Hugh Willoughby, with the Company of his two ships perished for cold, is called Arzina in Lapland, near unto Kegor. But it appeareth by a Will found in the Ship that Sir Hugh Willoughby and most of the company were alive in January 1554." † ‡

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* It was in this haven they died.

† Hakluyt, "The Principal Navigations," etc., vol. i. p. 262. London, 1599.

‡ The polar passage by the north-eastern route from Europe to the Indies has since actually been made, and the voyage of the *Vega*, under Baron Nordenskiöld, has fulfilled this secular dream of maritime adventure.

Sailing from Tromsoe, on July 25, 1878, the *Vega* successfully ran the ice blockade of the Kara Sea, doubled, for the first time in the annals of navigation, Cape Chelyuskin, the most northern promontory of Asia, and, after passing a winter imprisoned in the ice within a hundred and twenty miles of Behring's Straits, returned home by way of the North Pacific, the Indian Ocean, and the Suez Canal early in 1880, after having circumnavigated the two continents of the Old World. Her name stands out as that of the only ship which has ever passed from the one great ocean to the other by the Arctic Seas.

CHAPTER IV.

Shipping in the time of Henry VIII.—The *Henri Grâce à Dieu*—The fleet for the siege of Boulogne in 1545—Will Hawkins—Voyages to the Gold Coast—Piracy in the English Channel—Voyages of discovery—The North-West Passage—Frobisher—John Davis—Sir John Hawkins—Sir Francis Drake—His celebrated voyage round the world.

In the year 1544, King Henry VIII., under a feeling of irritation caused by the French alliance with Scotland, resolved upon an invasion of France; and a large and powerful naval force was collected, the Mercantile Marine being again called upon to furnish ships towards the fleet to be used against the French.

Previously to this Henry had caused to be constructed the largest ship yet built in England—the *Henri Grâce à Dieu*, or, as she was more popularly called, the *Great Harry*. She was of 1000 tons burden, had four masts, and carried 700 men.* The *Henri Grâce à Dieu* formed one of the ships of

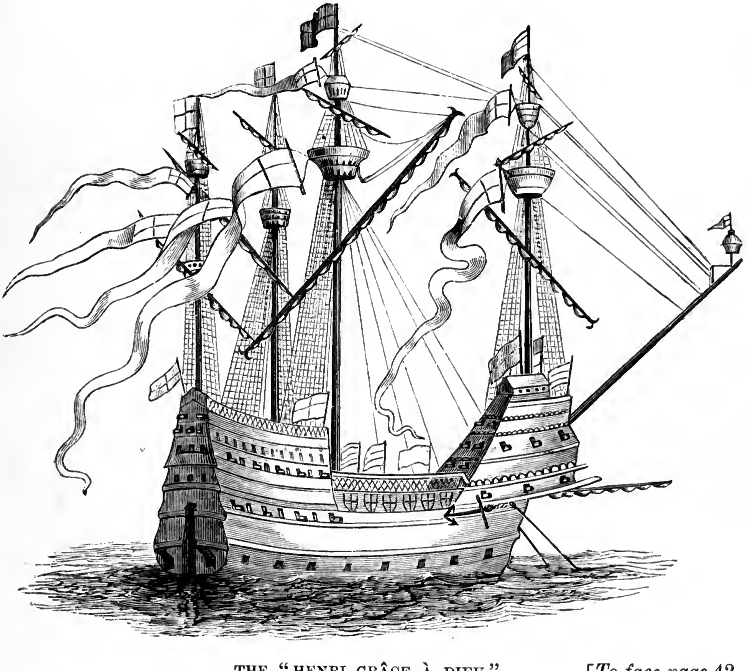
* The *Henri Grâce à Dieu* was burnt at Woolwich on the 27th of August, 1563.

The following is from the Pepysian Library, Cambridge:—

Furniture of the "Harry Grâce à Dieu."

Gonnes of Brass.		Gonnes of Yron.	
Cannons	iiii.	Port Peces	xiiii.
Di-cannons	iii.	Slyngs	iiii.
Culveryns	iiii.	Di-slyngs	ii.
Sakers	iiii.	Fowlers	viii.
Cannon-Pesers	ii.	Baessys	lx.
Fawcons	ii.	Toppe peces	ii.
		Hayle-shotte peces ...	xl.
		Hand-gonnes complete ...	c.

In a list of the king's ships in the first year of King Edward VI., the *Henri Grâce à Dieu* is stated to be at Woolwich. She is thus described: "The *Harry Grâce à Dieu*, 1000 tons, soldiers 349, mariners 301, gunners 50, brass



THE "HENRI GRÂCE À DIEU." [*To face page* 42.

(*From a MS. in the Pepysian Library.*)

this fleet, which numbered altogether about a hundred vessels, including the king's own ships and the ships provided by the different mercantile ports.

In a MS. Kalendar of Bristol for the year 1545 occurs the following:—

"This year several men went with the King to the siege and taking of Boulogne, which was taken in September, 1544. Twelve ships went out of Bristol, with Matthew, Earl of Lennox. And when the King came on board Bristol's fleet, he asked the names of their ships, and they answered the King, 'It is thus: the barque *Thorne*, of 600 tons; the barque *Pratt*, of 600 tons; the barque *Gournay*, of 400 tons; the barque *Younge*, of 400 tons; the barque *Winter*, of 300 tons; the barque *Shipman*, of 250 tons; the *Elephant*, of 120 tons; and the *Dragon*, of 120 tons.' The King answered that he wished he had many such *Thornes*, *Pratts*, *Gournays*, and the like in his land."

The *Henri Grâce à Dieu* never took part in any other expedition, but was laid up at Woolwich, where soon afterwards she was accidentally burnt.

In Henry VIII.'s reign voyages of discovery and distant voyages for the purposes of commerce, such as had rendered conspicuous the reign of his father, were still continued. Will Hawkins, of Plymouth, was a name of note among the mariners of the time. Brought up on board the vessels bringing wine from Spain and Portugal, he was early imbued with the spirit of adventure. In 1530 he sailed in a ship of 250 tons for the Gold Coast, and from thence crossed the Atlantic to the Brazils, where he opened up a trade, carried on for the most part by the merchants of Southampton, which continued for fifty years, and was only put a stop to by the conquest of the Portuguese by the Spaniards in 1580. In 1532 Hawkins made another voyage, which, however, resulted in no additional discoveries.

After the death of Edward VI. a regularly organized system of downright piracy obtained in English waters. A number of young men of good families fitted out some small vessels, chiefly built in ports of the West of England, and cruised in the Channel and in the Bay of Biscay, looking out for and

pieces 19, iron pieces 103." This was the first ship fitted with port-holes for the guns—said to have been the invention of a Frenchman, one Deschayes, a native of Brest.

attacking any Spanish vessel, or ship from the Low Countries, that they could lay their hands on. They were speedily joined by a few discontented Frenchmen of similar tastes, and were, for a time, a distinct menace to maritime commerce. One of the principal leaders of this gang was Sir Thomas Seymour, who had formed the project of seizing the Scilly Islands, which were to become the head-quarters of this piratical fraternity, who had gone so far as, besides attacking and robbing the ships, to actually murder the crews. During the early part of the reign of Elizabeth, however, an end was promptly put to this business, and Seymour and his followers returned to their allegiance.

After the accession of Elizabeth expeditions for the purposes of discovery became more frequent than they had been during the reigns of her predecessors, and many more voyages were made in the hopes of finding out a northern passage to the Moluccas and to the coast of China, before the attempt was finally abandoned as hopeless. Martin Frobisher, a native of Yorkshire, made three voyages, all directed to this end, in the years 1576, 1577, and 1578. In June, 1576, he sailed from the Thames with three small vessels manned with but thirty-four men, on "a voyage of discovery of a north-west passage." The coast of Labrador was reached, and some of the regions to the north were sighted, but he then abandoned the attempt and returned home. In 1578 Frobisher sailed again, and discovered the channel afterwards known as Hudson's Straits, in lat. 62° N., but his efforts towards "Cathay" ended in a vain endeavour to procure gold ore from the coast of North America.

In 1585, 1586, and 1587, John Davis, a native of Sandridge in Devonshire, renewed the attempt, but still without success.* He afterwards, in 1592, made a voyage to the Pacific, in the course of which he discovered the Falkland Islands. His writings and achievements show him to have been one of the most scientific navigators of the time.

Another great seaman of this period was John Hawkins (afterwards Sir John), who was born at Plymouth. He made several voyages to Spain, Portugal, and the Canary Islands,

* See p. 65.

and in 1562, learning that "negroes were very good merchandise to Hispaniola, and that store of them might easily be had upon the coast of Guinea," started upon an expedition to the Gold Coast with three small vessels—the *Solomon*, of 120 tons; the *Swallow*, 100 tons; and the *Jonas*, of 40 tons; and there embarked a cargo of three hundred slaves, which he carried to the West Indies; thus having the honour of beginning the disgraceful traffic in negroes carried on by British merchant ships, which lasted until early in the present century. He received from the Spaniards in exchange for his three hundred slaves, pearls, ginger, sugar, and hides, enough not merely to freight his own vessels, but two other vessels besides, and "thus with prosperous success, and much gain to himself, and the aforesaid adventurers, he came home, and arrived in September, 1563."

Hawkins made a second voyage in 1564, and it is said that it was upon this voyage that he brought home that useful vegetable, the potato, a native of South America, which, however, had long been known on the continent of Europe through the Spaniards, who brought it from Peru; but which was for the first time planted in Ireland by Hawkins, in 1566. Sir Francis Drake is also said to have introduced the plant into England; but it was undoubtedly Sir Walter Raleigh, who brought it from Virginia, who was the first to really make it popular in this country.

In 1567, Sir John Hawkins started on his third voyage for slaving purposes; but this time on a much larger scale than either of his previous expeditions, having now six ships, two provided by the queen herself, and four fitted out by himself and his brother, one of these, the *Judith*, being under the command of one Francis Drake, a name destined to become hereafter one of the most famous of the Elizabethan age. He successfully reached the Gold Coast, and having obtained a large number of slaves, sailed for the West Indies; but meeting with a hurricane off the island of Cuba, three of his ships were wrecked. Falling foul of the Spaniards, another ship was lost, only two of the original fleet, the *Minion* and the *Judith*, escaping. The same night, however, the *Judith* deserted; and after protracted sufferings from bad weather, sickness, and famine, Hawkins, in the *Minion*, at length reached Vigo, where he obtained some provisions, and ultimately got back to England, having lost in this venture all that he had made in his previous voyages. The queen, however, still continued to accord him her favour, and conferred upon him the post of Superintendent of the Royal Dockyards, where he introduced many important improvements in shipbuilding, some of the best ships afterwards used against the Spanish Armada having been designed by Hawkins.

On the 24th of May, 1572, Francis Drake sailed from Plymouth with two small vessels, the *Pascha*, of 70 tons, and the *Swan*, of 25 tons, bound on a buccaneering expedition to the West Indies, where he was joined by a certain Captain Rowse, with an Isle of Wight ship, having thirty-eight men on board. Hearing that there was a great treasure at a town called Nombre de Dios, the small squadron determined to attack the place, but were not successful in securing the treasure. Drake, however, learned that the silver of which they were in search was transported from Panama on the backs of mules, and he determined to intercept it.

While awaiting its arrival, Drake was taken to an eminence on the Isthmus of Darien, from whence the sea on either side could be seen; and from here he saw the Pacific, being the first Englishman to gaze upon its waters.

Soon after this the long trains of mules came in sight, and as they were practically unguarded they fell an easy prey to Drake and his companions, who helped themselves to as much silver as they would, the only difficulty being its transport to the coast. They, notwithstanding, succeeded in securing a very large amount and getting it safely on board their ships, when they at once left for England, making the passage home to the Scilly Islands in the wonderfully short period of twenty-three days. Arriving at Plymouth on a Sunday, the news was carried into church during sermon time, "and there remained few or no people with the preacher, everybody hasting to welcome home the great voyager."

The most memorable voyage of the Elizabethan age, at once mercantile and piratical, was, undoubtedly, that of

Drake when he circumnavigated the world. Queen Elizabeth gave her most gracious sanction to the undertaking, and presented Drake with a sword, making use of these remarkable words: "We do account that he which strike that thee, Drake, striketh at us." The expedition, fitted out at his own cost, and that of various fellow adventurers, comprised five vessels, the largest of which, the *Pelican*, being of only 100 tons, whilst the smallest was of no more than 15 tons. The destination was given out as being Alexandria.

On the 15th of November, 1577,* Drake, with his fleet, left Plymouth, ostensibly for the Mediterranean, but being overtaken by a heavy gale before they were clear of the Channel, the vessels narrowly escaped shipwreck, and all had to put back to Plymouth to refit. When they started again the Alexandrian destination was given up, and an island off the coast of Barbary was appointed as the rendezvous in case of the vessels being separated at sea.

By the middle of January Drake was off the Cape Verde Islands, having already committed some daring acts of piracy, and having taken several small prizes. Here he gave chase to and captured a Portuguese ship bound for Brazil with a cargo of wine, and having on board several passengers. The passengers and the ship's company Drake sent adrift in their own boats, and then took possession of the prize. For nine weeks after leaving the Cape Verde Islands they were out of sight of land, ultimately making the South American continent somewhere between Rio de Janeiro and Monte Video; and they then coasted southwards, the different vessels of the squadron, which had been for some time separated, reassembling in the harbour of Port St. Julian. Here Drake remained for over two months; and here it was that one of his officers, a certain Master Doughtie, who had been put in command of the Portuguese prize, was tried for mutiny, and beheaded. The Portuguese vessel, which had become by this time very leaky and unseaworthy, was here broken up. Drake re-christened his own ship the *Pelican*, the *Golden Hinde;* and then he weighed anchor, and sailed for the Straits of Magellan.

* Hakluyt's "Voyages."

Seventeen days were occupied in getting through the Straits, and the ships were again separated during a heavy gale from the north. One of them, the *Marigold*, must have foundered during the gale, as she was never seen or heard of again. Another of the squadron, under the command of Captain Winter, regained the Straits, and coming to an anchor, kept fires burning for some time on the shore, as a signal to Drake should he also succeed in re-entering the Straits. After waiting for many days and seeing nothing of her, Winter concluded that Drake's ship must also have foundered during the gale, and he therefore gave up the expedition altogether, and returned to England.

Drake in the mean time had been driven considerably to the southward, eventually making the land again in the neighbourhood of Cape Horn, the gale having blown continuously, and with but little intermission, for over seven weeks. The weather now moderating somewhat, he managed to steer a northerly course, and the next land he made was Mocha Island, in 38° 23′ S., where, landing with the object of obtaining fresh provisions, he was attacked by the natives, and twelve of his men were wounded, Drake himself receiving a shot under his right eye. Sheering off from Mocha, Drake missed Valparaiso, getting too far to the northward; but, lying at anchor off a small port, he came across a large ship laden with wine. This vessel was boarded and taken possession of; and Drake, not satisfied with acts of piracy on the high seas, now turned his attention to sacrilege, sending an expedition ashore, and stealing the silver candlesticks, crucifixes, lamps, and altar plate from the church of the town, and whatever else of value he could lay his hands upon.

Resuming his northerly course, Drake fell in with and captured a Portuguese vessel, the master of which agreed to pilot him safely to Callao, upon condition that his own cargo was spared. They arrived off Callao at nightfall, "sailing in between all the ships that lay there, seventeen in number." Not meeting with any great opposition, most of the crews being ashore, they rifled many of the ships of their valuables, including large quantities of rich silks and linen, and one chest of silver reals. But they heard news here that made them at once relinquish these vessels, namely, that a ship, the *Cacafuego*, laden with untold treasure, had sailed only a few days before for the neighbouring port of Payta.

Drake cut the cables of the ships at anchor, and let them drift foul of each other, or where they would, so that their crews might be too much occupied with their own affairs to think of following him, and set all sail in pursuit of the *Cacafuego*. The alarm had, however, been given, and the authorities at Lima despatched two vessels after him; but these Drake managed to elude, and shortly afterwards he took three tolerable prizes, one of which yielded forty bars of silver, eighty pounds weight of gold, and a gold crucifix "set with goodly great emeralds." One of Drake's men having secreted two plates of gold from this prize, and denying the theft, was hanged out of hand.

Finding that the *Cacafuego* had left Payta, still continuing his pursuit of her, Drake crossed the line, hoping to cut her off before she should reach Panama. In a few days he fell in with her, and when they had approached sufficiently near, he hailed her to strike; but receiving a refusal, he at once opened fire upon her with such effect as to bring down her mainmast and to wound the captain. She now hauled down her colours, and having taken possession of her, Drake for some considerable time stood out to sea with his prize. When sufficiently far from the land the two vessels brought up, and the work of transferring the cargo of the *Cacafuego* to the *Golden Hinde* was proceeded with.

She proved to be fully as richly laden as had been reported; gold and silver in coin and bars, jewels and precious stones, amounting to three hundred and sixty thousand pieces of gold, being taken from her, the silver alone representing a value in our money of £212,000. It is stated that Drake, with a cruel irony, called for the register of the treasure on board, and then sat down and wrote a receipt for the amount that he had taken, having done which he put her own captain and crew on board again, and let the *Cacafuego* depart.

Drake's object was now to get home as speedily as possible; but as it would have been obviously unwise to have gone back the way he came, the whole coast of Chili and Peru being by this time aroused, he determined to sail to the northward, and try for a passage round the north of the continent of America—the north-west passage reversed, in fact.

Putting in at a small island off the coast of Costa Rica, he obtained a supply of fresh water, wood, and fish, and made another small capture, in the shape of a coaster laden with butter and honey. He now steered a northerly course, and reached the Bay of San Francisco; but by this time his crew, coming so recently out of the tropics, began to complain bitterly of the cold, so that he entirely changed his plans, and decided upon the bold stroke of putting his ship about, and crossing the Pacific and Indian Oceans, and coming home by the Cape of Good Hope.

For sixty-eight days after leaving the coast of California, Drake's ship, with as valuable a freight as ever vessel had, was out of sight of land, until ultimately the Pelew Islands were made, and then the Moluccas. After staying a short time at Ternate, laying in a fresh stock of provisions, and adding to his cargo a quantity of cloves and other spices, Drake commenced the intricate navigation of the Malay Archipelago. Off Celebes the *Golden Hinde* became entangled among the shoals, and while running under full sail, struck on a sunken rock, and stuck fast. The boats were got out with a view of laying out an anchor, and so warping her off, but deep water was found all around. Much of the recently acquired cargo, and some of the guns and spare stores were then thrown overboard, and the wind, soon afterwards freshening, the ship came off the rocks almost uninjured.

Passing through the Straits of Sunda on the way home, a short stay was made in Java, and the Cape was reached without further incident. They put into Sierra Leone, and arrived safely at Plymouth on September 26, 1580, having been away from England very nearly three years.

Many gentlemen, for doing precisely what Drake had been doing during the past three years, have had involuntarily to put in an appearance at Tyburn; but instead of so dismal a termination to his adventures, Francis Drake received from Her Most Gracious Majesty, Queen Elizabeth, the honour of knighthood on the deck of his own ship at Deptford.

CHAPTER V.

The intended Spanish invasion of England in 1588—The Invincible Armada—The squadron of the Duke of Medina Sidonia—The English armament—Particulars of the fleet—Chiefly merchant ships—The fate of the Armada—The general state of Merchant Shipping in England—The Government returns—A return for the year 1591—The fisheries of Iceland and Newfoundland—Voyages to the coast of Guinea—Disastrous voyage of the *Edward Cotton*—The voyage of Sir Humphrey Gilbert to North America—Sir Walter Raleigh—Voyage of Captains Amadas and Barlow—First English settlers in Virginia—Introduction of tobacco—The Dutch, and their encroachments—The Navigation Laws of Cromwell. and Charles II.—Shipbuilding in the seventeenth and eighteenth centuries.

MANY reasons conduced to Philip II. of Spain's fitting out a fleet, known as the "Invincible Armada," for the invasion of England. The serious injury inflicted by English ships upon Spanish commerce, the rejection of his hand by the queen, to whom after the death of Mary he had made proposals of marriage, and the hope of furthering the Catholic cause, all combined to make the King of Spain desirous of attacking England.

It was not long before the opportunity presented itself, for the conquest of Portugal, in 1580, put him in possession of a powerful navy, and when, in 1588, the preparations were completed, we find the first or commanding squadron of the Spanish Armada to have been composed entirely of Portuguese ships. This division appears to have consisted of the following vessels:—

"THE SQUADRON OF PORTUGUESE GALLEONS, UNDER THE PARTICULAR COMMAND OF THE GENERALISSIMO, THE DUKE OF MEDINA SIDONIA.

			Tons.	Guns.	Sailors.	Mariners.
1.	*St. Martin*	Captain-General of all the Fleet	1000	50	177	300
2.	*St. John*	Admiral-General	1050	50	170	231
3.	*St. Mark*	... ...	792	40	117	292
4.	*St. Philip*	... ...	800	40	117	415

	Tons.	Guns.	Sailors.	Mariners.
5. *St. Louis*	830	40	116	376
6. *St. Matthew*	750	40	50	177
7. *St. James*	520	30	100	300
8. *Galleon of Florence*	961	52	100	300
9. *St. Christopher*	352	30	90	300
10. *St. Bernard*	352	30	100	280
11. *Zabra Augusta*	166	13	55	55
12. *Zabra Julia*	166	14	50	60"

In the whole fleet, which numbered not less than 132 sail, six ships were of 1000 tons and upwards; 59 ranged between 500 and 1000 tons; and 67 were of less than 100 tons.

The English armament that was to oppose the Armada consisted of 197 vessels, only 34 of which, however, could properly be said to be ships of the Royal Navy; one of these, the *Triumph*, being of 1100 tons, seven others ranging downwards to 600 tons, and the rest being quite small vessels. The remainder of the fleet were ships of the Mercantile Marine, either hired on the spur of the moment, or most patriotically offered by their owners for the public service in this sudden emergency, or else were vessels provided by the great towns, of which vessels none exceeded 400 tons burden, nor were there more than two even of that magnitude.

" The hundred and ninety-seven ships of the English fleet were made up thus:—

	Ships.	Tons.	Mariners.
The Queen's ships, under Admiral Lord Howard of Effingham	34	11,850	6,279
Serving with the Lord High Admiral	10	750	230
Serving with Sir Francis Drake	32	5,120	2,384
Fitted out by the City of London	38	6,130	2,710
Coasters with the Lord High Admiral	20	1,930	993
Coasters with Lord Henry Seymour	23	2,248	1,073
Volunteers with the Lord High Admiral	18	1,716	859
Victuallers (? store ships)	15	—	—
Sundry small vessels, of which no particulars are given	7	—	—
Total	197	29,744	14,528 "

Thus fully two-thirds of the fleet consisted simply of merchant vessels, many of them being quite insignificant coasters, merely armed for this special occasion.

The history of the defeat of the Invincible Armada is an oft-told tale, and only concerns us in so far as it bears on the subject of the uses to which Merchant Ships were occasionally put during the Elizabethan era.

It was on July 19, 1588, that the Spanish Armada, dispersed once by a storm in May, entered the English Channel in formation of a crescent, said to have been seven miles in width from horn to horn. Of the opposing English fleet, some of the Queen's ships were those that had been designed by Hawkins, and the improvements that he had effected became at once apparent. The sterns and forecastles of these new ships had been made lower than had been heretofore the fashion, and the ships themselves had a greater length in proportion to their beam, so that they were able to pass easily to windward of the Spanish ships, and to take up a position in the rear of the enemy, raking them with their guns at a safe distance with deadly effect, so that ship after ship was lost to the enemy, either by surrender or destruction. The only drawback experienced by the English as the fight went on was the failure of their ammunition; but fresh vessels came out from the various Dorsetshire ports, bringing fresh supplies of powder and such other things as were required.

On July 27 the Spanish fleet came to an anchor in Calais Roads, and soon afterwards the English ships brought up within a couple of miles of them. On the 29th the English commander assailed the enemy with a new device. Eight fire-ships, well alight, and filled with combustibles and explosives, were sent among the ships of the Armada, throwing them at once into the utmost confusion. On the next morning the English ships made a further fierce attack, in which many of the largest of the Spanish vessels were sunk or captured, and Medina Sidonia, with a hundred ships, fled to the North Sea, intent only on getting back to Spain by sailing round the north of our islands. Everything, however, seemed to be against the Spaniards, for no sooner had they got clear of the guns of Howard and of Drake, than bad weather set in, and the shores not only of England, but of Ireland and of Norway were strewed with Spanish wreckage and with Spanish corpses. Out of the vast and imposing fleet that had left Corunna, only fifty-three ships returned. Eighty-one vessels are said to have perished, with nearly 14,000 soldiers, besides an immense number of the picked mariners of Spain.

Previous to the sixteenth century, whenever ships were required by the sovereign for fighting purposes they were, to a large extent hired, either from the Venetians, the Genoese, the Hans Towns, or some other mercantile people, as the case might be; and these vessels, together with some ships supplied by the Cinque Ports, formed the main strength of the English National Navy; and as soon as the particular service for which they were hired was accomplished they were returned to their original owners, and resumed their ordinary mercantile pursuits, lapsing again into merchantmen.

After the absolute and crushing defeat of the Spanish Armada the necessity for keeping up a national fleet upon so extensive a scale, to a certain extent, ceased; but still the nation did not at once revert to a state of torpidity and inaction, and the queen and her ministers prudently determined to prevent the possibility of a repetition of any such attempt as that recently made by Spain. To this end, by collecting accurate information of the general state of the English Mercantile Marine, together with that of such foreign countries with whom it was probable, or even possible, that disputes might arise, Elizabeth's advisers hoped to place themselves in the best position for knowing what was likely to be required in the future, and how that want might the more readily be met.

To accomplish this great and necessary purpose, regular accounts began to be taken of all merchant vessels throughout the kingdom; and the returns were made, not of the ships and vessels belonging to each port, but of those vessels that were then actually in the ports at the time of making the return. These returns being frequently made, the Government had the opportunity of knowing, with some considerable amount of precision, exactly what number of ships could be relied upon at any particular time.

Owing to the constantly unsettled state of affairs in the Low Countries, the English counties that were nearest to Holland and Flanders—that is to say, Sussex, Kent, Essex, Suffolk, and Norfolk—appear to have been more particularly attended to than the other maritime counties; and it is by no means unworthy of remark that, although the number of vessels as given in the annexed certificate, amounting to 471, may fairly be supposed to represent only one-half of what actually belonged to these five counties, the other half being absent on distant voyages, yet the 471 vessels so enumerated as being in these ports at one time, amounted to far more than half the entire shipping possessed by the whole kingdom thirteen years before, so rapidly had shipping advanced during the latter part of Elizabeth's reign.

The following, taken from one of these returns for the year 1591, preserved among the Cottonian MSS., gives us an exact picture of the state of the Mercantile Marine, as far as the home counties were concerned, during the closing years of the reign of Queen Elizabeth:—

"A Certificate of the Ships and Vessels in the Ports and Towns of Essex, Suffolk, Norfolk, Kent, and Sussex, in the Year 1591.

Essex.	Ships, Barks, and Hoys.	Mariners, and Seafaring Men.
Lee	14	80
Malden	3	18
Colchester	28	80
Harwich	8	40
Suffolk.		
Ipswich	6	190 *
Woodbridge	6	18
Orford	5	25
Aldborough	54	120
Dunwich	14	80
Walbswick	4	60
Southwold	20	100
Packfield	4	46
Lowestoft	4	50
Norfolk.		
Yarmouth	55	541
Cley	8	30
Wainton	6	30
Blackney	8	40
Burnham	2	20
Wells	16	75
King's Lynn	23	110

* This would give over thirty men to each vessel, which would have very greatly exceeded the average; so that either there must have been a large number of unemployed sailors in Ipswich at the time, or there must have been some error in the return in this instance.

KENT.	Ships, Barks, and Hoys.	Mariners, and Seafaring Men.
Feversham	12	31
Sandwich	29	118
Dover	34	110
Hythe	5	25
Lydd	2	20
SUSSEX.		
Rye	35	150
Hastings	18	100
Brighthelmstone ...	34	120
Pevensey	0	0
Newhaven	8	12
Shoreham	1	30
Arundel	1	8
Chichester	4	40
Total	471	2517"

The mercantile navy of Great Britain was much improved in Elizabeth's reign, although in that of her immediate successor it was allowed to fall again into a low condition, and much of our commerce was carried by foreign vessels. During the whole of the Elizabethan age, however, a gradual development was taking place in the English Mercantile Marine. A great nursery for seamen had been found in the fisheries of Iceland and of Newfoundland, and here it was that the sturdy mariners of the West Country, to whom was largely due the defeat of the Spanish fleet, had received their training. Between 1570, and 1580, more than 300 ships went forth from Europe every year to the foggy banks of Newfoundland, but of this large number not one-tenth were English. After the latter date, however, the proportion of English vessels materially increased, and every year at least fifty vessels sailed from England for the Banks of Newfoundland, a large number hailing from the western ports; and from 2500 to 3000 men were then regularly employed in this trade.

Besides the fishing vessels themselves were a number of other larger vessels, considered fast sailers at the time, which were employed in carrying the fish between Newfoundland and the ports of Portugal and Spain; and most of these vessels were built at either Bridport, Dartmouth, Plymouth, or Bideford, which places remained celebrated for this particular type of vessel from that time until well into the present century.

The more extended voyages of Hawkins and of Drake induced others speedily to follow in their steps, and trading voyages to the Mediterranean, to the coast of Guinea, and to the Brazils were beginning to become frequent.

The following account, taken from Hakluyt,* is given, as presenting some interesting particulars connected with a merchant ship so employed at about the middle of the reign of Queen Elizabeth. The number of the men on board in proportion to the tonnage will be particularly noted.

"1583—Certain remembrances of an intended Voyage to Brazil, and the river of Plate by the *Edward Cotton*, a ship of Mr. Edward Cotton's, of Southampton, which perished through extreme negligence, near Rio Grande, in Ginnie, 17 July, 1583.

"Articles of Covenant between Edward Cotton, Esquire, owner of the good ship called the *Edward Cotton*, of Southampton of the one part, and William Huddie, Gentleman, Captain of the said Ship, John Hooper, his Lieutenant, John Foster, Master, Hugh Smith, Pilot for the whole Voyage, and William Cheeseman, Merchant, of the other part.

"(1) Item. To observe and keep the daily order of Common Prayer aboard the same ship, and the Company to be called thereunto, at least once in the day, to be pronounced openly.

"(2) Item. That they be ready with the first fair wind to set sail and sails in the Voyage, and not to put into any port or harbour but being forcibly constrained by Weather, or other apparent or urgent cause.

[Here follow some clauses as to the cargo.]

"(7) Item. That if any man shall practise by any device or devices whatsoever to alter the Voyage from the true Purpose and Intent of the owner, that is to make their first port at Santas and St. Vincents, and there to re-victual and traffick, and from thence to the River of Plate—then upon due Proof made, shall lose their whole entertainment due by shares or otherwise for this said Voyage, to be adjudged by the Captain, his Lieutenant, the Master, Pilot, and Merchant, or three of them at the least, whereof the Captain is to be one.

"(8) Item. That the Pinnace be ready at all times to serve the Merchant's turn upon his Demand, to take in Wares and Commodities, and to carry and re-carry to and from the Shore, when and as oft as Need shall be, and to give due Attendance at the Merchant and at the Merchant's directions during the whole Voyage.

"(9) Item. That no Head or Chief Officer being set down for such Officer under the Hand of the Owner at the going to sea of the

* Hakluyt, "The Principal Navigations, etc.," London, 1598.

said Ship shall or may be displaced from his said Place or Office without great Cause, and his misdemeanor to be adjudged by the Captain, and his Lieutenant, the Master, the Pilot and the Merchant, or by the consent of three of them at the least.

"(10) Item. That upon the return of the Ship to the coast of England the Master and Pilot put not into any Port or Harbour to the westward of Southampton, but forced by Weather, or such other urgent cause.

"(Signed) WILLIAM HUDDIE JOHN FOSTER
JOHN HOOPER WILLIAM CHEESEMAN.
HUGH SMITH

"These things being thus ordered, and the Ship of the burden of 260 tons, with 83 men of all sorts furnished, and fully appointed for the Voyage, began to sail from Hurst Castle upon Friday, the 20th day of May, 1583: and the 17th day of July ensuing fell in with the coast of Ginnie, to take in fresh Water, where through mere dissolute Negligence, she perished upon a Sand, with the most part of the Men in her, as appeareth by the confession of one that escaped, the substance and tenor whereof is this:—

"The Confession of William Bends, Master's Mate in the *Edward Cotton*, the 21st of October, 1584.

"He saith that the 17th day of July, 1583, having some lack of fresh water, they put room upon the Coast of Ginnie, where they were set upon a Sand, about eight Leagues from the Shore, and this Examinate with twenty-nine more, got into the Pinnace, who arrived in an Island, being desolate of People, and five Miles in compass, where they rested eighteen Days through Force of Weather, not having else to eat but Grass. The rest of the Company, the Ship being splitted in two, and in quarters, got them into one of the after quarters, and by the help of Rafts, came also ashore into another Island near to Rio Grande, where they all died, as he supposeth.

"The other thirty in the Pinnace, at the end of eighteen Days departed that Island and came to St. Domingo, where coming on Shore they were taken of the Moors and stripped naked. And they buried one Coxe, an old man, alive, notwithstanding his pitiful lamentation, and shriekings; the rest, having rice and water allowed them, lived there a certain time. This Examinate was at last sold to a Portingall,* with whom he dwelt for the Space of a quarter of a Year. And in the end a Portingall Carvell coming hither, his Master laded the same with Negroes, and he obtained Leave of his Master to go in the same Carvell, and by that means arrived at Lisbon, and from thence came into England the 17th of October, 1584, leaving behind him of his Company three Men and a Boy, with two others which were gone beyond St. Domingo: all which, as he saith, were so sick and diseased that he judgeth them to be, long before this time, dead."

The Spaniards and the Portuguese having practically absorbed the South American continent, it remained for

* Portuguese.

England, in order not to be entirely out of the race in the way of colonization, to turn its attention to the continent of North America; and the first act towards colonizing that part of the New World by the British was the granting of Letters Patent to Sir Humphrey Gilbert, of Compton, Devon, by Queen Elizabeth, in 1578.

The expedition fitted out for carrying this purpose into effect consisted of five ships, manned by about 260 men. The vessels were the *Delight*, of 120 tons; the *Raleigh*, 200 tons; the *Golden Hinde*, 40 tons; the *Swallow*, 40 tons; and the *Squirrel*, of 10 tons. The squadron sailed from Plymouth on Tuesday, the 11th of June, 1583, and arrived off the coast of Newfoundland on the 30th of July, seven weeks after leaving England. Sir Humphrey Gilbert took formal possession of the island in the name of Queen Elizabeth, and then proceeded towards the continent of America, passing the islands of Sable and Cape Breton, at the entrance of the Gulf of St. Lawrence. Here, unfortunately, he met with great calamities. The *Delight* was totally lost during a heavy gale on the night of the 29th of August; and the other ships having suffered considerably, it was determined to abandon the expedition altogether, and to return to England. On the passage home the *Squirrel* was lost, so that out of the five ships that left Plymouth in June three only returned.

In the year 1584 Sir Walter Raleigh obtained Letters Patent from the Queen, "for the discovery and the planting of new lands and countries on the coast of America;" and in the year that the Letters Patent were granted Captain Philip Amadas and Captain Arthur Barlow were sent out by Sir Walter Raleigh to explore the coast of America, and to report as to its capabilities. The report that they made upon their return was so favourable that it tended greatly to increase the desire of many Englishmen to go out and settle in the country.

Captain Amadas and Captain Barlow sailed from England on the 27th of April, 1584, and instead of proceeding to the northward, as Sir Humphrey Gilbert had done, they steered south, as far as the Canary Islands. From thence they crossed the Atlantic to the West Indies, and sailing past the Bahamas, proceeded up the coast, until on the 2nd of July they landed on the American continent slightly to the north of Cape Hatteras, taking possession of the country in the name of the queen, who afterwards requested that it should be called Virginia.

Inspired with a great desire to settle in Virginia, a party of Englishmen, with Sir Richard Grenville at their head, proceeded there, and stayed a year; but, unfortunately, a misunderstanding with the Indians caused them to give up all idea of settling, and they returned home again. Another attempt to colonize the country was made in the year 1590, but that also failed; and the settlement of Virginia was retarded for some years further by the rumour of the existence of the golden treasures of Guinea, in the vain pursuit of which the efforts and the fortunes of Sir Walter Raleigh and his associates were utterly wasted in three unsuccessful voyages in 1595, 1596, and 1597. It was not until a few years after the death of Queen Elizabeth that the successful effort at last was made by a body of colonists who landed on the banks of James's River, and laid the foundation of the old dominion of Virginia, the original seat of the Anglo-American race.

Amongst many articles which were brought from Virginia by the early colonists, one took especial hold on the taste of the public, and had almost as much influence in peopling Virginia as the gold of Mexico, the silver of Peru, and the sugar of Brazil and the West Indies, had in peopling those vast regions. This was the much-admired, much-abused American plant, tobacco. Camden, in his history of Queen Elizabeth, after speaking of the early attempts to colonize Virginia, says—

> "And these men who were thus brought back, were the first that I know of, that brought into England that Indian plant which they call Tabacca, Nicotia, or Tobacco, which they use against crudities, being taught it by the Indians. Certainly from that time forward it began to grow into great request, and to be sold at a high rate, whilst in a short time men, everywhere, some for health's sake, others from mere wantonness, with insatiable desire and greediness, sucked in the stinking smoak thereof, through an earthen pipe, which presently they blow out again at their nostrils; insomuch that tobacco shops are now as ordinary in most towns as tap-houses and taverns."

By the early part of the next century the American colonies of Great Britain had increased to such an extent that a very important maritime trade existed between them and the mother country; and the Dutch, ever ready to push their commerce, were largely employed in carrying the produce of the British colonies to home or to foreign ports, to the obvious disadvantage of the English shipowners. To remedy this evil, frequent applications were made to Parliament, but for many years, at all events from 1642 to 1650, the king on the one hand, and the Parliament on the other, had plenty else to think about, without troubling their heads very much about either ships or shipowners; but in the year 1651 the celebrated Navigation Act of Cromwell came into operation. By this act Dutch maritime commerce received a serious blow, the new Act prohibiting any goods or commodities whatever, of the growth, production, or manufacture, of Asia, Africa, or America, including also our own plantations, from being imported into either England or Ireland or any of the plantations of Great Britain, in any but English-built ships, belonging to English, or English plantation, subjects, navigated also by English commanders, and of which at least three-fourths of the crews should be Englishmen.

The Act was still further distinctly aimed at the Dutch in another direction. During the early part of the century the Dutch had seized upon all the fishing-grounds adjacent to our coasts, and are said to have had no less than three thousand vessels, and between forty and fifty thousand men, engaged in this trade, from which they were attempting to drive out the English vessels by force; but Cromwell's Act declared the presence of the Dutch vessels on our fishing-grounds to be absolutely illegal.

At that time the Dutch were the only really serious rivals that British merchant ships had to fear; in order, therefore, still further to cripple the Dutch, and at the same time to promote the interests of the British Mercantile Marine, a further Act was passed, prohibiting any goods of the growth, production, or manufacture of any country in Europe to be imported into Great Britain except in British ships, owned and navigated by British subjects, or in such ships as were the real property of the people of the country or place in which the goods were produced, or from which they could only be, or most usually were, exported.

Now, as the Dutch had little or nothing of their own to export, and as they were practically the only foreign nation engaged in the carrying trade, it was manifest that this Act was specially directed against them, and it was so understood by them. Their irritation at it, together with the continual differences occurring between the English and the Dutch in the East, at last culminated in the great naval war between the two countries, in which Blake on the one hand, and Van Tromp on the other, equally distinguished themselves.

Besides the disadvantages resulting from the long-protracted naval wars with the Dutch in the seventeenth century, English merchant ships had another constant source of danger and annoyance to contend with in the determined attacks of the Moorish pirates of the Barbary coast; and the apathy, not to say the absolute cowardice, too frequently displayed by many masters of merchant ships, in quietly giving up their vessels on condition that their lives should be spared by the pirates, conduced to the passing of an Act in the sixteenth year of Charles II., which enacted

"that the master of any merchant vessel of not less than two hundred tons burden, carrying sixteen guns, shall not yield to an enemy of any force without a resistance, on pain of incapacity to command any English vessel for ever afterwards."

A ship of less burden than two hundred tons was

"forbidden to yield to any enemy not having double her number of guns without fighting;" and "if any mariner or inferior officer shall refuse to fight when commanded, or discourage other mariners from so doing, they shall lose their wages and all their goods on board, and shall be liable to imprisonment with hard labour for six kalendar months."

Although during the reigns of the Stuarts our Mercantile Marine, including the art of shipbuilding, was gradually getting into an exceedingly depressed state, yet the latter part of the seventeenth century saw a fresh revival. Anthony Deane and Phineas Pett were entrusted by the Government of the country with the designing and the reconstruction of the Royal Navy of England, and they performed these duties in a very successful and notable manner. They have the credit given them of having been the first men of this country who endeavoured to apply the principles of science to the designing and building of ships, and the wooden vessels built by them served as models for several succeeding generations to copy, without alterations or attempts at improvement, until the early part of the present century. Our naval commanders constantly complained of the inferior qualities of their vessels as compared with the sailing capabilities of the ships of the French Navy; and vessels captured by our ships from the French often proved of service as models to imitate in the construction of vessels for our own Navy.

"The almost entire absence of any knowledge in this country of the very first principles of the art of shipbuilding, both in the seventeenth and the eighteenth centuries, has often been referred to, and it has been stated by a competent authority that there was scarcely a single person in the country who then knew correctly even the first element of the displacement of a ship. The French had been far more enterprising and systematic with respect to their vessels, for they applied scientific principles to practice with a large amount of success in the construction of their ships. Their fleet was largely developed in the seventeenth century under the able administration of Colbert, who encouraged men in the investigation of the principles of the strength and the construction of ships, and of their behaviour when at sea. Bouguer, a celebrated French writer, led the way in 1746, by publishing a treatise on the stability and the rolling of ships; and several other French writers contributed important researches on the science of naval architecture long before the English had given any attention to such matters; and to the French, therefore, must be given much of the credit due to the improvements in the building of British ships during the last century." *

* George Stanbury, Esq., Surveyor to Lloyds' Register.

CHAPTER VI.

Outline of the history of the East India Company—Trade with the East—The Venetians and the Genoese—The Spaniards and the Portuguese—The Dutch—The English—Attempts to reach the Indies by the North-West Passage—John Davis—First Charter of the English East India Company, 1600—The first East Indiamen—Disputes with the Dutch—Fresh charter from James I.—The *Trades Increase*—Value of the trade with the East—Losses of the English East India Company—The French East India Company—The charter granted to the English Company by Charles II.—Success of the Company—Opposition—A new Company—Rival traders—Amalgamation of the two Companies—The East India Company of 1708—The ships—Heavy losses in the company's fleet—The *Earl of Balcarres*—The officers of the ships—Life on board an East Indiaman—End of the Company—Sale of the ships.

The history of the English Mercantile Marine during the seventeenth and eighteenth centuries is so intimately connected with the East India Company that it will be well to give a brief account, although it must necessarily be the merest outline, of the history of that vast commercial corporation which at one time directed and controlled our present Indian Empire.

Successively the Egyptians, the Romans, and later on the rich and enterprising merchants of the Adriatic, carried on an ever-increasing trade with the East. In the eighth and ninth centuries the commerce of Europe had centred itself at Constantinople; but later on, the trade with the East was the almost exclusive monopoly of the Venetians and the Genoese. The commercial centre of the world was again shifted when first, in 1487, Bartholomew Diaz, and afterwards, in 1498, Vasco da Gama, doubled the Cape of Good Hope, and so reached by sea Calcutta and Malabar. To the astonishment and to the grief of the Italian maritime traders, they suddenly found themselves eclipsed in their pursuits, and in a very short time totally excluded from all commerce, save that of the Mediterranean itself; whilst the countries bordering the Atlantic began to occupy the place hitherto so proudly held by the cities of Italy and of the Adriatic, the ships of Spain and Portugal rapidly spreading over the face of the Atlantic, and along the shores of India.

When Pope Alexander the Sixth issued his famous Bull, dividing the whole undiscovered heathen world between Spain and Portugal, he awarded India to the latter power, and the Portuguese, who already possessed extensive settlements along the Western coasts of Africa, began immediately to cultivate the trade with India. As time passed on, by 1580, the power of Portugal in the East was already on the wane, and the Spaniards were rapidly taking her place.

Commerce with India was, however, manifestly of far too profitable a nature to allow such an enterprising nation as the Dutch for any great length of time quietly to acquiesce in a monopoly by Spain and Portugal, and by 1597, Dutch ships were rounding the Cape of Good Hope, bent on acquiring a share of the spoil. These ships were fiercely handled by the Spanish, and at once stronger fleets, and more formidable, were equipped and sent out by the Dutch, with the distinct object of expelling the Spanish-Portuguese from the Spice Islands and from the Indian coasts.

At last so lucrative a trade engrossed the attention of England, and a number of merchants in London, being of opinion that sooner or later a north-west passage to India would be discovered, so that both the Spanish and the Dutch might be circumvented, fitted out two small vessels—the *Sunshine*, of 50 tons, with twenty-three hands, and the *Moonshine*, of 35 tons, and nineteen men. The command of the expedition was placed in the hands of John Davis, a mariner of considerable repute, who embarked in the *Sunshine;* and the two vessels sailed from Dartmouth on the 7th of June, 1585, reaching as far north as 66° 40′, and discovering the straits now known as Davis's Straits.

The following year a second voyage was tried, but with no further result. In his third voyage Davis sailed up the same straits, with open water in Baffin's Bay as far as 73° north latitude, attaining the point on the western coast of Greenland, which he named Sanderson's Hope, from a wealthy merchant who had largely contributed to the funds of the expedition. He tried a fourth voyage, but it was equally unsuccessful, so that the owners of the ships gave up all idea of the north-west passage, and determined to send Davis, in 1589, to the East Indies by way of the Cape of Good Hope; the destruction of the Spanish Armada, and the consequent weakening of the maritime power of Spain, having made a passage to India by way of the Cape a less perilous undertaking than it had heretofore been. Davis made five voyages to India, but on his fifth voyage he was unfortunately killed by pirates off the coast of Malacca in December, 1605.

In the year 1589 certain English merchants memorialized Queen Elizabeth to grant them license and encouragement to open a trade with the East Indies, adducing as a reason for her granting their request that such a trade would by degrees add to the shipping, seamen, and naval force of the kingdom, in the same manner that it had increased the Portuguese fleets; but the project gave great offence to the Spanish and the Portuguese Governments, and in order not to offend Spain, it was a long time before the queen would grant their request. In the year 1600, however, and the forty-second year of Queen Elizabeth's reign, on the petition of Sir John Hart, Sir John Spencer, Sir Edward Micheburn, William Cavendish, and more than two hundred merchants, shipowners, and citizens of London, a charter was granted to the London Company for fifteen years, and this Deed of Incorporation was the commencement of the English East India Company, and of British rule in India.

The stipulated capital of £72,000 having been raised, the Company despatched five ships to open the trade. They were the *Dragon*, of 600 tons, her commander, according to the custom of the time, being styled "Admiral of the Squadron;" the *Hector*, of 300 tons; two ships of 200 tons each; and a store-ship of 130 tons. The men employed in the expedition were 480, all told; and the cost of the vessels and their equipment £45,000. They had on board twenty merchants as super-cargoes, and the vessels were all well armed. The voyage proved a success, and the ships returned to England with valuable cargoes.

At this time Spain claimed the exclusive right of trading with the East Indies;—indeed, they claimed the whole of the Indian seas as their own exclusive property, and permitted no European nation whatever to obtain any footing on the coast of India, threatening with the severest penalties any but their own nation who should presume to trade in any way with that country—a line of conduct which resulted in the sharpest conflicts between the Spanish and the Portuguese on the one side, and the English and the Dutch on the other, the earlier records of the English East India Company abounding in accounts of the fiercest contests between the English ships and those of the Spanish and the Portuguese.

Although the Dutch, when opposing Spain, strongly asserted that all nations had an equal right to trade with India, yet they had no sooner succeeded in partially ousting the Spaniards than they at once deliberately endeavoured to establish the strictest monopoly for themselves; and although England and Holland were on terms of peace in Europe, yet in India they so seriously disagreed upon the question of the East India trade, that in 1611, the London merchants were praying for protection and redress, representing that the Hollanders were driving them out of all places of traffic in the East Indies, they having far better ships than the English.

In 1603, Sir Walter Raleigh, in a report he made to King James I., says that the merchant ships of England were not to be compared with those of the Dutch, and that while an English ship of one hundred tons required a crew of thirty men, the Dutch would sail a ship of the same size with one-third of that number.

Upon obtaining a new Charter from James, in May, 1609, also for fifteen years, the Company set about constructing a better and a larger ship than they had ever had before, named the *Trades Increase*, of one thousand two hundred tons, the largest English merchant ship yet built, together with a pinnace of 250 tons, called the *Peppercorn*. These two vessels, with a third, the *Darling*, of 90 tons, were despatched in 1610; but the venture did not turn out so well as the previous ones, the *Trades Increase* being totally lost off the coast of Bantam.

The Company, however, not to be daunted, sent out the next year a single ship called the *Globe*, followed by the *Clove*, the *Hector*, and the *Thomas*. In 1614, four ships were sent from London: the *New Year's Gift*, of 650 tons; the *Hector*, of 500 tons; the *Merchant's Hope*, of 300 tons; and the *Solomon*, of 200 tons. During this voyage a serious engagement took place between the East India Company's ships and the Portuguese, upon the occasion of the latter attacking one of the ports belonging to the Moghul, thus materially strengthening the relations of the English Company with that monarch; and, indeed, so prosperous had the affairs of the Company now become that in the year 1617, its stock stood at two hundred and three.

Some idea of the value of the trade contended for may be obtained from the fact that in 1615 the Dutch had over fifty ships engaged in the East Indies, whilst the English East India Company, the same year, paid no less a sum than £14,000 customs on two ships alone; and in 1616, one ship arrived in the Thames from the Indies with a cargo valued at £140,000. Owing to a very large extent to the East India Company, the number of ships hailing from London rapidly increased, and Sir William Monson states that

> "the shipping of the Port of London had so augmented during the first fifteen years of the reign of Charles I. that it was now able to supply a hundred sail of stout vessels capable of being converted into men-of-war; and that ten large ships had been added to the effective force of the Royal Navy."

Continual quarrels and incessant hostilities went on between the English and the Dutch companies for twenty years, until a particularly atrocious outrage on the part of the Dutch brought matters to a climax. The massacre of almost the whole of the English settlers at Amboyna, in the Moluccas, in 1623, at once bred a long and fierce resentment against Holland amongst the English merchants and the English sailors of that age, that culminated, other sources of disagreement assisting, in the wars with Holland during the time of the Commonwealth and the reign of Charles II.

During all this time affairs were not so prosperous with the English Company. In a return presented to Parliament on the 29th of November, 1621, there is an account of the trade carried on by the East India Company during the whole time that they had held their charter; and out of 86 ships which had been despatched to the East during that time, 11 were surprised and seized by the Dutch, 9 had been lost at sea, 5 had become worn out with long service, and only 36 had returned home with cargoes; the remaining 25 being reckoned as then in India, or on their way home.

Gradually the Dutch trade was gravitating further and further to the East, and thus gradually the way was being paved for England's advancement in India itself. But a third rival was now about to enter the arena, although many years were still to pass before France could establish herself substantially upon the Indian coast, the French East India Company not being fully established until 1664, and it not being until 1665, that the first French squadron was despatched to the East Indies.

Meanwhile the English Company were ever seeking more extensive powers, and Charles II., willing to obliterate the name of Cromwell from their then existing charter, gave them a new charter authorizing them to make peace or war with any nation not Christian; with license to coin money, to administer justice, and to punish interlopers. The English Company's establishments in the East Indies at the close of the seventeenth century consisted of the Presidency of Bantam, with Macassar, and other places in the Indian Archipelago; Fort St. George, and its dependent factories on the Coromandel coast and in the Bay of Bengal; and on the west coast, Bombay, Surat, and other subordinate places on that side of India.

During the twenty years succeeding the Restoration the value of the annual imports from Bengal alone rose from £8000 to £300,000, and the gains of the Company from their monopoly of the import of East Indian produce had then become almost incredible.

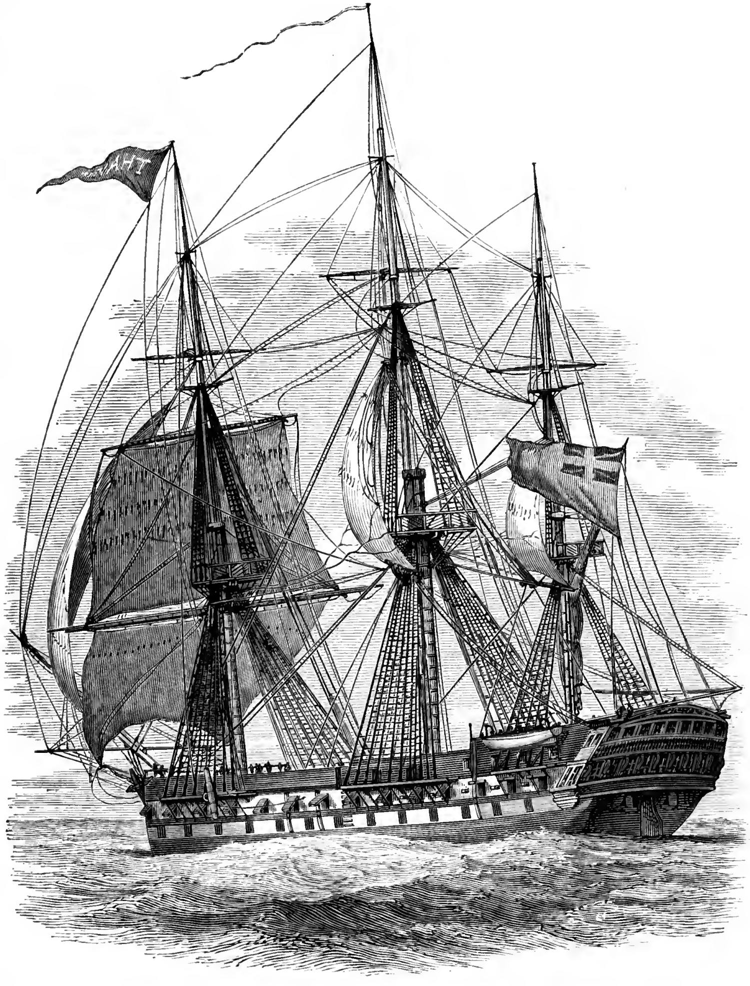
In 1685, the head-quarters of the Company's business on the western side of India were transferred from Surat to Bombay, whilst in 1687, the chief Bengal agency was removed from Hooghley to Calcutta, and Madras had become the central port on the eastern shores of the Indian peninsula.

Such success naturally excited jealousy, and energetic attempts were made to share profits so enormous. In Strype's "Stow's Survey of London" he says—

"A new East India Company was set on foot and managed against the [old] Company by those they called *Interlopers*: who traded into the places of their Privileges, and were not free of the said Company, whose ships and goods the Company stopped, and used other ways and means to hinder their Trade—in short the Trade to the East Indies lay open from the year 1653 to 1657. Then this method of private trade proved so very destructive to the several private traders thither, that the governing Power at that time found it necessary to unite them all into one joynt Company with a joynt Stock."

The charges of delinquency and mismanagement against the old Company induced the House of Commons, in 1692, to send up an address to the Crown, requesting the dissolution of the Company, and praying for the incorporation of a new association. But it was not until 1698, that the Government, being in want of money, resolved to throw the trade of India open to the highest bidder. The existing Company was outbid by a new Company, whose tender to supply two millions sterling was accepted, and it was embodied as "The English Company trading to the East Indies," with the exclusive possession of the commerce of the East for ever. The old Company, however, was to have three years' grace, in which to wind up its affairs.

The old Company, however, through its treasurer, subscribed for and obtained £315,000 of the loan, and thereby became the largest shareholder in the new Company. The greatest confusion of conflicting interests consequently ensued. The old Company was trading with its vessels for three years. The new Company was commencing to trade, but at the same time having no possessions whatever in India. There were some people who had subscribed to the loan, but who had not joined the new Company, and who were permitted to



THE "THAMES," EAST INDIAMAN.

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trade on their own account. And there were, fourthly, those private traders whose vessels had cleared out of England previous to the 1st of July, 1698, and who had the right to trade until they should return to England.

No fewer than sixty ships were employed by all these rival traders, a number vastly in excess of the requirements of the trade, so that the competition was ruining everybody, the £100 shares of the old Company, which had once stood at over £200, falling to £37.

In 1708 this scandal was put a stop to by an amalgamation of the new and the old Companies as the "United Company of Merchants of England trading to the East Indies," and the East Indian Company from that date practically assumed the position that it occupied until the year 1858.

The Company, as now constituted, was still frequently opposed, and in 1730 the merchants of Bristol tried very hard to prevent the Government from granting a renewal of the Company's charter, on the grounds that their profits were enormous. This, however, appears to have been a perfectly groundless charge; and although, no doubt, the Company at times did well, at other times matters were entirely the reverse, and in 1772, instead of being able to pay the Government the sum of £400,000 per annum, as they had agreed to do, they were applying to the Treasury for a loan.

In this year (1772) thirty-three ships were employed by the Company, of an aggregate tonnage of 23,159 tons, which would give an average of 700 tons to each ship. The Company were carrying on their business in an expensive manner, freight from India to London costing £32 10*s*. a ton; and at a later period no less than £50 a ton freight was paid. In 1795 India-built ships were permitted to convey goods to London, and the cost by these vessels was only £16 per ton for rice, and £20 per ton for light goods to the Thames.

The newspapers of the time give many interesting particulars of Indiamen of the early part of last century, from which it will be seen that although they were vessels of but small tonnage, as we now reckon, yet they were always armed, and that not only for defensive, but very frequently for offensive purposes. The following appeared in the *St. James's Evening Post*, of August 31, 1734:—

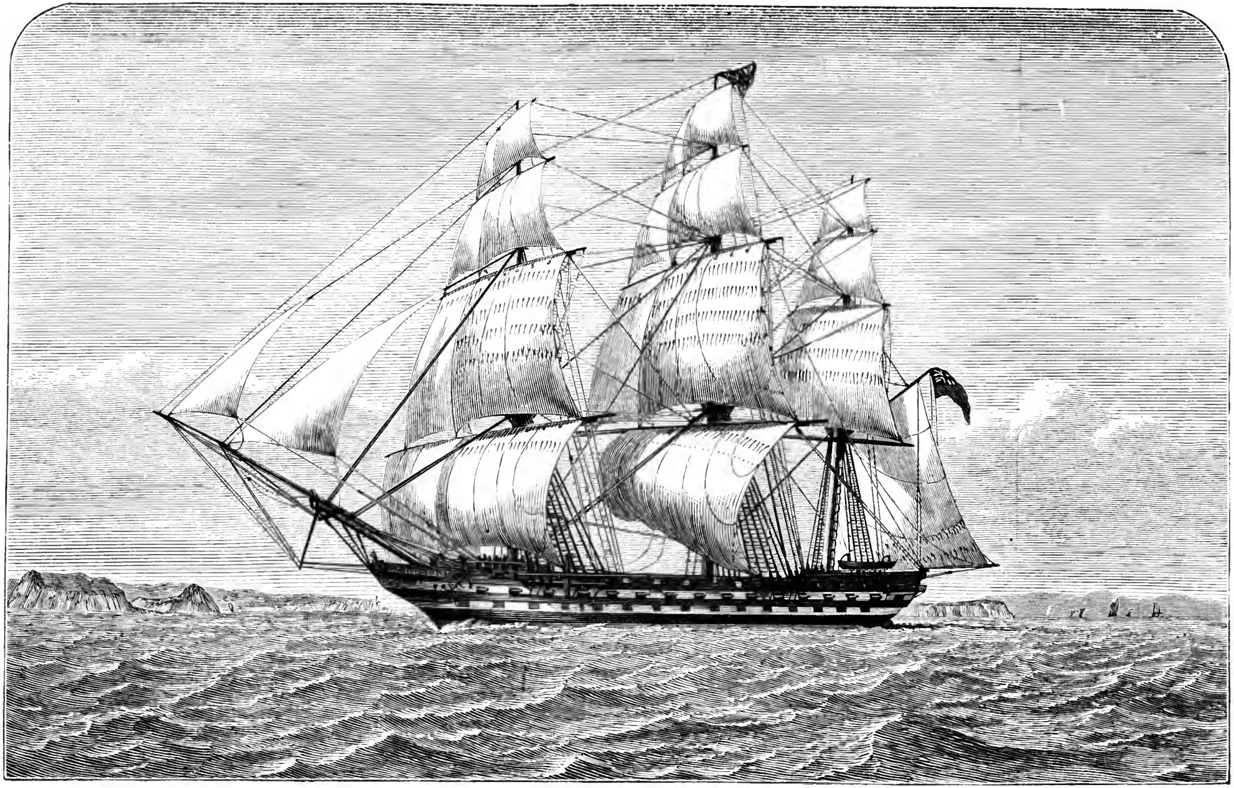
"Yesterday the Court of Directors of the East India Company took the following ships into their service, viz.—

Ship's names.	Commanders.	Tons.	Guns.	Men.	Voyage.	Where bound to.
Queen Caroline	David Wilkie	490	34	98	1	Bombay
Marlborough	Thomas Hunt	490	34	98	2	Coast and Bay
London	Robert Bootle	490	34	98	1	China
Beaufort	Richard Bolton	490	34	98	1	Coast and Bay
Onslow	John Balchen	480	32	96	1	"
Godolphin	Francis Steward	480	32	96	1	"
Derby	Abraham Anselm	480	32	96	4	Bombay
Duke of Cumberland	Benjamin Braunde	480	32	96	3	St. Helena and Bencoolen
Prince of Orange	Charles Hudson	480	32	96	2	Coast and Bay
Nassau	William Hutchinson	480	32	96	2	West Coast and Madras
Houghton	Philip Worth	460	30	92	4	China
Richmond	Charles Gough	460	30	92	2	"
Scarborough	George Westcote	460	30	92	1	Bombay"

In another number of the same newspaper, namely, on August 13, 1734, occurs the following, which gives a good general idea of the trade carried on with the East, the five ships bringing about 500 tons of cargo each:—

"The following is the cargo of five homeward-bound India Ships of the Dutch Company, which sailed the 22nd of December, 1733, from Ceylon, and arrived at Amsterdam last week:—

"1,395,862 pounds of Brown Pepper.
9,747 Ditto of Ceylon Pepper.
480,000 Ditto of Cinnamon.
868,943 Ditto of Powder Sugar.
652,316 Ditto of Salt Petre.
345,000 Ditto of Sapan Wood.
27,049 Ditto Coffee of Ceylon.
14,000 Ditto Cardimum of Ceylon.
105,769 Ditto of Cowries.
18,000 Ditto of Tutucoryn Cotton Yarn.
10 Ditto of Pearls.
1 Ditto of Spiritus Hakmalla.
2,920 Pieces of Gaetjes (divers sorts).
1,000 Ditto Mouries.
160 Ditto Percalles.
31,160 Ditto Salampours (divers sorts).
18,280 Guineas."



THE "EARL OF BALCARRES," EAST INDIAMAN, 1417 TONS.

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From time to time the losses of the Company, from the number of their ships taken by the enemy, lost at sea, or burnt, were exceedingly heavy. From the year 1702 to the year 1818 no less than 169 ships of the Company were thus lost; forty-three being taken by the enemy, of which number seven, however, were afterwards retaken; eighteen were burnt or blown up; and one hundred and eight were lost at sea.

During the years 1808 and 1809 the Company were particularly unfortunate with their ships, having lost in those two years four outward-bound, and ten homeward-bound ships; the value of one of these ships, which was not chartered, but which belonged to the Company, and her cargo amounting together to £1,048,077.

The East India Company possessed some of the finest merchant ships afloat at the time, but they always paid heavily for them. It was said that for ships similar to those for which private firms were paying £25 a ton, the Company was paying £40 a ton; but it must be borne in mind that the Company's ships were practically armed cruisers, and were often obliged to be in action with the enemy, of whom they not unfrequently were able to give a very good account. The greater number of their ships during the latter part of the last century and the commencement of this, were handsome frigate-built ships, whilst some of the larger ones, such as the *Earl of Balcarres*,* for instance, had a double row of ports, and were precisely like two-decked line-of-battle ships.

This ship, which may be taken as a type of the finest of the Company's ships, had a crew of 130 men, consisting of the commander, six mates, surgeon and assistant-surgeon, six midshipmen, purser, bo'sun, gunner, carpenter, master-at-arms, armourer, butcher, baker, poulterer, caulker, cooper, two stewards, two cooks, eight bo'sun's, gunner's, carpenter's, cooper's, and caulker's mates, six quarter-masters, one sail-maker, seven officer's servants, and seventy-eight seamen.

Every commander in the Company's service was required to

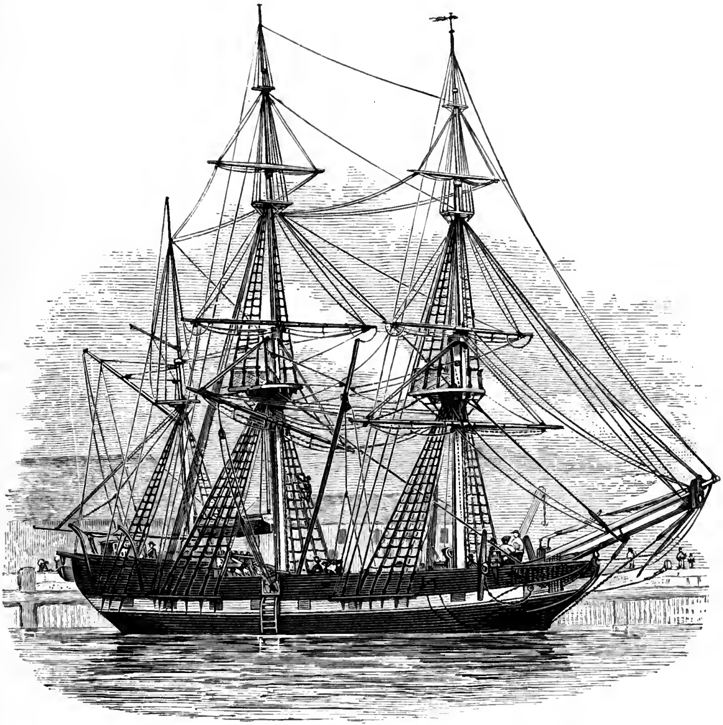
* The *Earl of Balcarres* was built at Bombay in 1815; she was of 1417 tons burden, carried 26 guns, and was manned by a crew of 130. She was sold out of the Company's service in 1831 for £10,700. She was, however, still in existence in 1855, because I saw her come up the Thames in that year.

be at least twenty-five years of age, and to have been one voyage in the regular service of the Company, either as chief or second officer, or to have commanded a ship in the extra service. Chief mates were required to be at least twenty-three years of age, and to have made one voyage at least as second or third mate in the service to India or China. Second mates were obliged to be twenty-two years of age, and to have been a similar voyage. Third mates were required to be at least twenty-one years of age, and to have made at least two voyages as midshipmen in the Company's service.

A commander's uniform, and that of the subordinate officers did not materially differ from it except that they had no swords, consisted when in full dress of a blue coat, velvet lappels, cuffs, and collar, with a bright gold embroidery, "as little expensive as may be," waistcoat and breeches of deep buff; the buttons of yellow gilt metal, with the Company's crest; cocked hat, side-arms, "to be worn under the coat," and black stocks or neck-cloths. The undress consisted of blue coat with lappels, black collar and cuffs, waistcoat and breeches deep buff, and buttons similar to the full dress.

In the Company's own ships promotion went strictly by rule of seniority, but in the ships of private firms merely chartered by the Company for a certain number of years, it a good deal depended upon the influence that could be brought to bear upon the owners, by whom all appointments and promotions were made. The command of these ships was almost invariably sold to the highest bidder competent to fill the post, the price averaging about £3000.

The captain of an East Indiaman enjoyed so many privileges and perquisites that the amount of his pay, which was supposed to be £10 a month, was really but a very small part of his income; indeed, it was always reckoned that, after being in command for five voyages to the East Indies, a man would have made sufficient to retire upon. Including the amount of cargo-space that was allowed him, all his perquisites, and his pay, it was supposed that he usually made from £3000 to £5000 each voyage; but the amount was often very much in excess of this, a good deal of illicit trade and smuggling being systematically carried on. Indeed, to so great an extent



A FREE-TRADE BARQUE.

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was this the case that the Company at last resolved to put a stop to it, and advertised large rewards to all such as would give information.

The internal economy and the discipline on board the Company's ships was far in advance of that of other merchant ships of the same time. The crew were divided into port and starboard watches, as usual, but the officers had three watches. At five bells in the morning watch the duties of the day commenced by the watch on deck washing down and cleaning the decks. At half-past seven hammocks were piped up, and stowed by the quarter-masters in the hammock-nettings in the waist. At eight o'clock breakfast was served to all hands; and then commenced the ordinary day's work at sea, similar to that of the present time. Dinner was at noon, and then work was resumed until four o'clock, the men being allowed during the dog-watches to do as they liked, to mend their clothes, ro to spend the time in games or other amusements.

Twice every week, on Wednesdays and Saturdays, the 'tween-decks, where the men slept and had their meals, between the guns, man-of-war fashion, were cleaned and holy-stoned, and afterwards inspected by the commander and the surgeon; and the Company's ships being in reality to a great extent men-of-war, the men had very frequently to go through cutlas and small-arms drill, and were exercised at the guns as opportunity offered.

In the year 1831, the sale of the large ships of the East India Company commenced, but the greater part were not sold until 1834. The first ship to be sold in the former year was the *Atlas*, which fetched £4100 to be broken up. This was speedily followed by the *Aisa*, which went for £6500; the *General Harris* for £6600; the *Minerva*, £8400; and the *Princess Charlotte of Wales* (to be broken up), £3000. In 1834 twenty-four of the finest ships went to the hammer, the one fetching the highest price being the *Scaleby Castle*, which realized £13,500; the *Earl of Balcarres* and the *Thames* brought in £10,700 each; the *Buckinghamshire*, £10,550; and the *Lady Melville* and the *Castle Huntley*, £10,000 each.

After the trade to the East Indies had been thrown open a number of vessels, ranging from 350 to 700 tons register, were built to be employed chiefly in the trade to the East, but they were free to seek employment wherever they could obtain remunerative freights, and were very soon to be found in all parts of the world—in fact, they were the "ocean tramps" of that day.

CHAPTER VII.

The discovery of Australia, Tasmania, and New Zealand in the seventeenth century—Pedro Fernando de Quiros—Luis vas Torres—Jan Abel Tasman—Dampier—Dampier's voyage in the *Roebuck*—Anson's Voyage in the *Centurion*—Parsimony of the Government—John Byron—Pepys' Island and Falkland's Island—Captain Cook's three voyages—Discovery of islands in the Pacific—Antarctic exploration—Death of Captain Cook—Loss of the *Betty Galley*, on the Cornish coast—Loss of the *Prince Eugene* near Milford Haven—Loss of the *Dublin Packet* on the Isle of Man—The press-gang.

As recently as the close of the sixteenth century but very little indeed was known of the South Indian Ocean, the southern part of the Atlantic, or of that immense tract of water, the Pacific. It is true explorers had sailed along portions of the eastern shores of Africa; traders had found their way round the Cape of Good Hope to India; and the "Spice Islands," the islands of the Malay Archipelago, were already visited by Europeans; but, although it was considered probable by scientific men that land of some considerable extent would be found in those regions, the great continent of Australia and the vast islands of New Zealand and Tasmania were as yet entirely unheard of.

During the time that the Spanish and the Portuguese were occupied in their East Indian trade, their navigators appear to have occasionally sighted isolated points on the western coast of Australia; but nothing at all definite was known of it until the commencement of the seventeenth century, when, in 1606, one Pedro Fernando de Quiros sailed from Peru with two vessels, the smaller of the two being under the command of one Luis vas Torres, bound on a voyage of discovery to the westward. Having passed through a great part of the

Southern Archipelago, the two vessels became parted during a violent storm, Pedro de Quiros discovering some important islands, to which he gave the name of "Australia del Espiritu Santo," now believed to have been part of the New Hebrides group; whilst Torres, driven further to the north, reached New Guinea, sailing through the strait that has ever since borne his name.

After the Spanish and the Portuguese, the Dutch visited nearly all the northern and western, with much of the southern, coast-line of Australia. In 1642 Jan Abel Tasman sailed from Batavia with an expedition which reached the island, now justly called by the name of its discoverer, but which he styled Van Dieman's Land, in honour of the then Governor of the Dutch East Indian colonies. Tasman sailed round its southern shores, but not round the north of the island, and for nearly a century and a half Van Dieman's Land was believed to form a part of the great southern continent of Australia.

In his eastern course Tasman came upon New Zealand, and then returned to Batavia by the north of New Guinea. In 1664 the States-General gave the name of New Holland to the western part of the region of which their countrymen had certainly seen more than any other navigators, and for many years after that, not only the western part, but the whole of the Australian continent was simply known as New Holland. The land then appears to have been almost forgotten in Europe until towards the close of the seventeenth century, when, in 1699, the British Government sent out William Dampier upon a voyage of discovery, of which the primary object was to obtain accurate information as to this recently discovered country of New Holland, and after that to visit the islands of the South Pacific.

Dampier had originally been known as one of the most daring of the buccaneers in various piratical expeditions, and he had made voyages of his own to the Pacific, and also along the coast of New Holland itself; he was therefore looked upon as one eminently fitted for this duty, and an old ship called the *Roebuck* was placed at his disposal.

The *Roebuck* that the Government provided for Dampier was a vessel utterly unfitted for the service in which she was about to be engaged, and Dampier, with much justice, boasted upon his return—

> "that he had successfully carried out the object for which he was sent, with this old and worn-out vessel, which he was at last obliged to abandon at Ascension on his way home, as he could no longer keep her afloat."

He made the western coast of New Holland, in latitude 26° S., near the bay that he then named Shark's Bay, from the number of sharks that then, as now, infested it; and from thence he sailed to the northward, making the island of Timor, at the southern extremity of the Malay Archipelago, and then coasted all round New Guinea, naming, and making careful surveys of its bays and harbours before he eventually returned to England.

If the Government of 1699 treated Dampier with parsimony, a succeeding Government of George II.'s, which sent out the expedition under Commodore Anson, carried the same kind of policy to a far greater length. Anson's expedition was not specially one of discovery, although it resulted in his celebrated voyage round the world, occupying altogether three years and nine months; but it was principally intended to chastise the Spaniards for their outrages upon British ships in the West Indies. The squadron consisted of six ships, mounting in all two hundred and twenty-six guns, of which the largest, the *Centurion*, was commanded by Anson himself. The ships were badly found and wretchedly manned, and although Anson hoisted his pennant in November, 1739, it was September, 1740, before he could finally get away. Such was the difficulty experienced in manning the squadron that five hundred out-pensioners were sent from Chelsea Hospital, many of whom were sixty years old, and some were even seventy. Of these two hundred and forty deserted before the ships sailed, and their places were filled up with men to a large extent provided by the press-gang, who, if they were younger, were, if possible, still more useless.

Sailing down the North and South Atlantic, and rounding Cape Horn, Anson proceeded to the coast of Peru, plundering the seaboard and destroying the town of Paita. On his way home round the Cape of Good Hope, he took a Spanish galleon richly laden with silver; but when he returned to England the *Centurion* was the sole surviving ship of his squadron.

Among those who served under Anson in this voyage was an officer named John Byron, who later on, as Commodore Byron, was himself sent out on an expedition purely of discovery. He sailed from England in 1764, with orders to find out

"whether lands and islands of great extent, hitherto unvisited by any European power, were to be found in the Atlantic Ocean, between the Cape of Good Hope and the Straits of Magellan, within latitudes convenient for navigation, and in climates adapted for the produce of commodities useful to commerce; also to seek for His Majesty's Islands called Pepys' Island and Falkland's Island."

These instructions to Byron throw a light on the state of geographical knowledge concerning the southern hemisphere prevailing scarcely more than a hundred years ago that is exceedingly curious, the whereabouts of these latter islands, or even whether they existed at all, being then quite unknown. It was to the clearing up of these points that Byron first directed his attention, with the result that he reported that Pepys' Island had no existence, but that the Falklands were two distinct islands of some considerable size near to the coast of South America. He then entered, and made careful surveys of the Straits of Magellan, returning to England in 1766.

The next expedition despatched from England for scientific purposes, although not strictly as a voyage of discovery, was that fitted out in 1768, to observe the transit of Venus, the command of which was given to Captain James Cook. Cook was born at Whitby in 1727, where he was apprenticed to a linen-draper; but, disliking the business, he left it, and went to sea, serving for nine years on board a collier. In 1755 he joined the Navy, where his ability soon put him on the quarter-deck,* and in 1759 he was employed upon a survey

* It takes some time now for an ordinary man-of-war's man to get on the quarter-deck. In a speech of Lord Charles Beresford's in the House of Commons on the Navy Estimates, on the 18th of March, 1898, he stated that "at the present time, out of 50,000 seamen, only two have been promoted

of the coast of Newfoundland, Labrador, and the mouth of the St. Lawrence, a task which he achieved to the entire satisfaction of the Admiralty.

The transit of Venus was to take place in June, 1769, and it was at the request of the Royal Society that the Government consented to send out an expedition to select a suitable spot for the observations. With a number of scientific men on board, Captain Cook left England in the *Endeavour* on the 26th of August, 1768, and on the 29th of September, after only thirty-four days—a marvellously short passage for that time—he rounded the Horn, and then sailed for the island of Tahiti. Here an observatory for the transit was established, and the main object of the expedition was successfully carried out. Cook now visited and surveyed the group of islands of which Tahiti is one, naming them the Society Islands, in honour of the Royal Society, who had been the chief instigators of the expedition.

In October, 1769, Cook arrived at New Zealand, and spent six months in examining and surveying its shores, proving it to be two islands, the narrow strait separating them having since been named in his honour Cook's Straits. From New Zealand Cook went on to Australia, giving to that part of the Australian continent the name it still bears of New South Wales, an inlet on the south-east shore receiving the name of Botany Bay, from the number of new plants there observed by the savants of the expedition. Sailing along the coast of what is now called Queensland, Cook reached Papua, from whence he came home by the Cape of Good Hope, after an absence from England of three years all but a month.

The next year after his arrival at home—namely, in 1772, —Cook was sent out again, this time being ordered to investigate the then still unsolved problem of a great southern continent lying between the meridians of the Cape of Good Hope and Cape Horn, and which had been only partly

to the rank of officers. It would be beneficial if they could promote warrant-officers to command rank, just as certain classes of officers in the Army were promoted from the ranks. It was absolute nonsense to say that out of sixty thousand Bluejackets in the Navy there was not one fit to be made an officer."

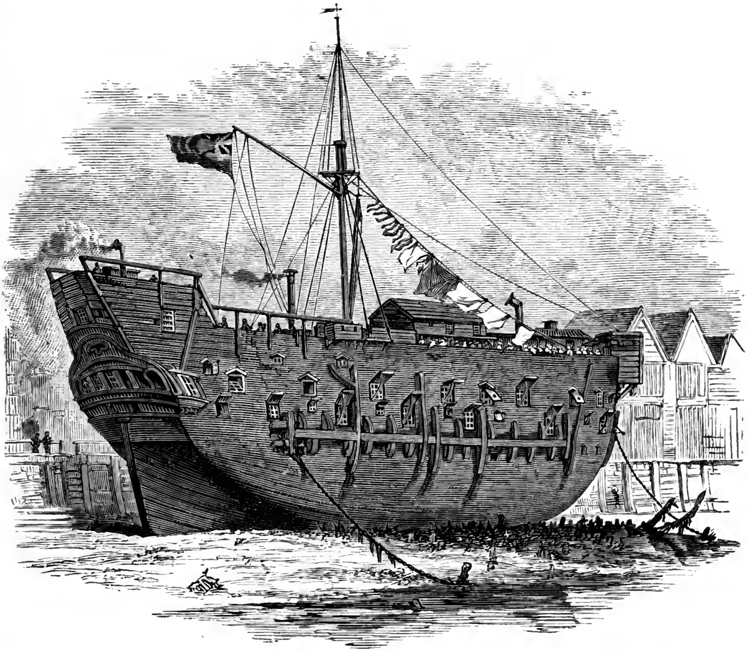
set at rest by Byron's voyage to the Falkland Islands in 1764.

The expedition consisted of two ships, both Whitby vessels —the *Resolution*, of 462 tons, of which Captain Cook took the command, and the *Adventure*, of 336 tons, which was commanded by Captain Furneaux. Unlike the treatment at the hands of the Government experienced by Dampier and Anson, the authorities under Lord Sandwich seem to have done everything in their power to make the equipment of Cook's ships as complete as possible.

The expedition left Plymouth on the 13th of July, 1772, and after calling at the Cape of Good Hope, proceeded southwards until they were stopped by the ice, in latitude 67° 15′ S., on the 17th of January, 1773. As far as the eye could reach appeared an impenetrable barrier of icebergs, of which Cook counted no less than ninety-seven, towering above his ship like a range of mountains. Finding it utterly impossible to get further to the south, Cook made his way to New Zealand, where he arrived at Dusky Bay in the South Island on the 25th of March, having been the first British sailor to cross the Antarctic Circle.

From New Zealand he went on to his old island, Tahiti, completing the survey of the Society Islands upon which he had been engaged during the previous voyage. After this he returned to Queen Charlotte's Sound, New Zealand, to obtain a fresh supply of provisions and to refit the ships. Upon the return of summer Cook recommenced the investigations as to the supposed southern continent, and attained as high a latitude as 71° S. without discerning any traces of land, and he therefore came to the conclusion that no such continent as had been supposed, existed.

He now sailed northward, and examined Easter Island in the South Pacific, which had been discovered by Davis in 1686. Thence he sailed to the group to which he had given the name of the Friendly Islands; thence to a further group of islands which he named the New Hebrides; and from there to New Caledonia and Norfolk Island, the latter of which he found to be uninhabited. From here he came back again to New Zealand, and then started for home.



CAPTAIN COOK'S OLD VESSEL, THE "DISCOVERY."

[*To face page* 82.

He made a clear run to Cape Horn, and then stayed on his way, and carried out a careful examination of Tierra del Fuego and Staaten Island, arriving at Portsmouth on the 13th of July, 1775, having thus been away exactly three years, during which time he had only lost four of his men.

Captain Cook was again only a year at home, as on the 12th of July, 1776, he started on his third and last voyage. This time his object was to explore the North Pacific, and to renew the search for a continuous waterway between the Pacific and the Atlantic Oceans along the northern coast of America. Cook had his old ship, the *Resolution*, the accompanying vessel being the *Discovery*, which was commanded by Captain Clerke. The expedition, after calling at the Cape of Good Hope, visited Kerguelen's Land, and reached Adventure Bay, Tasmania, on the 26th of January, 1777.

From Tasmania Cook proceeded to New Zealand, and then sailing northwards, spent three months in examining the Fiji Islands. Still shaping his course in a northerly direction, he discovered, in 21° N. and 158° W., a group of islands, hitherto unknown, which he named the Sandwich Islands, after the noble earl, who was then head of the Admiralty. From here he sailed to Vancouver, and from thence to the Behring Sea, passing through Behring's Straits, until, in 70° 44′ N., he was stopped by the ice, when he returned to Hawaii, the largest island of the Sandwich group, where, most unfortunately, he met his death at the hands of the natives.

Some interesting glimpses may be obtained of matters connected with the British Mercantile Marine during the early part of the eighteenth century from the newspapers of the time. The absence of all coast-guard supervision, and the rough and lawless conduct of the poorer classes residing along the coast, are more than hinted at in the following paragraphs, taken from one of the principal London newspapers * of the year 1734:—

"Feb. 21:—We have received the Following Letter from Edward Penrose Esq. at Penrose near Falmouth, in Cornwall, dated Feb. 16th:—Yesterday was lost at Gunwalloe, in Mounts Bay, a Ship called the *Betty Galley*, Capt.

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* The *Saint James's Evening Post.*

Henry Day, of and for Lynn, from Malaga; by the Violence of the Sea, the Ship, after she struck not standing whole more than the Space of two Minutes at most. The Master and three Men were drown'd, and five Men were saved, but with great Difficulty, and almost naked.

"I went to the Place, and with much ado preserv'd from the Country People about ten Pipes of Wine, some full, and some a third, and some a fourth Part out, and a large Anchor, which I have deliver'd over to the Officers of the Port of Penzance, for the Relief of the poor Men that were preserv'd, and for the Owners. The Officers of the Port of Penzance brought a large Party of Soldiers with them, for the better Security of what I had preserv'd from the Country People, and the Soldiers are really of great Use in such Misfortunes, the Country People dreading the Sight of a Bayonet screw'd on at the End of a Musket. I ran much Hazard amongst these rude inhuman People, who are not to be govern'd, when there is any Liquor in the Case.

Having no Acquaintance at Lynn, or with any Merchants that deal that Way, I beg the favour you'll make this known to the Owners the Speediest Way you can. The Boatswain, who is sav'd, says the Cargo was 197 Casks of Wine, and 5 Tons of Fruit, &c."

The next paragraph points to a similar state of things on another part of the coast.

"Sep. 7:—On Saturday two Vessels from Dublin, loaded with Linnen Cloth, Glue, &c., and bound for Liverpool, were entirely lost, near Poulton, in Lancashire. The same Day, the *Prince Eugene*, Capt. Robert Hays, a fine new Ship, of and from Liverpool, for Cork, and the Coast of Guinea, was forced on shore by the heavy Gale, near Milford Haven; and great Numbers of the Country People came down with Axes and Hatchets, to break her up, and carry off all they could get. But several Merchants from Haverford-West, getting as many Assistants as they possibly could, went to the Place, and after a sharp Engagement succeeded in putting them to Flight; and at the coming away of the Post they were using their utmost Endeavours to save what they could for the unfortunate Owners."

In 1734, the only light at the mouth of the Thames was the *Nore* Lightship, which had been placed there two years previously. The number of vessels passing the Gunfleet, which lies between Harwich and the *Nore*, was rather different in 1734, from what it is at the present day, as may be learned from the following:—

"Nov. 21:—The *Mac'Allister*, Capt. Montgomery, bound from Gottenburg to Liverpool, was lost on the 13th Instant on the Gunfleet Sand: After the Ship struck the Crew took to the Rigging, and they continued for three Days in the Shrouds without any Sustenance: the Master and a Boy getting Light-Headed, flung themselves off into the Sea, and were drown'd only about three Hours before the rest were saved by Capt. Butcher, in the *Exchange*, from

Norway, which Ship arriv'd in the River this Day. They saw five Ships pass by them, the three Days they were in the Rigging, but none came to their Assistance."

The Irish mail, in 1734, was somewhat different from the present admirable service between Holyhead and Dublin:—

"Oct. 12:—They write from Dublin, Oct. 5, that the Pacquet-Boat which had on board the Mail from London, of the 24th past, was by the Violence of the Winds last Monday, drove to the Isle of Man, and cast away upon that Coast; but all the People on board escaped, and they took the Mails on shore with them. They hired a Vessel of that Island to bring them here, which Vessel arriv'd in Dublin Bay yesterday, about two Hours after the Pacquet which brought in the next Mail."

"The *Sea Nymph*, Robert Codd, Master, left Holyhead last Saturday, in Company with the *Grafton*, Pacquet-Boat. The *Sea Nymph* arriv'd here safe Yesterday, but she brings Account that the *Grafton* is totally lost on the Isle of Man, the Passengers and Crew being sav'd."

Merchant ships at that time suffered much from the press-gang, as may be seen from the following paragraphs, men who had been away for a couple of years being seized by the press-gang just as they were arriving home again:—

"June 8:—On Thursday Morning, the Directors of the East India Company received the agreeable News of the safe Arrival of the *Devonshire*, Capt. Prince, from Bengal, but last from St. Helena. The Purser left the said Ship safe in the Downs on Wednesday. She sail'd from the Downs, for the East Indies, on the 27th of Nov. 1732. Her Men have all been impress'd by the Men of War in the Downs, and other Hands were put on board to bring her up to her Moorings in the River."

"June 11:—On Saturday last, the *Devonshire*, Capt. Prince, belonging to the East India Company, came to her Moorings off Woolwich. She was manned up the River by 68 Hands, part of the Crew of the *Berwick*, Man of War; and the *Berwick* impress'd a like Number out of the *Devonshire*, as she was coming through the Downs."

"July 23:—On Sunday Morning the Purser of the *William*, Capt. Petre, arriv'd in Town, who brought Advice of the safe Arrival of the said Ship in the Downs, richly laden, on Account of the Turkey Company: The Ships of War in the Downs impress'd all her men, and put others on board to bring her up to her Moorings in the River."

"Oct. 24:—Notwithstanding the Report spread about 14 Days ago that no more Sailors would be impress'd out of the Homeward-Bound Ships, several Ships that arriv'd last Week, had all their Men taken from them in the Downs."

CHAPTER VIII.

The maritime commerce of England at the close of the reign of Elizabeth—Salee Rovers—Charles I.—Ship-money—Shipping of London—The other principal ports—State of the port of London in the seventeenth century—In the last century—Serious robberies on the river—The first docks—The "legal quays"—The West India Docks—The London Docks—The East India Docks—The St. Katherine's Docks—The Victoria Docks—The Royal Albert Docks—The Surrey Commercial Docks—A few particulars of the Port of Liverpool.

At the close of the reign of Queen Elizabeth the population of the whole of England did not greatly exceed five millions, and the population of London was about a hundred and fifty thousand. The greater part of the maritime commerce of the country, however, was centred in London, the customs of the port of London being at that time seven times greater than those of all the rest of the kingdom put together.

After London, the chief mercantile ports were Bristol, Newcastle, Hull, Yarmouth, Harwich, Boston, King's Lynn, Southampton, and Plymouth. Liverpool had then but a few hundred inhabitants, and those chiefly fishermen and persons engaged in a very small way in the coasting trade. Towards the end of the seventeenth century, however, Liverpool was gradually rising into prominence; but still the second mercantile port of this country was Bristol, which, with a population of about 30,000, had practically a monopoly of the West Indian trade.

In 1634, the dominion of the English crown over the Channel and the adjacent seas was being vigorously disputed, and the inhabitants of the towns along the southern coasts not unfrequently suffered much from the depredations of the

French and of the Dutch, or the more formidable descents of the Salee Rovers, who not only captured English vessels actually within sight of the English coasts, but carried away the fishermen in large numbers into slavery. Charles I., finding himself in want of money for the purpose of fitting out an adequate naval force to put a stop to this state of things, had recourse to an old device for the provision of maritime defence, and the port of London and the maritime counties generally were called upon for this purpose to furnish ships, or in lieu of ships, money.

The first writ for levying the ship-money was issued by Charles in 1636, and the quotas required to be contributed by the several places therein mentioned afford some means of estimating the relative wealth and importance of these particular places:—

The contribution of Lancashire was 1 ship of 400 tons, 160 men, £1000 in money.
„ „ Yorkshire was 2 ships of 600 tons.
„ „ the Borough of Leeds ... ... £200.
„ „ „ „ Hull ... ... £140.
„ „ „ „ Wigan ... ... £50.
„ „ „ „ Preston ... ... £40.
„ „ „ „ Lancaster ... ... £30.
„ „ „ „ Liverpool ... ... £25.
„ „ „ „ Clithero ... ... £7 10*s.*
„ „ „ „ Newton ... ... £7 10*s.*
„ „ Bristol was 1 ship of 100 tons, 40 men, £1000 in money.
„ „ London was 7 ships of 1000 tons, 1560 men, and six months' pay.

In 1702, 560 vessels belonged to the port of London. During the last three months of that year, 413 vessels were entered inwards, at the Custom House, London, and 256 vessels cleared outwards; * but in addition to these foreign-going vessels there was a very considerable number of coasters. At the close of the seventeenth century coal was becoming largely used in London, and in the year 1700, no less than 250,000 tons of coal were brought to London from the north by sea, the shipping employed in the coal-trade between the

* The reason of the great disparity between the number of ships entered inwards and of those cleared outwards would probably be accounted for by the fact that a large number of the homeward-bound ships would be from Norway, Sweden, and the Baltic ports, to which scarce any vessels would be going out during the months of November and December.

north of England and London being then regarded as especially the nursery for seamen.

In the year 1702, the shipping and seamen belonging to the principal ports of the kingdom were as follows:—

	Vessels.	Average burden.	Seamen.
London	560	150 tons.	10,065
Bristol	165	105 ,, ...	2,359
Newcastle	163	73 ,, ...	—
Yarmouth	143	62 ,, ...	668
Exeter	121	59 ,, ...	970
Hull	115	66 ,, ...	187 *
Whitby	110	75 ,, ...	571
Liverpool	102	85 ,, ...	1,101
Ipswich	39	—	—

In 1702, the total number of vessels belonging to all the ports of England put together was 3281, the total tonnage was 261,222 tons, the average burden being 80 tons. The total number of seamen was 27,196. This was exclusive of the Royal Navy, which consisted in the year 1695 of 200 vessels, of the burden of 112,400 tons, or an average burden of 562 tons, and which were manned by 45,000 seamen. Thus London at that time possessed one-sixth of the entire shipping of the country, and rather more than one-third of the entire number of sailors.

About the middle of the sixteenth century (in 1558) certain wharfs, afterwards known as "legal quays," were appointed to be the sole landing-places for goods in the port of London. They were situated along the river bank, between Billingsgate and the Tower, and had a frontage of 488 yards, or rather more than a quarter of a mile, to the river, of which frontage 388 yards were appropriated to the ships employed in the foreign trade; but this trade was so rapidly increasing that these quays soon became totally inadequate to the requirements of the port.

The following figures show the rapid increase in the number of ships engaged in the foreign trade entering the port of London during the eighteenth century:—

* Eighty of the Hull vessels were laid up at the time of this return, it being winter, and the trade of Hull lying chiefly with the Baltic, or in whaling in the northern seas.

	Ships.	Tons.	Average tonnage per ship.
In the year 1702 ...	839	80,040	95
" 1751 ...	1498 *	198,053	132
" 1794 ...	2219 †	429,715 ‡	193

Coasting Trade.

	Vessels.	Tons.	Average tonnage per ship.
In the year 1750 ...	6,396 ...	511,680	80
" 1795 ...	11,964 § ...	1,176,400	98

The greater part of the vessels during the last century, both coasters and foreign-going ships, entering the port of London discharged their cargoes as they lay in the river, there being at that time no docks to receive the steadily increasing amount of shipping. Property of the most valuable kind was always lying exposed in open boats, and the robberies were so enormous that Mr. Colquhoun, in his work, has estimated that they exceeded half a million annually. Neither was this particular species of crime by any means of recent origin, for in Stow's "Survey of London," published in 1633, we read—

"Now one Note on the North Side of the River, concerning Pyrates: I read that in the year 1440, in the Lent Season, certain Persons, with six Ships, brought from beyond the seas Fish, to victual the City of London: the which Fish when they had delivered, and were returning homeward, a Number of Sea Thieves in a Barge in the dark Night, came upon them when they were asleep in their Vessels, riding at Anchor in the River of Thames, and slew them, cut their Throats, cast them overboard, took their Money, and drowned their Ships, for that no Man should espy or accuse them. Two of these Thieves were after taken, and hanged in Chains upon a Gallows set upon a raised Hill, for the Purpose made in the Fields beyond East Smithfield, so that they might be seen far into the River of Thames."

In 1792, the actual number of barges and other craft employed in the transit of goods between the ships loading and unloading in the river and the shore was as follows: 500 for timber; 1180 for coal, each averaging 33 tons; 402

* Of these 203 were West Indian sugar-ships.

† Of these 433 were West Indian sugar-ships.

‡ In the year 1889 the tonnage entering the port of London amounted to 10,400,000 tons; 1890 (the year of the Dock Strike), 8,700,000 tons; 1891, 8,400,000 tons; 1892, 8,245,000 tons; 1893, 8,121,000 tons.

§ As a coaster would probably make half a dozen voyages in the year, this number divided by six would give about the actual number of vessels.

lighters of 39 tons each; 338 lighters of 20 tons each; 57 luggers of 24 tons each; 6 sloops of 27 tons; 10 cutters of 71 tons; and 10 hoys of 58 tons, making a total of 2503 craft of all descriptions.

The temptation afforded by so many barges and other craft filled with valuable merchandize lying constantly exposed in the river naturally produced a large amount of crime, and hundreds of men lived entirely by robbery on the river. There were among these river thieves several quite distinct classes, each with its own special mode of operation, and each acting entirely independently of the others. The particular class known as "Light Horsemen" would look out for a lighter having valuable goods on board, and at night, stealing up quietly, would cut her adrift; then following her as she floated down with the tide, would by-and-by rescue her, and bring her back, claiming salvage. It is needless to say that she had, in the meanwhile, been relieved of a very considerable portion of her cargo. The "Heavy Horsemen" did their work in the day-time, when they went on board as Lumpers to clear the ships. The "Coopers," "Ratcatchers," and "Scuffle-Hunters," were all thieves in a greater or less degree, whilst the "River Pirates" were practically marine burglars, getting on board ships at night, by the stern-windows, open ports, or skylights, or down the companion, visiting the captain's cabin, and the after parts of the ship, not hesitating to cut a throat or two should occasion require. The "Mudlarkers" were, for the most part, old men—too old for most of the above professions, but still able, in their boats, to creep about among the tiers of shipping, and to collect bags of copper nails, sugar, coffee, or what not from the less scrupulous members of the crews of the homeward-bound ships.

The waterside—Deptford, Greenwich, and the like—abounded with "fences"—receivers of stolen goods, where the commodities brought ashore could be disposed of, and no questions would be asked; and if, at any time, a particular neighbourhood became too warm, then there were always what were called "Jew-carts," ready to take the goods inland, where they would not be so minutely looked after.

In 1798, the Thames police, then called the Marine police, was instituted to prevent these depredations on the river, but the port of London continued in nearly as bad a state until the formation of the docks, which took the ships out of the river.

The first docks for the port of London were on the Surrey side, and Pennant, in his book on London, published in 1793, says—

"Near the extremity of this parish (Rotherhithe) are the docks for the Greenland ships; a profitable nuisance, very properly removed to a distance from the Capital. The greater dock is supposed to have been the mouth of the famous canal, cut in 1016, by King Canute, in order to avoid the impediment of London Bridge, and to lay siege to the capital by bringing his fleet to the west side."

This dock, for a long time known as the Greenland Dock, was not allowed to be used by vessels discharging their cargoes, in consequence of objections on the part of the Commissioners of Customs.

Pennant goes on to say—

"St. Saviour's Dock, or as it is called, Savory, bounds the east end of this parish (St. Olave, Southwark). St. Saviour's Dock may be considered as the port of Southwark. It is in length about four hundred yards, but of most disproportionable breadth, not exceeding thirty feet. It is at present solely appropriated to barges which discharge coals, copperas from Wittlesea, in Essex, pipe-clay, corn, and various other articles of commerce."

With the exception of these two docks there was at that time no other dock, and the first wet dock for the port of London was the work of a private individual. In 1789, Mr. Perry, a shipbuilder, constructed a dock, called the Brunswick Dock, adjoining his shipbuilding yard at Blackwall, capable of containing at one time 28 East-Indiamen, and 50 smaller vessels.

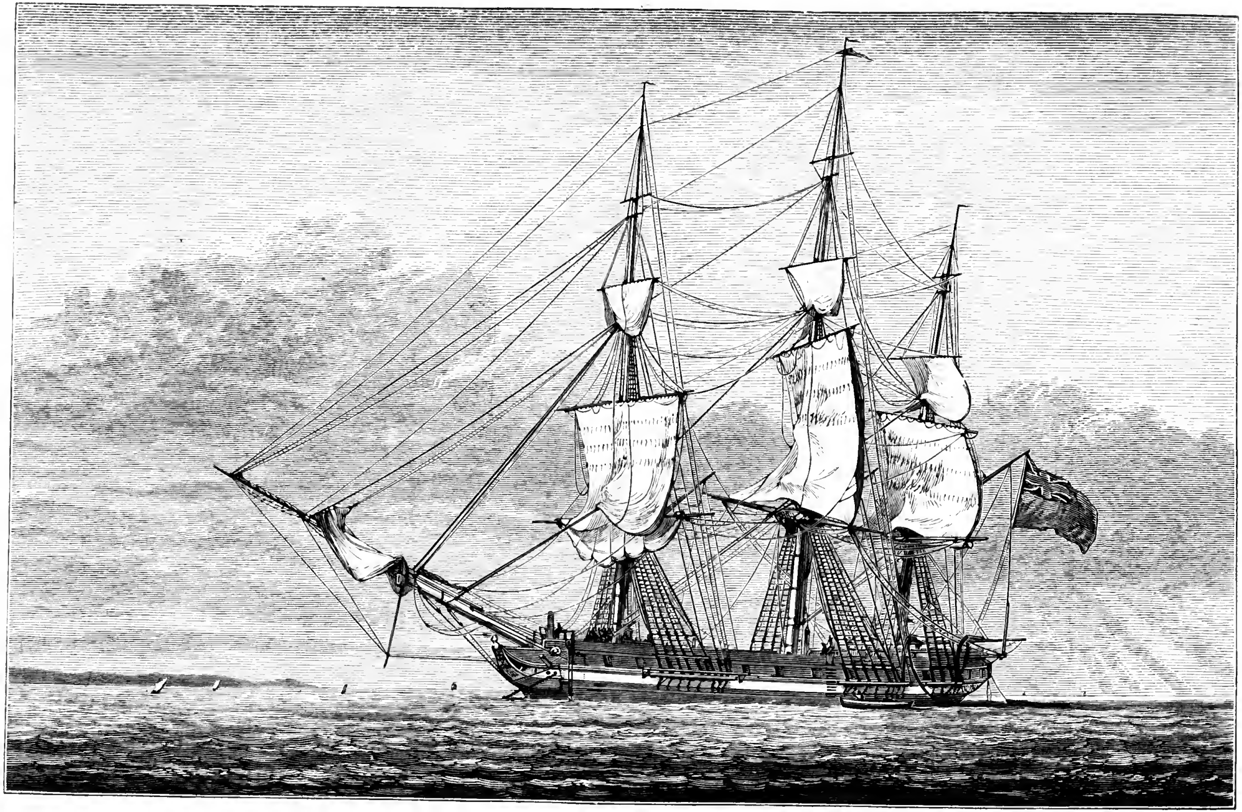
The difficulties of landing goods at the "legal quays," the only other landing-place, was so great that a large quantity of merchandise was often kept afloat in barges for the simple reason that there was no room to land it. The quays were covered with bales and packages, whilst the sugar hogsheads were often piled six and eight high.

About 1793, the complaints of the merchants as to the existing state of things began to attract public attention, and in 1796, Parliament took up the subject, and instituted a formal inquiry. After the war with France had commenced, in 1793, the evils became immeasurably greater, as before that time ships had arrived or departed singly, but now they came and departed in fleets, which were under the convoy of the men-of-war. A Parliamentary Committee was appointed to consider the whole subject, and a number of schemes were proposed with a view of increasing the facilities for loading and unloading the ships. In 1799, the West India merchants, a very wealthy and influential body, at length attained their object of having wet docks, and the Bill was passed for the construction of the West India Docks, which were at once commenced, and the docks were opened for business on the 21st of August, 1802, the opening ceremony being performed by William Pitt the younger. They were specially constructed for the ships engaged in the West India trade, and a compulsory clause was introduced into the Act, requiring all ships coming to London laden with West Indian produce to make use of the West India Docks for the space of 21 years from the date of opening. The northern, or import dock is 2600 feet long, by 510 feet broad, and covers a space of 30 acres; the southern or export dock is 2600 feet long, and 400 feet broad, and covers an area of 24 acres; and both are surrounded by a series of large warehouses, capable of containing over 100,000 tons of goods.

Accustomed as we are to consider the Docks, if not in the very heart of London, at least as being well within the Metropolitan area, it is curious to read the criticisms of writers of the time when these West India Docks were first opened. One says—

"Notwithstanding these Docks have occasioned a very important trade to be moved to a considerable, and even inconvenient, distance from the metropolis, yet the advantages to the Port of London are, upon the whole, incalculable. The West Indian trade generally arrives in fleets, and occasioned so much crowding, confusion, and damage, in the River, that these ships being disposed of in these docks, the overgrown trade of the port is now able to be carried on with pleasure and convenience."

In 1800, an Act was obtained for the construction of the London Docks, and certain important privileges were accorded them; all ships, at that time, entering the port of London laden



THE "THETIS," WEST INDIAMAN.

[*To face page* 92.

with wine, brandy, tobacco, or rice, being required to enter these docks, which were opened for public business on the 30th of January, 1805. They cover an area of 100 acres, and cost four millions sterling. The two docks accommodated 500 ships, reckoning the kind of ships in vogue at the time; and the quays are lined with large warehouses with capacious vaults for the reception of wine, spirits, and tobacco.

The warehouses for tobacco are at the eastern end of the docks, and are two in number, the larger being 762 feet long, and 160 feet in width, divided into compartments by double iron doors; the smaller 250 feet long, and 200 wide. Both of them have extensive vaults, chiefly used for housing wines, of which they usually contain from five to six thousand pipes. They are solely under the control of the officers of the Customs.

In 1803, the Act of Parliament was obtained for the construction of the East India Docks, specially for ships in the East India trade; and the docks were opened to the public on the 4th of August, 1806. They were at one time under the management of a certain number of East India Directors; but when the trade to the East Indies was thrown open they were purchased by the West India Dock Company.

The import dock is 1410 feet long, 560 feet wide, and 30 feet deep, covering 18 acres; and the export dock is 780 feet long, 520 feet wide, and of the same depth, covering 9¾ acres. From these docks all the goods of the Company were conveyed to their London warehouses along a tramway in covered waggons, locked up so as to prevent fraud and smuggling.

About the year 1820, all the monopolies of the West India and the London Docks were about to expire, and every effort was made by the Companies to obtain an extension of their privileges. This occasion seemed to offer a favourable opportunity for further dock accommodation for the port of London, and after the most strenuous opposition on the part of the old Companies, in 1825, an Act was obtained by a new Company for the construction of the St. Katherine's Docks. Upwards of eight hundred houses, mostly of a poor and dilapidated description, were pulled down to make way for the new docks, and among them was the Hospital of St. Katherine, founded in 1148 by Matilda of Boulogne, the wife of King Stephen, which Hospital was re-erected in the Regent's Park. The first stone of the St. Katherine's Docks was laid on the 3rd of May, 1827; and they were opened for shipping on the 25th of October, 1828. The docks occupy an area of 23 acres, of which 11 acres are water.

Previous to the construction of the docks, and when ships discharged in the river, it was reckoned that an East Indiaman of 800 tons took a month to unload, whilst one of 1200 tons took six weeks. At the St. Katherine's Docks, which were fitted with all the best appliances then known, the average time occupied in discharging a vessel of 250 tons was twelve hours; and a ship 500 tons two or three days. In 1841, over a thousand ships and upwards of ten thousand lighters and boats entered the St. Katherine's Docks. Now, partly from the fact that the great steamers, three or four hundred feet long, which have to a large extent superseded the old ships of a thousand or twelve hundred tons, cannot get in or out of these docks, and partly because by using the newer docks, such as the Albert and the Victoria Docks, the navigation of the narrower and more crowded part of the river is avoided, the St. Katherine's and the London Docks are comparatively deserted, and at the present day wear a desolate and melancholy aspect.

In 1855, the Victoria Docks, situated at a short distance to the east of Bow Creek, the entrance to the River Lea, were specially constructed to meet the requirements of these large ocean-going steamers. They occupy an area of 200 acres, and contain over a mile of quays.

In 1869, the accommodation of the West India Docks was increased by the addition of a large basin now known as the South-West India Dock; whilst south of this again are the Millwall Docks, occupying the greater part of the Isle of Dogs. These last docks are now very largely used, particularly by the grain steamers from the Baltic and the Black Sea. Not far off is one more dock, the Regent's Canal Dock, chiefly used by Norwegian vessels and small craft generally.

The latest addition to the docks of the port of London, not reckoning the Tilbury Docks, which are twenty miles away, are the Royal Albert Docks, nearly opposite Woolwich, the head-quarters of the P. and O., and other large lines of ocean steamers.

At the present time the whole of the above docks, that is to say, the London Docks, the St. Katherine's, the West India, the South-West India, the East India Docks, the Royal Albert, the Victoria and the Tilbury Docks, are under the management of a joint committee known as "the London and India Docks Joint Committee."

On the Surrey side of the river are the Surrey Commercial Docks, with an area of 49 acres, of which 38 acres are water. These docks are almost exclusively used by vessels engaged in the timber trade of the port of London; and perhaps nowhere can be seen such a collection of every kind of timber from every known country of the world as is to be met with in the Surrey Commercial Docks.

The state of the East and West India Docks, the London Docks and the St. Katherine's, at the present time presents a lamentable contrast from what was to be seen some forty or even thirty years ago. At that time steam to Australia was practically unheard of, and the sailing trade to the Australian ports, to Calcutta, Bombay, and the East, was perhaps at its best. The East India Docks in the "fifties" and in the "sixties" were absolutely full of the magnificent ships of Green, Money Wigram, Somes, W. S. Lindsay, Thompson, Devitt and Moore, Dunbar, and the rest. Every one who went to Australia or to New Zealand, and, perhaps, the greater part of those going to India, took their passage in such splendid sailing ships as the *Light of the Age,* the *La Hogue,* the *Star of India,* the *Alfred,* the *Maid of Judah,* the *Somersetshire,* the *Patriarch* and other similar ships, which all lay packed close together along the quays of these docks. Occasionally was to be seen the black hull and the tall tapering masts bearing the well-known red house-flag with the black ball in it, of the *Lightning,* the *Red Jacket,* the *James Baines,* or some other crack clipper of the Black Ball Line; or perhaps one of Bligh's buff-coloured ships loading for the Cape. Nothing was anywhere to be seen but a forest of tall spars and a maze of rigging, whilst scarcely a funnel was to be found in the Docks.

How is it to-day with the East India Docks? In the Export Dock, perhaps, two Donald Currie boats; in the Basin, one more Castle Liner, and a stray "tramp" or two; in the Import Dock—nothing. Little wonder that the annual meetings of the Docks Company are sometimes stormy, and exasperated shareholders ask why the Docks are not filled up again, and sold as building sites!

Liverpool.

A few of the barest particulars may be given as showing the recent and rapid rise of the second mercantile port of the kingdom. Its first charter was granted to Liverpool, then scarcely more than a village, by Henry II. in 1173; this was renewed by King John in 1207; and this charter was again renewed by his son and successor, Henry III., in 1227.

In the fourteenth century Liverpool was still but a very small and obscure place; but it must have even then possessed a few small vessels, for Edward III., in 1333, previous to his invasion of Scotland, ordered the town "to provide six of the largest and strongest ships to be found in the port of Liverpool" for service against the Scots.

During the two centuries that followed there was but little alteration, apparently, in the state of the town, for on the 16th of February, 1557, in the fifth year of Queen Mary, when a war with France was imminent, the queen sent a letter to "the mayor, customs-comptroller, and searcher of the town and port of Liverpool, and to all other officers to whom it shall appertain," requiring them to make "a return of all ships and other vessels within the port, and the creeks belonging to the same: of the tonnage thereof: and likewise the number of mariners and seafaring men." In answer to this order, the mayor reported that "there were only two ships, one of 100 tons, and the other of 50 tons, and seven smaller ships, belonging to the town and the creeks, which were then in port; and that there were four ships abroad; and that the number of seamen belonging to the port was 200."

In the year 1565, the seventh year of Queen Elizabeth, an order was again addressed to the Mayor of Liverpool, requiring information as to the then state of the place; the number of vessels belonging to the port; and also the number of seamen by whom they were worked. From the return made to this order it appears that there were in Liverpool at that time only 138 householders and cottagers; that the number of vessels belonging to the River Mersey was fifteen; and the amount of their tonnage 267 tons, no vessel being greater than 40 tons; so that the two vessels given in the previous return, in Queen Mary's reign, must have been either lost, sold, or worn out. The number of seamen belonging to the port was returned as 80. The fifteen ships belonging to Liverpool in 1565 were described in detail thus:—

		Tons.		Crew.
"One ship—the *Eagle*	...	40	...	12 men and 1 boy.
One "	...	36	...	10 "
One "	...	30	...	8 "
One "	...	24	...	8 "
One "	...	20	...	8 "
Two " [16 tons each]	...	32	...	12 "
Two " [15 tons each]	...	30	...	8 "
One "	...	14	...	— "
Two " [12 tons each]	...	24	...	5 "
One "	...	8	...	3 "
One "	...	6	...	3 "
One "	...	3	...	3 "
Total 15 ships.		267 tons.		80 men."

In 1571, the town having been ordered to provide certain vessels for the use of the Crown, a petition was sent to the Queen, praying relief against the subsidy imposed upon them, in which they style themselves "your Majesty's poor, decayed town of Liverpool."

An accurate and exceedingly interesting picture of the maritime importance of the port of Liverpool during the latter part of the reign of Queen Elizabeth may be obtained from a month's return of the movement of the port, selected at random from the records of the time:—

"28th of March, 1586, two vessels only entered the port of Liverpool; and one sailed from it. The two which entered were the *Trinitie*, 15 tons, from Dundalk, and the *Speedwell*, 16 tons, from Dublin.

"The vessel that left was the above-named *Trinitie*, which went back to Dundalk.

"No other vessel entered the port until the 8th of April, when the *Michael*, 16 tons, arrived from Drogheda; and the *Marie*, 6 tons, also from Drogheda.

"On the 12th of April, entered the barque *Strange*, 18 tons, from Carlingford; and the *Tobie*, 26 tons, from Dublin.

"13th of April:—The *Tobie* left for Dublin.

"16th of April:—The *Elizabeth*, 10 tons, left for Dublin, with 10 tons of coal.

"18th of April:—The *Hope*, 34 tons, cleared out for Dublin, with 28 tons of coal; and the *Swallow*, 12 tons, sailed for Drogheda.

"22nd of April:—The *Speedwell*, 16 tons, cleared out for Carrickfergus.

"30th of April:—The *Golden Gray*, 19 tons, arrived from Dublin."

So that the total number of vessels that entered the port of Liverpool in a month in 1586 was seven vessels, with a total tonnage of 116 tons; and six vessels left the port, having a united tonnage of 113 tons.

From that year until the troublous times of the reign of Charles I. the town appears still to have made but very little progress; but in 1644, previous to the battle of Marston Moor, we read that

"in that year the town was in the hands of the Commonwealth, under the command of Colonel Moore, who defended it for some time against Prince Rupert. It was then well fortified with a high and strong mud-wall, and a ditch twelve yards wide, and nearly three yards deep."

In 1662, the number of inhabitants was 775; and in 1700, the number is stated to have been 3100. From this time, however, Liverpool began rapidly to increase, and Enfield says that "in 1753 the number of houses was 3700, and the number of the inhabitants 20,000." In the year 1722, Parliament was first applied to for an Act to build a dock for Liverpool, since which time the docks have steadily increased in number, until at present the dock accommodation of Liverpool is, perhaps, the finest in the world.

The King's Dock was opened in 1788, and the first vessel that entered the new dock was a brig called the *Port-a-Ferry*, which was then trading between Liverpool and Ireland. This vessel was one of three ships that carried troops from Liverpool to Ireland, to raise the siege of Londonderry, in 1689; she must, therefore, when she entered the Liverpool dock, have been at least a hundred years old. In 1792, the Queen's

Dock was completed. This dock was 270 yards long, and 130 yards wide, and attached to it was a graving dock; the cost of these docks being £25,000. The St. George's Dock was the last constructed before the end of the century. It was 250 yards long and 100 yards broad, with a length of quay of 670 yards, and was chiefly intended for ships in the West India trade. At the close of the century there were altogether thirteen docks in Liverpool; namely, five wet docks, five graving docks, and three dry docks, besides the Duke of Bridgwater's dock, occupying altogether a space of about three miles in circumference.

The number and tonnage of ships that paid dock rates and town dues in Liverpool * is given thus:—

Year.	Ships.	Tonnage.	Amount.
1760	1,245	—	£2,330
1770	2,073	—	£4,142
1780	2,261	—	£4,508
1790	4,226	—	£10,037
1800	4,746	450,060	£23,379
1812	4,599	447,000	£45,000
1871	20,121	6,131,745	£562,953
1880	20,070	7,524,533	£706,449
1890	23,633	9,654,006	£1,110,057
1897	23,640	11,473,421	£1,108,097

By the year 1772, Liverpool had become as important a port as Bristol; and at that time the ships of these two ports alone, engaged in the slave trade, carried annually 50,000 negro slaves from the African coast to the British plantations in the West Indies. It was in this year that after a long agitation by the Society of Friends in favour of the total abolition of slavery, the famous decision of Lord Mansfield was obtained, "that a slave becomes free at the moment of his setting his foot on British soil." Violent opposition to the abolition of the slave trade was offered by the merchants and the shipowners of Liverpool; but with the ultimate passing of the measure for negro emancipation, in March, 1807, this trade at last came to an end.

Liverpool at the present day, naturally from its position commands the bulk of the American trade, there being now

* This information has been kindly supplied by the Secretary of the Liverpool Chamber of Commerce.

practically a daily service of the finest and best appointed steamers in the world between the Mersey and the United States. Although the entrance to the estuary of the Mersey is encumbered by sand-banks, yet there is even at low water spring tides a depth of 11 feet over the bar. The tide rises 21 feet at neaps, and 31 feet at springs, so that there is always for some time before and for some time after high water plenty of water for even the very largest ships.

Along the whole of the Liverpool bank of the river are now no less than six miles of continuous wet docks; the existing docks, with their basins, including wet, dry, graving docks, locks, etc., covering an area of 388 acres, and having upwards of twenty-five miles of quay space; whilst on the Birkenhead side of the Mersey there are other docks having an area of 164 acres of water space, with upwards of nine miles of quays; and these docks are capable of taking in the largest steamers afloat.

Even this large amount of dock accommodation for the port of Liverpool is about to be still further increased. At a recent meeting of the Mersey Docks and Harbour Board, it was decided to form additional docks on the Liverpool side of the river, including the construction of a graving-dock 1000 feet in length, and having an entrance 90 feet in width, the whole being at a total cost of between three and four millions sterling.

CHAPTER IX.

The application of steam to the purposes of navigation—Mr. Patrick Miller—Symington—Lord Dundas—The *Charlotte Dundas*—Fulton—The *Clermont*—The *Comet*—The first Margate steamer—The *Marjory*—The *Rob Roy*—The first ocean steamer, the *Savannah*—The first attempt to reach India by steam—The *Enterprise*—The first steam warship—Transatlantic steam navigation—The *Sirius*—The *Great Western*—The *British Queen* and the *President*—The screw propeller—The *Archimedes*—The *Rattler* and the *Alecto*—The *Great Britain*.

The application of steam to the purposes of navigation has, during the present century, made such rapid strides, and has to so large an extent superseded the use of sails, that there appears a probability that in the not far distant future—except, perhaps, in the case of small vessels and coasters—the sailing ship will have become entirely a thing of the past. All this vast revolution has taken place during the last hundred years; for although here and there, towards the close of the eighteenth century, the propulsion of vessels by steam-power was attempted, very little was actually done before the year 1800.

It must be remembered that the original object in introducing steam-engines into ships was not one of either speed or economy, but it was rather to make them independent of the weather; yet after a comparatively short experience other advantages of the new departure became so manifest that it was persevered in, at first only with passenger steamers, but when the screw propeller had been invented, allowing steamers to run equally well on any draught, steam-ships were also designed to carry cargo.

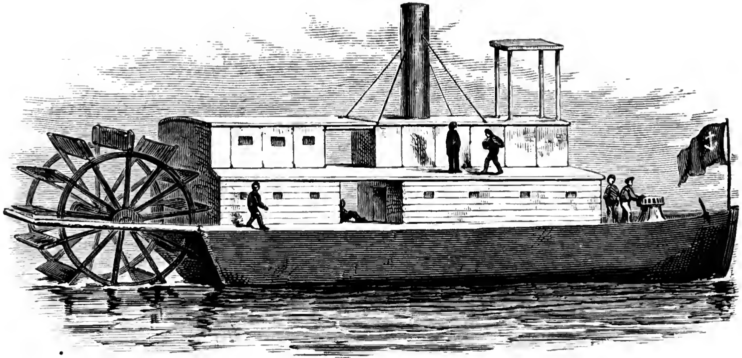
Long before steam was introduced the propulsion of vessels by means of paddle-wheels had frequently been attempted. The art of working paddles by means of oxen in a circular wheel was known to the ancients, and was used in the Middle Ages; and even on the Thames, and on the Medway, there were boats propelled in this manner in the reign of Charles II.

In the year 1543, a Spaniard, one Blasco de Garay, exhibited a vessel in the harbour of Barcelona said to have been worked by steam; but the fact of steam having really been the motive-power of this vessel has always been doubted. A certain Solomon de Caus, of Frankfort, in 1615, is also said to have constructed a similar vessel propelled by steam; but of this also nothing at all authentic is known.

As early, however, as December, 1736, one Jonathan Hulls obtained a patent for "a machine for carrying ships and vessels out of or into any harbour or river, against wind and tide, or in a calm"—for a steamboat, in fact. His steamer was fitted with an engine fixed amidships, which by means of a band, or rather of a rope running in grooved wheels, worked a paddle-wheel at the stern of the boat. Nothing, however, appears to have come of his invention. In 1781 the Marquis de Jouffroi constructed a somewhat similar boat, also propelled by steam, and he exhibited it on the Saône; but this also seems to have resulted in nothing.

Boats very much after the fashion of Hull's steamer are even now to be seen in some parts of the world, as, for example, on the Murray, in South Australia. Such boats have also been used on the upper Thames, and the remorqueurs of the Seine are still constructed on not very dissimilar principles.

In the year 1787, Mr. Patrick Miller, a gentleman of considerable property, of Dalswinton, in Scotland, published a pamphlet on the subject of propelling boats by means of paddle-wheels turned by men. For the purposes of his experiments he built, from first to last, eight boats of different kinds, and is said to have spent no less than thirty thousand pounds upon his hobby. In most of his experiments he was assisted by a Mr. James Taylor, who was tutor in his family, and who had repeatedly urged upon Mr. Miller the application of steam-power rather than manual labour to his engines. At last Mr. Miller agreed to Mr. Taylor's proposal,



STERN-WHEEL STEAMER, USED ON THE MURRAY.

[*To face page* 102.

and he employed a mechanical engineer named Symington to carry out Mr. Taylor's idea.

Symington, who was employed at the lead mines at Wanlockhead, had constructed a small steam-engine, originally intended for propelling wheeled carriages, and this engine Mr. Taylor caused to be fixed on board one of Mr. Miller's boats, on Lock Dalswinton. The boat was 25 feet long and 7 feet wide, and was furnished with two paddle-wheels; and on the 14th of November, 1788, the experiment was made. The engine performed its work beyond their most sanguine expectations, driving the vessel at the rate of 5 miles an hour, although the cylinders were only four inches in diameter.

The account of this experiment appearing in the Scotch newspapers, Mr. Miller was asked to repeat it on the Forth and Clyde Canal. This being agreed to, a double engine with cylinders 18 inches in diameter was ordered to be built at the Carron Ironworks, and in the following year it was fitted on board another of Mr. Miller's vessels. When it was first tried the floats of the paddle-wheels gave way, and it was not until the December of that year that the experiment could be satisfactorily carried out. The engine answered perfectly, and the boat was propelled at a rate of from 6½ to 7 miles an hour.

Mr. Miller seems, however, to have taken no further steps in the matter, and more than ten years elapsed before Symington could find any one else to take up the idea; and it was not until 1801, that Thomas, first Lord Dundas, of Aske, employed him to fit up a steamboat to be used as a tug for the Forth and Clyde Canal Company, of which Lord Dundas was a large shareholder.

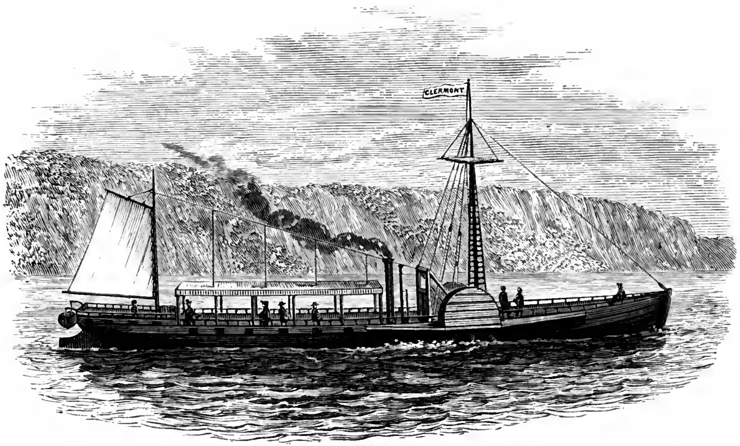
The steamer produced was the *Charlotte Dundas,* so named after his lordship's daughter, and in March, 1802, she made her trial trip on the Forth and Clyde Canal. A party of gentlemen interested in the Canal, among whom was Lord Dundas himself, assembled on board; and taking in tow two barges of 70 tons burden, the *Charlotte Dundas* accomplished the trip to Port Dundas, Glasgow, a distance of 19½ miles, in six hours, or at the rate of 3¼ miles an hour, although she had a strong gale in her teeth the whole time.

In spite of the success of the experiment, the scheme was not looked upon very favourably, and the *Charlotte Dundas* does not appear to have been again used. She was laid up in a creek of the canal near to Bramford Drawbridge, where she remained for many years, exposed to public view as a mere curiosity.

When Symington's experiments were being conducted, a certain Mr. Robert Fulton who had gone over to America, and was there practising as an engineer, happening to be again in Scotland on a visit, came to see the result; and being much interested, asked permission to take some notes and to make some sketches of the size and construction of the boat and of the apparatus. The necessary permission was accorded, and Symington even offered to have steam got up, and to take him a trip on the canal. Fulton going on board, the vessel went four miles down the canal and four back in one hour and twenty minutes, to the utter astonishment of Mr. Fulton and the other guests on board.

Mr. Fulton soon after that went back to America, and in 1806, in conjunction with a Mr. Livingstone, commenced building a steamboat in the yard of Charles Brown, on the Hudson. She was decked for a short distance only, at the bow and at the stern; the engine was exposed to view, and a house like that of an ordinary canal-boat covered the boiler and the spaces for the passengers and the crew. She was launched in the spring of 1807, and was called the *Clermont*. Her engine, which had been ordered of Messrs. Boulton and Watt, had a cylinder 24 inches in diameter, and a piston with a 4-foot stroke.

On her trial trip the speed of the *Clermont* was 5 miles an hour; but Fulton, perceiving that the floats of her paddles were too deep in the water, had them altered, with a highly beneficial result. He then went in her from New York to Clermont, Mr. Livingstone's residence, a distance of 110 miles, in twenty-four hours; and on the trip from Clermont to Albany, a further distance of 40 miles, the time was 8 hours, thus averaging a speed of very nearly 5 miles an hour.



FULTON'S STEAMER, THE "CLERMONT," ON THE HUDSON.

[*To face page* 104.

The *Clermont* was soon after this lengthened and improved —practically rebuilt, she now being 130 feet in length, with 16½ feet beam, her tonnage being 160 tons, with one engine of 18 horse-power. She continued for many years to ply with goods and passengers between New York and Albany.

On the evening of Fulton's first voyage in this steamer on the Hudson he despatched a triumphant letter to his great friend, Sir Richard Philips, one of the sheriffs of the city of London. This letter was shown to Earl Stanhope, a nobleman distinguished for his mechanical genius and scientific researches, and to several eminent engineers, but it was laughed at, and treated with scorn and derision, as describing impossibilities. Sir Richard Philips, however, was not to be daunted, and he endeavoured to form a company to repeat on the Thames what was being successfully done on the Hudson; but, unfortunately, without success, and the project, therefore, for a time fell through, and the American accounts were treated as falsehoods.

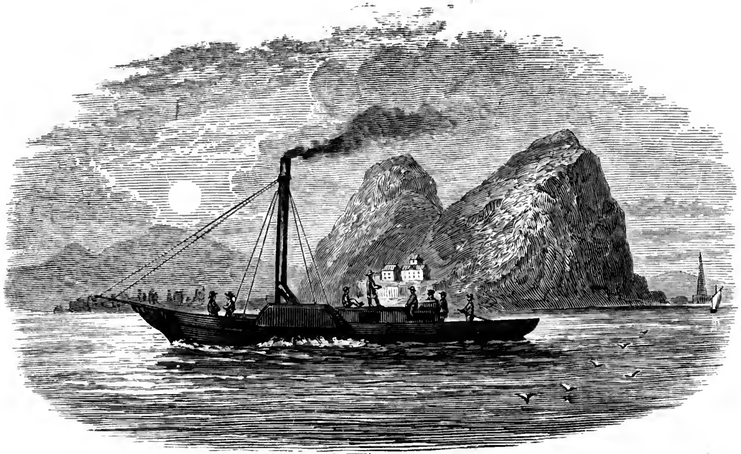
In 1811, the first British passenger steamer, the *Comet*, was being built for a Mr. Henry Bell, by Mr. John Wood of Port Glasgow on the Clyde. In January, 1812, Mr. Bell completed her; but it was six months later before she actually commenced running. She was only of about 25 tons burden, 40 feet long, 10½ feet beam, and she drew 4 feet of water. Her engine, which cost £192, was constructed by John Robertson; it was a condensing engine of 3 horse-power, the diameter of the cylinder being 11 inches, and the stroke 16 inches, the crank working below the cylinder, and the engine-shaft was provided with a fly-wheel. At first the *Comet* was fitted with two pairs of paddle-wheels, 7 feet in diameter; but soon afterwards she was lengthened to 60 feet, a new engine of 4 horse-power was substituted for the old engine, and one pair of paddle-wheels was discarded, her speed being somewhat increased by the alteration. She was not, however, an entire success; her speed at the best was not more than 3 miles an hour, and occasionally she would break down altogether; so that it was not at all an uncommon occurrence for the passengers, when the engine of the little steamer was getting exhausted, to take a turn at the fly-wheel to assist her into port.

In 1813, a steamboat was built at Leeds, and was started to run between Norwich and Yarmouth in the August of that year. This was the second passenger steamer launched in British waters; and in the December of the next year (1814) the first steamboat was seen on the Thames.

In the spring of 1813, the *Swiftsure*, a steamboat 140 feet long, and 24 feet beam, was launched on the St. Lawrence, and she was quickly followed by many others on that side of the Atlantic.

In 1814, a vessel called the *Marjory* was built at Dumbarton by William Denny, Senior, and was fitted with a side-lever engine of 14 horse-power, constructed by Cook of Glasgow. She made her way round from Dumbarton to the Thames, being taken south along the east coast, having come through the Forth and Clyde Canal. When she reached the mouth of the Thames the fleet were lying at anchor there, and she passed through the lines of ships, exciting great commotion among the officers and men, none of whom had ever seen a steamer before, many taking her for a novel species of fire-ship. She was hailed by the nearest man-of-war, and asked what she was, those on board replying that "she was a *steamer*, and from Scotland." Soon after her arrival in the Thames she commenced running to Margate with passengers. On her first voyage to Margate only ten people were found adventurous enough to trust themselves on board; but before the end of the summer she was running with a much larger number of passengers every trip; and this would appear to mark the real commencement of the passenger steamer in this country. The *Marjory* was 63 feet long, and 19 feet beam. She continued for many years to ply on the Thames, and was finally broken up in 1858.

On the 28th of June, 1815, the first steamer arrived at Liverpool from the Clyde. She was built specially for the purpose of carrying on a passenger traffic between the Mersey and Runcorn. On her passage round she called at Ramsay, in the Isle of Man. This vessel, the particular dimensions and details of which cannot now be traced, is remarkable as being practically the first steamboat built for making passages by sea, all her predecessors being essentially river-boats.



THE "COMET," 1812.

[To face page 106.

In 1818, the *Rob Roy* was built at Dumbarton by William Denny. She was of 90 tons burthen, and was fitted with an engine of 30 horse-power by David Napier. She was the first steamer to ply between Glasgow and Belfast. After running for some time on this service she was sent round to Dover, her name being altered to the *Henri Quatre*, and she was the first Channel steamer between Dover and Calais.

In 1819, Mr. Napier built the *Talbot*, of 150 tons. The *Talbot* was fitted with a pair of engines, each of 30 horse-power, and was the first steamer to be placed on the Holyhead and Dublin service.

In 1822, Messrs. Wood built a still larger steamer, in the *James Watt*, which was 146 feet long, and 25 feet beam. She was fitted with a pair of engines by Boulton and Watt, each of 50 horse-power, and her speed was said to be 10 miles an hour. She was the first steamer to be entered in Lloyds' Book. By 1830, the number of steamers had increased to 81, and the number of steamers entered in Lloyds' Book in 1832, was 100.

Steam navigation was not destined to be long confined to home waters, and men began to ask why they should not cross the Atlantic by steam. Many people, however, in this country pronounced the proposal impracticable, chiefly because it was thought that the vessel could not carry sufficient coal for steaming such a voyage. In these early steamers the coal consumed amounted frequently to as much as 9 lbs. per horse-power per hour, so that the objection would seem not to have been altogether unreasonable, especially when now viewed in the light of the fact that the high speeds of our ocean steamers at the present time are attained on a consumption in many cases of less than 1½ lbs. of coal per horse-power per hour. Dr. Lardner, a well-known scientist, in the course of a lecture that he was delivering in Liverpool in December, 1835, spoke as follows: "As to the project, however, which has been announced in the newspapers lately" —that was the project of crossing the Atlantic by steam—"it was, he had no hesitation in saying, perfectly chimerical, and they might as well talk about making a voyage from New York or Liverpool to the moon." In spite, however, of Dr.

Lardner and his theories, in 1817, a Mr. Scarlborough, of Savannah, Georgia, United States, determined to make the attempt to cross from America to Europe by steam. He accordingly purchased a vessel of 300 tons, that was then building at New York, fitted her with engines, and named her the *Savannah*. She was fully rigged as a sailing vessel, but thus possessed auxiliary steam-power, and her paddles were removable, so that she might either sail or steam. On the 19th of May, 1819, she left the port of Savannah for Liverpool, which was safely reached on the 20th of June. She did not steam the entire way across the Atlantic, as she ran short of fuel, so that the latter part of her voyage had to be accomplished under canvas only.

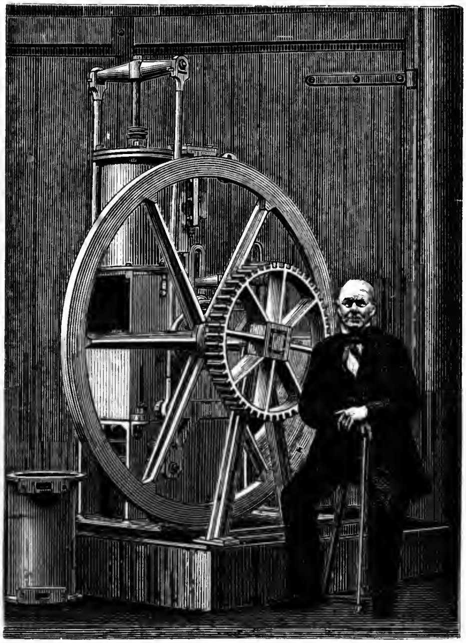
In 1826, the first large steamer to trade between London and Scotland was constructed. She was called the *United Kingdom*, was 160 feet long, and 26½ feet beam, and had engines of 200 horse-power. She had three masts, and was rigged as a barquentine, the paddle-boxes and the funnel being between the fore and the main masts.

In 1825, the first attempt was made to reach India by steam, and a small steamer, the *Enterprise*, 122 feet long, and 27 feet beam, left London for Calcutta, which port she reached, partly under steam and partly under sail, in 113 days.

In 1829, the *Curaçoa*, an English-built steamer of 350 tons and 100 horse-power, made several voyages between Holland and the West Indies.

In 1831, a Canadian-built steamer, the *Royal William*, of 365 tons, 145 feet long, and 27 feet beam, fitted with engines of 240 horse-power, crossed the Atlantic from Quebec to Liverpool in 24 days, but not entirely under steam, she being for many days under canvas only. Upon her arrival in this country she was bought by the Portuguese Government to be used as a transport; and after that she passed into the hands of the Spanish Government, who fitted her out as a man-of-war, under the name of the *Isabella Segunda*, and in this capacity she is said to have been the first steam warship in the world.

Little more was done in the way of Transatlantic steam navigation until the year 1837, when the *Sirius*, which was



THE ENGINE OF THE "COMET."

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built at Leith for the Irish trade, was purchased and altered specially for this purpose. She was a fairly large steamer, being of 703 tons. She was 178 feet in length, with a beam of 25 feet 8 inches, and a depth of 18 feet 3 inches, thus being in her proportions not very unlike the present type of ocean steamer—that is to say, having a length of about 7 beams. She was fitted with two side-lever engines of 270 horse-power, constructed by T. Wingate of Glasgow, the diameter of the cylinders being 60 inches, with a stroke of 6 feet. Her paddle-wheels were 24 feet in diameter, with 22 floats to each.

Early in 1838, an advertisement appeared in the public papers, announcing that the "Steamship *Sirius*, Lieutenant Roberts, R.N., Commander, would leave London for New York on Wednesday, the 28th of March, calling at Cork Harbour, and would start from thence on the 2nd of April, returning from New York on the 1st of May."

The *Sirius* was, however, delayed until the morning of the 4th of April, when, at ten o'clock, she started with 94 passengers for New York, which she reached, after a run of 18 days, on the 23rd of the same month. Three days after the *Sirius* left Cork, another steamer, the *Great Western*, built at Bristol, left that port also for New York, where she arrived only an hour or two after the *Sirius*, making the passage in 14½ days. The *Great Western* was a much larger vessel than the *Sirius*, having a tonnage of 1340 tons. She was a wooden vessel 212 feet long between perpendiculars, 35 feet 4 inches beam, with 23 feet depth of hold. She was exceedingly strongly built, her frame timbers being as heavy as those of a first-class line-of-battle ship, and they were placed so close together that they were caulked both inside and out before the planking was put on. Her engines were of 440 horse-power, constructed by Maudsley, Son, and Field, having cylinders 73½ inches in diameter and 7 feet stroke, her paddle-wheels, which were 28 feet in diameter, making from 12 to 15 revolutions per minute. Her average speed during her first passage from Bristol to New York was 208 miles per day, or at the rate of 8·6 knots per hour, and she consumed on the passage 655 tons of coal.

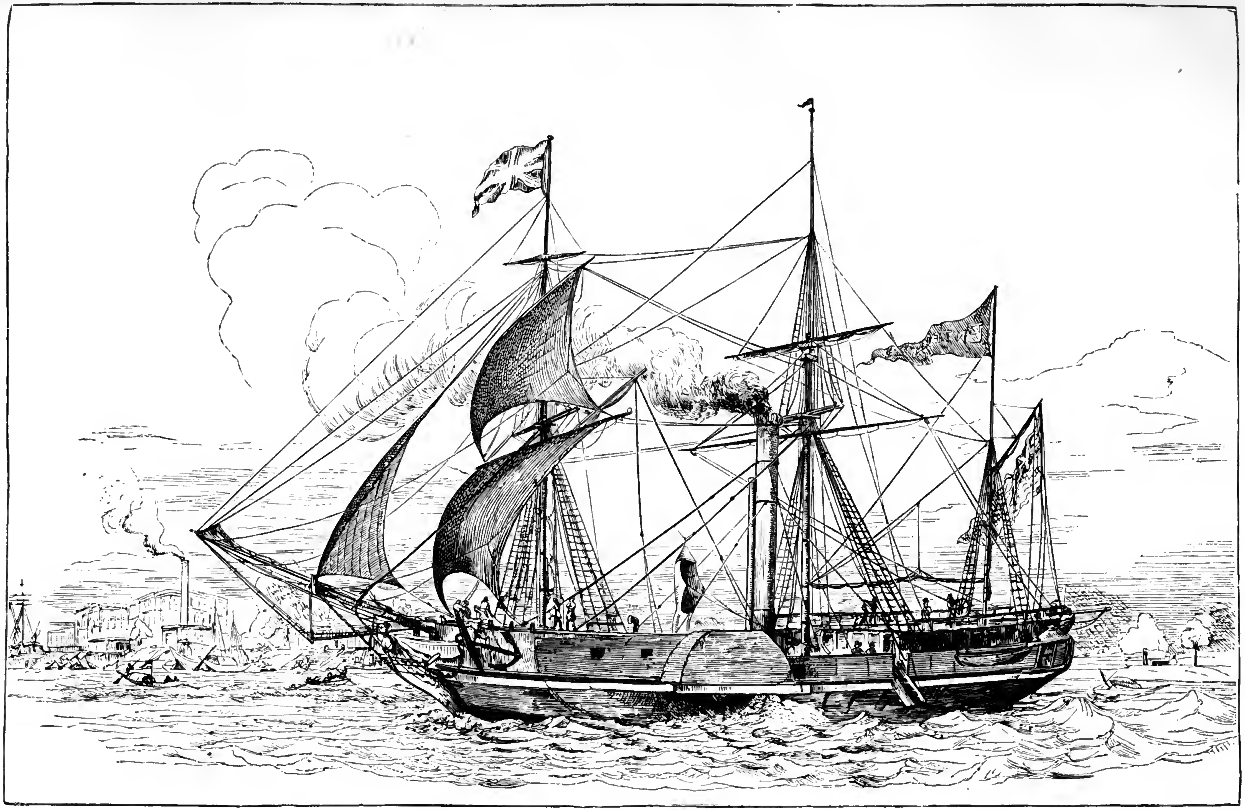
The *Great Western* ran regularly across the Atlantic from 1838 to 1843, making in all 64 passages. Her fastest passage out, from Bristol to New York, was made in 12 days 18 hours; and her fastest passage home in 12 days 8 hours. In 1847, she was sold to the West India Mail, and remained in their service for many years, being finally broken up at Vauxhall in 1857.

The same company that owned the *Sirius*—the British and American Steam Navigation Company—at once commenced building two vessels larger than the *Sirius*, the *British Queen* and the *President*. They were each of 1863 tons, with a length of 275 feet, 37 feet 6 inches beam, and with engines of 500 horse-power. The cylinders were $77\frac{1}{2}$ inches in diameter, with a stroke of 7 feet; the diameter of the paddle-wheels being 30 feet. The *Sirius* being considered too small for the Atlantic trade, was withdrawn from that service, and was used in the home coasting trade. She was wrecked in 1847.

The *British Queen* left Portsmouth for New York on the 12th of July, 1839; and made her first passage across in 14 days 8 hours. She crossed the Atlantic six times in 1839, and the following year made five voyages out and home; but financially she was a failure, and ultimately was withdrawn from the service, and in 1841 was sold to the Belgian Government. Her sister ship, the *President*, made only three passages. She left New York for Liverpool with a large number of passengers and a valuable cargo on the 10th of March, 1841, and was never heard of again.

The use of steam for marine purposes had scarcely been adopted when two further revolutions were to take place which were to entirely alter the existing state of things—the substitution of the screw-propeller for the paddle-wheels as the means of propulsion, and the substitution of iron for wood in the actual construction of the vessel itself.

As to who was the real inventor of the screw-propeller, it is a disputed point. There are many claimants for the honour. The French claim it for their engineer, M. Frederick Sauvage, and a statue of him is erected in the Place Frederick Sauvage at Boulogne-sur-mer, upon the pedestal of which



THE "ENTERPRISE," 1825. (*From a print of the time.*)

[*To face page* 110.

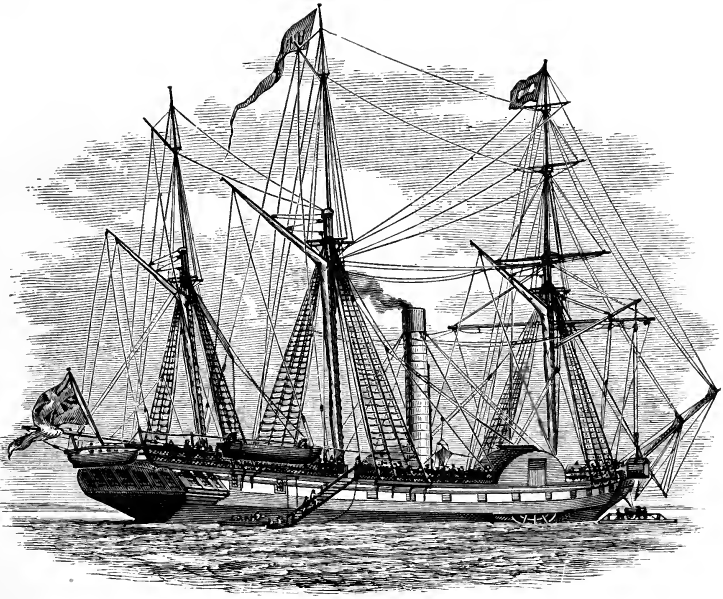
statue is an inscription to the effect that he was the real inventor of the screw-propeller; but, like most other important inventions, it was undoubtedly the combined result of the labours of many inventors. In 1752, the screw was suggested as a propeller by one Daniel Bernoulli, but nothing came of his suggestion. Since that time there have been several persons by whom similar proposals have been made, and many patents have been taken out for propellers of this nature; but a small vessel fitted with a screw-propeller, patented by Ericsson, was the first actually brought into practical use. A small experimental vessel called the *F. B. Ogden* was built in 1837, and was fitted by Ericsson with one of his propellers, and the Lords Commissioners of the Admiralty, attended by their secretary, Sir William Symonds, took a trip in her that year. They, however, failed to see the advantage of such an invention to men-of-war, and refused to entertain any proposal for its introduction into the Navy.

Mr. F. Pettit Smith also built a small experimental vessel during the same year (1837), she being exhibited on the Hythe Military Canal, and proving a complete success. Several patents for screw-propellers were taken out by a Mr. Woodcroft, his propeller being the first one to be ultimately adopted in the Royal Navy. Ericsson, receiving no encouragement from the British Government, took steps to bring his invention before the Government of the United States, and a small vessel called the *Robert F. Stockton* was built by him in 1838, in this country with this view, and she made the voyage safely across the Atlantic to America.

Mr. Pettit Smith in the mean time induced a number of influential men to form a company to carry out his invention, and in 1839, the *Archimedes* was built by them to test and demonstrate the value of his system of propulsion. She was of 237 tons, and had a draught of water of 9 feet 4 inches. The diameter of the cylinder of her engine was 37 inches, and the length of the stroke 3 feet. Her screw-propeller consisted of two half-threads of an 8-feet pitch, 5 feet 9 inches in diameter; each was 4 feet in length, and they were placed diametrically opposite to each other. The engines made 26 strokes per minute, and the revolutions of the screw were 138 per minute. The highest speed ever attained was 9·25 knots. A number of trials were made between the *Archimedes* and the *Widgeon*, a paddle-wheel steamer, then the fastest of the mailboats running between Dover and Calais; but most of these trials were made under *both* steam and canvas, a condition not much to the point. Under steam alone, the *Widgeon* seems to have had the advantage.

As the *Widgeon* differed, however, in many important respects from the *Archimedes*, the results of these trials were not considered as altogether decisive, and the Government of the day ordered, in 1843, a screw-steamer, the *Rattler*, to be constructed of exactly the same size, and on exactly the same lines, as the paddle-wheel steamer *Alecto*. These two vessels were consequently of the same tonnage, and of the same size, each of them being 195 feet in length and 33 feet beam. The results of the trials between the *Rattler* and the *Alecto* showed that if the *Rattler* were not actually superior to the *Alecto*, she was not by any means her inferior. Wooden paddle-wheel steamers still continued, however, to be used in the Royal Navy for many years, the Government very reluctantly giving up wood in the construction of their ships, and substituting iron. But when they at last found that paddles for warships must be given up on account of their liability to destruction in time of war; and when they found that it was perfectly impossible to construct a wooden ship with its stern-frame so strong as to be capable of withstanding the vibration from the screw, then paddles and wooden ships had to disappear together.

At the present day, with the exception of the Royal yachts, there are not half a dozen paddle-wheel steamers altogether in the list of ships of the Royal Navy, and these are only such steamers as the surveying vessels *Research* and *Triton*, or the *Cockatrice* and the *Sphinx*. In the Merchant Service the screw propeller was not at first by any means popular, and for some time it made but little or no progress. A company trading to Rotterdam, Messrs. Laming and Co., were amongst the first to abandon paddle-wheels and to adopt it, and the mercantile marine owes very much to their enterprise in this respect. Their vessels were always very successful, and



THE "UNITED KINGDOM," 1826.

[To face page 112.

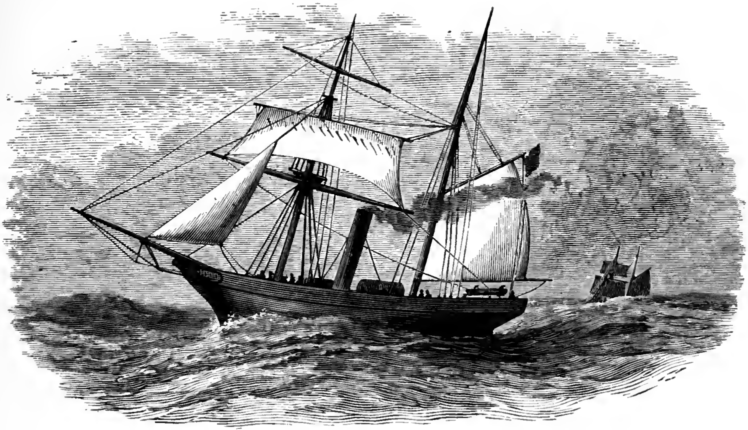
they attracted much attention from the time of their first adopting the new means of propulsion.

The Great Western Steam Navigation Company were the first to send a screw steamer across the Atlantic. In 1843, they built the *Great Britain*, at that time not only by far the largest steamer engaged in the Transatlantic service, but the largest steamer afloat. She was an iron ship of 2984 tons, and was built by Mr. Patterson at Bristol. Her dimensions were—extreme length 322 feet, beam 51 feet, depth 32 feet 6 inches, and draught of water 16 feet; and she was fitted with engines of 1000 horse-power. She had six masts; of these five carried only fore and aft canvas, the second mast from the bow being square-rigged. She left Liverpool for New York on her first voyage on the 26th of August, 1845, and she reached New York on the 10th of September, thus making the passage out in 15 days. On her third voyage she left Liverpool, outward bound, on the 22nd of September, 1846; but, the weather being exceedingly thick, she ran ashore in Dundrum Bay, near Belfast. Here she remained all through the winter, having a temporary breakwater of hurdles and faggots constructed round her as a partial protection against the winter storms. The next summer she was got off, and proved to be but little injured; it was, however, the final break-up of the Great Western Steam Navigation Company, the *Great Britain* then passing into the hands of a Liverpool firm, who refitted her, taking out her six masts, and replacing them with three masts, and for many years she was employed in the Australian trade. She was after this turned into a sailing ship, and was in existence until 1890, when she was ultimately broken up at Barrow.

In 1850 Messrs. Tod and Macgregor built a large iron screw steamer called the *City of Glasgow*, of 1609 tons, to trade between Glasgow and New York; but she was soon after transferred to Liverpool, and was the first steamer of the Inman Line, and an exceedingly fast ship.

Since 1850, when Tod and Macgregor built the *City of Glasgow*, the introduction of compound engines, and more recently that of triple and quadruple expansion engines, together with other important improvements in the steam propelling machinery, and the very materially decreased consumption of coal, have made it practicable to attain high speeds at costs which afford striking comparisons with the experience of that comparatively remote period. As before stated, in steamers at that time it was by no means infrequent that the coal consumed amounted to over 9 lbs. per horse-power per hour. Now the high speeds of ocean steamers can be attained on a consumption in some cases of less than 1½ lbs. of coal per horse-power per hour. The highest steam pressure in the boilers of the early steamers was 10 lbs. per square inch, and down to the year 1870 did not exceed 30 lbs. Then it was increased to 60 lbs., and at the present time steam is used at 180 lbs., and in some cases at even 215 lbs. to the square inch.

We have thus very briefly traced the gradual progress of steam navigation from the days of its earliest infancy at the beginning of the century down to the advent of the existing great steam companies, and at no period of the world's history has a single hundred years marked so stupendous a change in matters affecting the well-being of mankind as has been effected by the application of steam-power to the purposes of locomotion both by land and by sea.



ONE OF THE EARLIEST SCREW STEAMERS, THE "ROBERT F. STOCKTON."

THE "GREAT BRITAIN," 1845.

[To face page 114.

CHAPTER X.

Iron introduced for ship-building—Opposition at first encountered—Iron ships—The advantages of iron over wood—Greater immunity from fire—Case of the *Colombo*—The earliest iron vessels—The *Vulcan*—The *Rainbow*—The *Eclipse*—Steel taking the place of iron—Iron and steel passenger vessels—Ocean-going steamers—Cargo steamers—Speed of steamers—Mode of construction of iron and steel vessels—Double bottoms—Water ballast—Capsizing of the *Orotava*—The sides and decks—Water-tight bulkheads—Iron masts and yards—Iron rigging.

After the introduction of steam as a motive-power for ships, came, as a necessary sequence, the introduction of iron, and more recently that of steel, for the construction of the ships themselves; but even apart altogether from the question of steam, as the necessity for increase in the length and the speed of vessels arose, experience showed that the requisite strength of structure could not be efficiently maintained in wooden ships. The practical difficulties in the way of making the connections of the frames and the planking strong enough were insurmountable when the length reached about 300 feet. Vessels of this length, when built of wood, soon showed serious signs of weakness, notwithstanding the ingenious introduction of diagonal trussing, thick ceiling planks, and other devices. The average height of trees must necessarily be always an important factor in the size of a wooden ship, and so limit that size; but with an iron ship the simple connection of the iron plates and bars to each other by means of suitable straps of the same material, and by the use of rivets, would obviously so lend itself to the construction of the iron vessel that there need be absolutely no limit as regards her length or her size.* The limited and the ever-

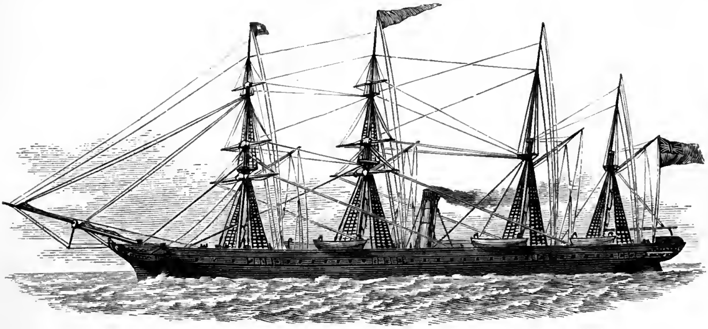
* The length of iron steamers appears to be always steadily increasing. At first the length increased very gradually from about 360 feet, the maximum

decreasing supply of timber in this country, and at the same time the rapid development of the manufacture of iron, were potent influences in effecting the change from wood to iron as the material for ships. The great alteration, however, involved by the substitution of iron for wood in ship-building did not take place without very considerable opposition, and no one more strenuously opposed it than did the Government of the day. It was a long time before the authorities of the Post Office would give their consent to iron ships being used instead of wooden ones for the conveyance of the ocean mail; and a still longer time elapsed before the Admiralty consented to the change of material for the ships of the Royal Navy, it being alleged as one very serious objection to the use of iron in the construction of men-of-war, that whilst in action a shot-hole in the side of a wooden vessel could be at once repaired, the hole caused by a shot in the iron plate could not. But even if this were so, there was a counterbalancing advantage on the side of the iron, inasmuch as there would be an entire absence of splinters, which very frequently, in the case of the old wooden ships, led to serious results among the men serving the guns.

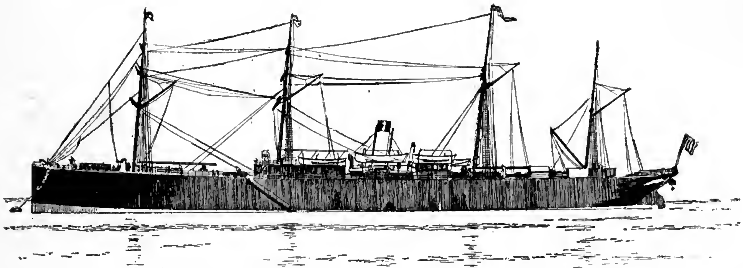
At first the proposal to use iron in ship-building was simply treated with derision and contempt. The thing was palpably absurd. It was unnatural. Wood would float. Every one knew that iron would sink. A wooden box, even if there were a hole in it, would still float. An iron tank with a hole in it must of necessity go to the bottom. The idea did not seem to strike people that if bricks, for instance, were placed in the wooden box—that is to say, cargo put in the ship—and a similar quantity of bricks placed also in the iron tank, and then a hole knocked in each, one would go to the bottom as readily, as quickly, and as certainly as the other. And it is just here that the iron tank has the advantage. It is not so liable to have the hole knocked

in the year 1861, to 400 feet in 1870; but since that time the progress has been much more rapid. The longest steamer in the world at the present time is the twin-screw steamer of the North German Lloyd's, the *Kaiser Wilhelm der Grosse*, which has a length of no less than 627 feet—not very far from being a furlong.

IRON STEAMERS.



EARLY IRON STEAMSHIP, THE "CITY OF MANCHESTER."



IRON STEAMER OF THE PRESENT DAY, THE "ASSYRIAN MONARCH."

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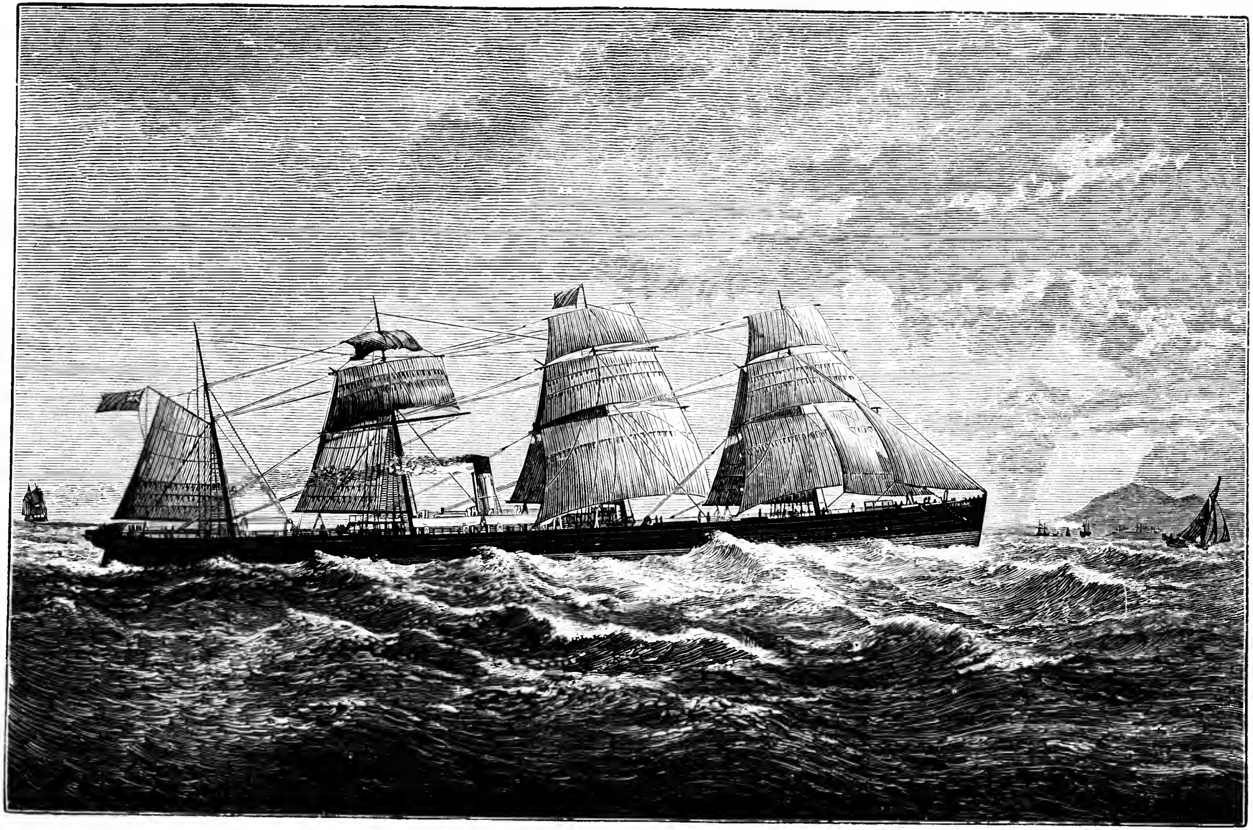
in it as the wooden box is. If the wooden ship strikes violently upon a sharp point it is fractured; and not only is the actual part struck injured, but the straining and the consequent leakage extend to the adjacent parts. With the stronger material, iron, the probability is that the concussion will result in an indentation only, and not in an actual fracture; but even if there be an actual fracture, the injury will usually be confined to one locality, and the other parts, as a rule, will not be affected.

Here, then, in the greater strength of the material, lies one of its great advantages. No wooden ship could possibly be built sufficiently strong to resist the vibration of the powerful engines that are used in the larger ships of the present day; and then, besides its strength, another advantage on the side of iron is its greater lightness. The iron vessel is far lighter than the wooden vessel of equal size, a strong iron ship not weighing one half of the same-sized wooden ship. The average weight of iron steam-vessels is from six to eight hundredweight per register ton; a wooden ship will weigh twenty hundredweight, and often more. The lighter ship is more easily propelled than the heavier ship; less engine-power is required; therefore, besides being stronger and lighter, she is more economical.

One advantage, however, undoubtedly the wooden ships possessed over iron ones, and that was that their bottoms, when sheathed with metal, never became foul as quickly as the iron ships' bottoms do from marine growths. Many proposals have been made from time to time with the object of preventing fouling, for it is obvious that serious loss of speed results from much fouling of the bottom; but it cannot yet be said that any of the paint compositions, or other plans to keep the bottoms of iron vessels clean, have been entirely successful, and this renders it necessary to place every iron or steel vessel in dry dock for cleaning and painting at intervals of from six to twelve months.

Soon after the building of ships with iron was commenced, the system of construction known as the composite system was adopted, and some fine and notable China tea-clippers were so built. The iron framing and wood skin planking admitted of considerable strength being attained; and the possibility of sheathing the bottom with metal to avoid fouling appeared to arrive at and attain the end that the promoters of composite ship-building had in view. This was to produce a vessel that should have all the strength of an iron ship, whilst at the same time obtaining the freedom from fouling of a wooden one. Experience soon showed, however, that the galvanic action set up between the copper or the yellow metal sheathing and the iron frames of the ship tended rapidly to deteriorate the ironwork, and sooner or later to involve the destruction of the ship. So rapid, indeed, was in some instances the wasting of the frames that composite ship-building has for some time past been entirely given up for merchant ships, although a few yachts still continue to be so built; and some ships of the Royal Navy, particularly such as are intended for use at foreign stations, where there are no suitable dry docks conveniently available, are still built with steel frames, being then sheathed with wood and afterwards covered with copper.

The sides of an iron vessel, while much stronger than the sides of the corresponding wooden ship, are very much thinner, thus giving many more cubic feet of internal space available for cargo. The sides of the iron ship, including the iron frames, often do not exceed four inches in thickness, whilst the sides of the wooden ship will be some twelve inches at the least. The iron ship is also, as a matter of course, far less liable to destruction by fire than the wooden ship, which is an additional argument in favour of iron. Ships laden with wool, cotton, and similar articles are extremely liable to take fire from the heating of the cargo. Not long since a large iron ship, the *Colombo*, laden with cotton, jute, and hemp, took fire in this way soon after leaving Calcutta, on her passage home to London, and the cargo continued to smoulder and burn all the time she was crossing the Indian Ocean, rounding the Cape, coming up the South and North Atlantic, passing up the Channel, until she actually arrived in the river. Once or twice the hatches were opened and some of the burning cargo got up and thrown overboard; but they were afraid to keep the hatches open long lest the



AN IRON STEAMER OF 1869, THE "BAVARIAN."

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air, getting down, should cause the flames to burst out, so that they were speedily battened down again. At times the ship's sides were so hot that it was impossible to touch them. With a wooden ship the ultimate result would have been very different, and instead of getting home, as the *Colombo* did, she would have been burnt at sea. In face, then, of the indisputable facts adduced in favour of iron, there could be but one result; and now iron or steel are the recognized materials for the construction of ships of every description.

The germ of iron ship-building was practically developed before the close of the last century, the first iron vessel having been built in 1787 by Mr. John Wilkinson, of Castlehead and Broseley, who was the owner of various extensive ironworks, and was known in his time as "the great ironmaster." In a letter written by him on July 14, 1787, to a Mr. James Stockdale, of Carke, he says, "Yesterday week my iron boat was launched; it answers all my expectations, and has convinced the unbelievers, who were 999 in 1000." In another part of his letter Wilkinson observes "that he expects his coinage will be out shortly (it was issued in 1790), and that the iron ship was pictured on the field of the reverse." This iron vessel was built at Willey, in Shropshire, and traded for some years on the Severn. About the same time Wilkinson constructed another smaller iron vessel, which he used for conveying peat down a canal that he had cut in the peat-moss near Meathop.

The next iron vessel of which there is any authentic record was built by Sir John Robinson, of Edinburgh, in 1818. This vessel was called the *Vulcan*, and was built at Faskine, on the banks of the Monkland Canal, a few miles from Glasgow. She was laid down on the 27th of October, 1818, and was launched on the 14th of May, 1819, being afterwards used for passenger traffic on the Forth and Clyde Canal.

The next iron vessel was the *Aaron Manby*, constructed in London in 1821 by a Mr. Manby and Mr., afterwards Sir Charles, Napier. It was sent to France, being followed shortly after by two other vessels, the *Anglia* and the *Fairy Queen*.

After this several small iron steamers were built at Liverpool, and they were found to be so successful that Mr., afterwards Sir William, Fairburn commenced building iron vessels on the Thames; whilst Messrs. Laird, of Birkenhead, did the same on the Mersey. In 1837 Messrs. Laird built the *Rainbow* for the General Steam Navigation Company; and she is said at that time to have been the largest iron steamer afloat, having a length of 185 feet, 25 feet beam, and being of 180 horse-power.

By this time iron ship-building was being largely carried on on the Clyde, at Bristol, and elsewhere. In 1839 and 1840, Messrs. Napier built three iron passenger steamers, fitted with high-pressure engines, specially for the traffic to Margate, Ramsgate, Deal, and Dover, called the *Eclipse*, the *Isle of Thanet*, and the *Fawn*. They made a considerable stir at the time with the general public, as being considered highly dangerous boats; the *Eclipse*, which, like the *Isle of Thanet*, was a double-funnelled boat, being called "Spring-heeled-Jack," the "Death and Glory boat," and so forth. This was the steamer immortalised in the "Ingoldsby Legends," published in 1840—

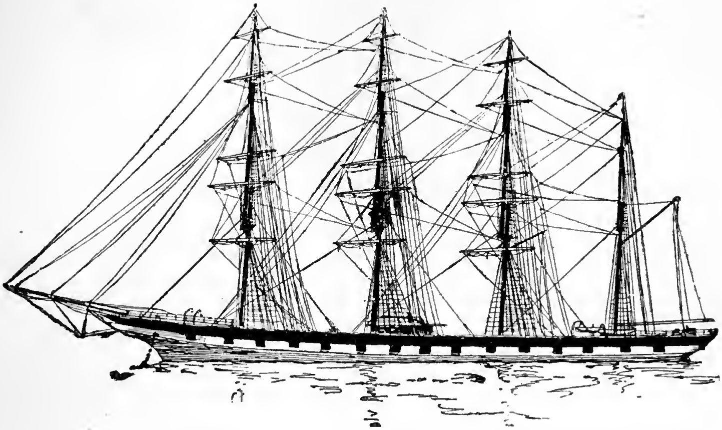
> "—If in one of the trips
> Of the steamboat *Eclipse*
> You should go down to Margate to look at the ships."

As then iron was quickly taking the place of wood at the middle of this century, so now at the close of the century steel is steadily superseding iron in the construction of ships; and this is clearly shown by the subjoined table:—

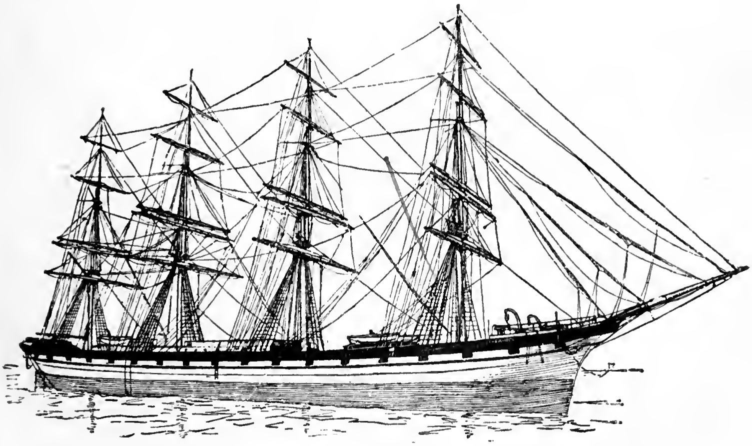
DESCRIPTION OF VESSELS BUILDING IN THE UNITED KINGDOM IN 1875, 1882, AND 1895 RESPECTIVELY.

Date.	Steel.				Iron.				Wood.			
	Steamships.		Sailing-ships.		Steamships.		Sailing-ships.		Steam-ships.		Sailing-ships.	
	No.	Tons, gross.	No.	Tons, gross.	No.	Tons, gross.	No.	Tons, gross.	No.	Tons, gross.	No.	Tons, gross.
Sept. 30, 1875	—	—	—	—	126	157,466	114	106,521	6	1065	203	51,122
June 30, 1882	89	159,751	11	16,800	555	929,921	70	120,250	6	460	49	4,635
Sept. 30, 1895	282	684,509	23	25,307	27	4,118	1	226	5	372	18	2,043*

* That is to say, for these eighteen wooden sailing vessels, an average of 113 tons each. These will, therefore, probably be small coasters, building in little out-of-the-way country ports.



CLYDE-BUILT IRON FOUR-MASTER, "LOCH TORRIDON," LAUNCHED IN 1880.



THE "LIVERPOOL," IRON FOUR-MASTED SHIP, BUILT AT PORT GLASGOW IN 1889.

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The demand for vessels of larger size than had hitherto been built, and for greater speed, led to the rapid development of the manufacture of mild steel, accompanied by a great reduction in the cost of that material. It is recorded that in 1859 as much as £40 a ton was paid for steel used in the construction of a vessel built on the Thames. At the present time mild steel of superior qualities for ship work can readily be obtained for £5 a ton.

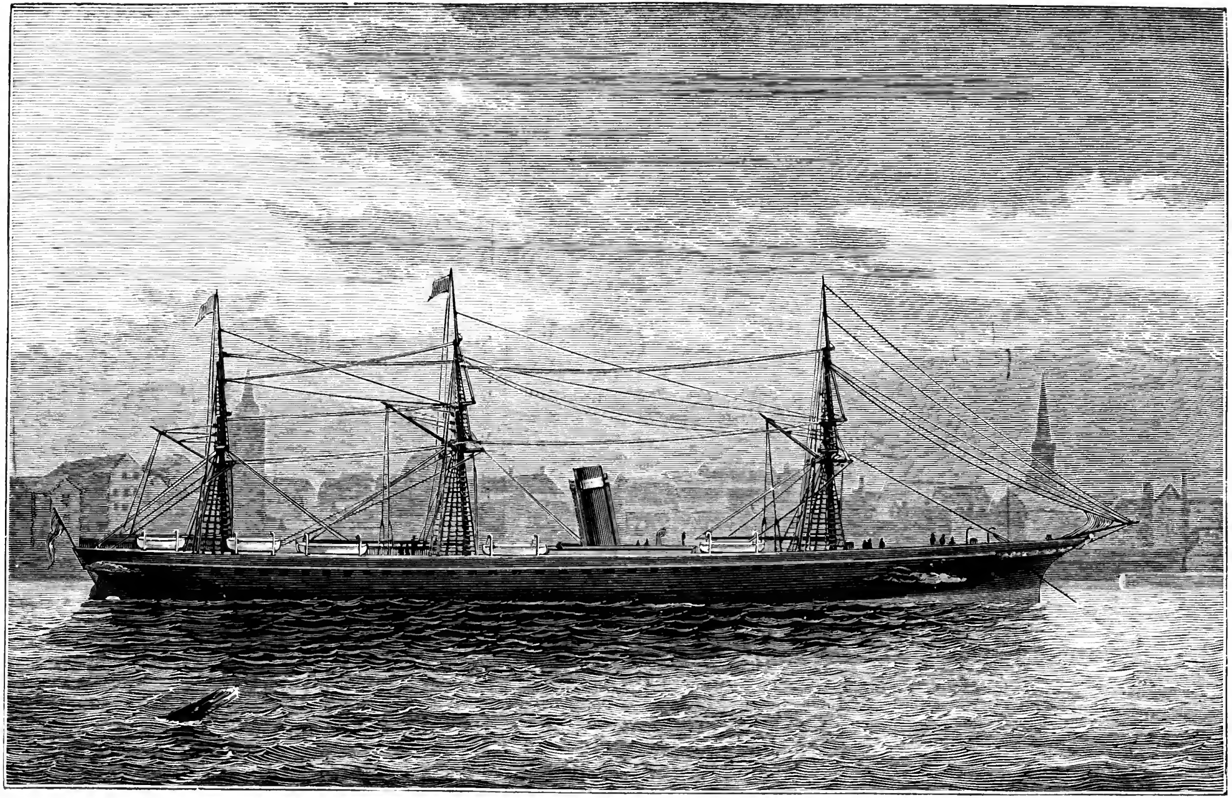
Mild steel has about fifty per cent. greater tensile strength than iron, considerably more ductile qualities, and, with proper treatment, much superior working qualities. These are important advantages in favour of steel for ship-building; and, further, the increase in the tensile strength over that of iron admits of a considerable reduction in the thickness of the material without diminishing the strength of the ship, the saving on the weight of the hull obviously admitting of increased carrying capacity on the same displacement.

The iron and the steel steamships of the Mercantile Marine may be considered generally as of three classes. The first class comprises those steamers which are built to carry a number of passengers and no cargo; the second class includes those built to accommodate a large number of passengers, and yet with considerable capacity for cargo as well—as, for instance, the ordinary ocean liner; and the third class takes in those ships that are entirely devoted to cargo, as the screw collier, and the majority of ocean tramps.

The boats of the first class, for the most part paddle-wheel steamers, are built chiefly for use on rivers, or for very short sea voyages, as, for example, the boats used on the Channel passage between Dover and Calais, or Dover and Ostend, Folkestone and Boulogne, and the like. These must attain a high rate of speed; their draught will be light; and their midship section, if not quite flat, will be very nearly so. The bow will be very sharp, with fine lines forward; whilst the aft lines will also be fine, in order to allow the wave formed by the paddle-wheels to pass aft with the least resistance, and so to fill up the void left by the vessel herself as she moves ahead. Nearly all the more recent Channel steamers attain a speed of from sixteen to twenty knots;

and some, notably those of the Chatham and Dover Company, have the stem and stern nearly alike, the aft lines being as fine as the forward.

The second class of steamships, invariably screw steamers —our ocean liners to wit—are constructed to carry a large number of passengers as well as a large cargo, and in addition to their cargo must also carry a large quantity of coal. Here also a high rate of speed is an absolute necessity, the keen competition between rival companies tending every day to accelerate it. The form of the ocean steamer will differ widely from that of the previous class, as a result of the different requirements; her beam will be greater, and her draught much greater. The length of an ocean steamship is usually, between perpendiculars, from seven to nine times her beam; but there are steamships afloat with a length of as much as ten and a half times their beam, and when properly constructed, with the greatest strength where most required —that is to say, with the greatest strength amidships—they have shown no signs of weakness. The bow lines, although still fine, are made fuller to afford greater buoyancy on the waves, and the after lines have a corresponding fulness. Were these ships to be as fine as those of the previous class, instead of rising to the waves in a sea-way, they would simply tend to bury themselves. Yet at the present day speed in an ocean liner is nearly the first element to be considered, the public always running after the ship that can steam the fastest, so that in an ocean passenger ship the happy mean has to be sought, and her lines must not be so full as to sacrifice her speed, nor so fine as to endanger her safety. Many vessels of this class exceed in speed 20 knots an hour; some of the more recent ships of the great companies—as, for instance, the *Campania* and the *Lucania* of the Cunard Line—attaining even 21 and 22 knots, and yet being perfectly good sea boats. But this insane desire for high speed on the part of the travelling public seems to be for ever on the increase, people not appearing to realize the fact that an excessively high rate of speed involves very materially increased danger, to say nothing of very materially increased expense. Some have



AN OCEAN LINER OF 1873, THE INMAN LINE STEAMER "CITY OF CHESTER."

[*To face page* 122.

maintained that the greater the speed the greater the safety, because, in the case of a collision, the ship that is going the fastest is the one most likely to come off best, just in the same way that a ship that rams is more likely to remain uninjured than the ship that is rammed. This, however, is a selfish kind of policy, not unapt to recoil on those who adopt it.

The third class of steamships includes those constructed to give the greatest carrying-power in cargo, and in these vessels a high rate of speed is not such an important consideration as it was in the two former classes. As capacity for cargo is the chief point aimed at, the size of the hold becomes the chief factor, and the depth of the hold will generally vary from one-tenth to one-twelfth of the length of the ship between perpendiculars. Most steamers devoted exclusively to cargo, as the generality of ocean tramps, are not engined for any great speed, and rarely make much more than eight knots at their best.

Cargo-boats, and all ocean steamships, for the matter of that, ought to be built exceedingly strongly, the strains of tension, compression, and torsion to which a ship with a heavy cargo is subjected being very considerable. They require also to be built not only very strongly, but of a uniform degree of strength, having no parts excessively strong as compared with other parts, for if one part of a vessel is made very much stronger than the rest, unequal strains will be set up, and a fracture, if it does occur, will take place near to the stronger part.

All vessels must have a certain amount of elasticity, and a uniform amount; for if not uniformly elastic there will be a great strain between the part having the greatest amount of elasticity and those parts which are the more rigid. The elasticity of some of the fast ocean liners is such that, when pushed to their utmost speed, the vibration is so great that it is impossible either to read or write in the forepart of the ship or towards the stern.

Considering an iron or steel ship as a girder, which she practically is, the conditions to which she is subjected will differ materially from those of a girder ashore, as, for instance, the girder of an ordinary railway bridge, where the directions of the strains are always similar. In the ship they are in every direction, and the conditions of one minute are often entirely reversed the next. The girder of the railway bridge, once supported at both ends, is always so supported. The ship may be at one moment supported at both ends, if the crest of a wave be under the bow, and the crest of the next wave under the stern—she then resembles the girder of the railway bridge; but the next minute she may be simply supported in the centre, and not at either end. Thus parts that are in compression at one moment will be in tension the next, to say nothing of the twisting strains to which she is constantly subjected by the waves.

As an additional element of strength, therefore, in iron ships, and also as affording an additional security against the risk of damage to the bottom of the vessel, many ships are now built on the double-bottom principle; and as many cargo boats go out with cargo and come back in ballast, or *vice versâ*, as a matter of economy, and as causing a great saving of time in the matter of taking in ballast, they are built to carry water ballast, and the double bottom is utilized for that purpose. This double bottom forms a spacious water-tank, or series of tanks, into which water is run to be used as ballast, and on the ship arriving at the port where she is to take in her cargo, these tanks are pumped out by means of a small pumping-engine fitted on board for that purpose. This is the quickest and cheapest method of ballasting ships, and it is perfectly safe when properly used, the tank or tanks being at the bottom of the vessel; but the tanks must be entirely filled with water, for unless this is done water-ballast is, of all cargoes, the most dangerous. By the adoption of this method of ballasting, a ship can discharge her cargo and take in her ballast, or get rid of her ballast and take in her cargo at one and the same time; and there are screw-colliers that by this means have made fifty-two voyages between the port of London and Hartlepool or Sunderland within the year.

By thus utilizing the double bottom of the ship, the water ballast is in the most effective place; but as showing a certain amount of danger attaching to this system of ballasting ships when improperly or when carelessly used may be cited the capsizing and sinking of the Orient liner *Orotava* in the Tilbury Docks on the 14th of December, 1896, upon which occasion five men were drowned. Some of the water-ballast tanks were entirely empty, and men were at work cleaning them out, whilst others of the tanks were only partially filled. The ship was at the time being coaled, when she suddenly gave a list to starboard, and ultimately sank, the great weight of water in the tanks on one side of the ship not being counterbalanced by an equivalent weight on the other side.

The permanent weights in a ship should always be kept down as low as possible, because the ship is naturally better ballasted when the weight is low down; yet still, when a ship is loaded with a heavy cargo, as, for instance, machinery, heavy guns, or railway iron, a portion of such cargo ought to be kept fairly high up, or stowed between-decks, otherwise there is a risk of making the ship too stiff, and of her not preserving a proper equilibrium, and unless this be attended to the ship will roll violently in a sea-way, and run the risk of springing a leak or carrying away her masts.

A few particulars of the actual construction of iron ships and of ships built of that material which is now fast taking the place of iron may not be altogether uninteresting.

In 1882, Dr. Siemens, addressing the British Association at Southampton on the subject of iron and steel ships, said—

"A new material was introduced for the building of ships by the Admiralty in 1876–78, when they constructed at Pembroke Dockyard the two steam-corvettes, the *Iris* and the *Mercury*, of mild steel. The peculiar qualities of this material are such as to have enabled ship-builders to save twenty per cent. [one-fifth] of the weight of the ship's hull, and to increase to that extent its carrying capacity. It combines with a strength thirty per cent. superior to that of iron such extreme toughness, that in the case of collision the side of the vessel has been found to yield or bulge several feet without showing any signs of rupture, a quality affecting the question of sea risk very favourably. When to the use of this material there are added the advantages derived from the double bottom, and from the division of the ship's hold by means of bulkheads of solid construction, it is difficult to conceive how such a vessel could perish by collision, either with another vessel or with a sunken rock." *

Besides the advantages that iron and steel ships possess over wooden vessels in the matter of strength, they possess the additional advantage of greater longevity. The Liverpool underwriters, when they had had an experience of iron ships for over thirty years said, "Experience has shown that iron ships are much more durable than was at first supposed; a well-constructed iron ship can be reckoned upon to last in first-class condition for a period of at least twenty years." The greatest number of years originally allowed by "Lloyd's Register" for the classification of any vessel built of wood to remain in the first class was from four to sixteen years, but seldom more than twelve; the classification might be renewed, but the original term never exceeded sixteen years, and was generally considerably less.

Comparing ships of the same size, whilst the iron or steel ship will carry more cargo than the wooden ship, so, other things being equal, the iron or steel ship will be faster than the wooden ship. To be exceedingly fast, however, any ship, whether of wood or iron, can have less carrying-power than would be the case if less speed were demanded of her. To be very swift, the amount of immersed body must be as small as possible, and she must have a deep keel to prevent her making leeway. She will then possess speed, but for carrying purposes will be practically useless. A ship that has to carry much cargo must inevitably have a very full midship section, with virtually a flat bottom amidships. Her midship section will somewhat, therefore, resemble the letter U, although the hull may assume a more V-like section forward and aft. The midship section is the area that ultimately has to be forced through the water, and it is manifest, therefore, that the ship that has a very full midship section has a much larger area of resistance than the ship with the V-like section, and will

* The *Iris* and the *Mercury* were, however, by no means the first ships for which steel was adopted as the material. Actually the first steel ship was built in 1862, by Messrs. Jones, Quiggen, and Co., of Liverpool. She was a merchant ship of 1200 tons, and the steel plates for her were manufactured at the Mersey Steel and Iron Works.

require more power to attain the same speed. But even with ships of a full midship section, an infinite variety of shape, and consequently of speed, can be attained according to the degree of fineness or otherwise that may be given to the lines forward and aft.

In the midship section of the majority of ocean liners the bottom is very nearly flat, the sides rising vertically or very slightly falling inwards towards the top; and to lessen the evils of rolling, such vessels are not unfrequently fitted with bilge-keels. The keels of iron vessels were very frequently at first made hollow, thus forming a kind of gutter or trough the entire length of the ship, which took the bilge water, but it was a form open to many objections, and it was discarded in favour of the solid-bar keel. This, however, was not found to be entirely satisfactory, as ships with this description of keel strained very much on being docked or when resting upon the keel, so that that type of keel was also discarded; and now a much stronger form of keel is obtained by uniting the keel and the keelson, which is done in a variety of ways.

The frames, practically the ribs of the ship, are of L-iron, the sizes, of course, varying with the size of the ship. A vessel with a length of 200 feet would have frames about $4'' \times 4'' \times \frac{1}{2}''$. They are placed from 20 to 24 inches apart, centre to centre, and are fitted close on to the upper edge of the keel, and in all vessels extend upwards to the gunwale.

The deck-beams are of the size prescribed by Lloyds, and are spaced according to Lloyd's rules. In the vessel above, a ship 200 feet long, they would be of L-iron about $5'' \times 4'' \times \frac{1}{2}''$. They are connected with and riveted to the frames, with bracket-ends or knee-plates, and act not merely as girders supporting the various decks, but as struts or ties between the sides; and as there is great flexibility in the sides of iron and steel ships, great care has to be taken that they shall be so arranged that the fastenings are not injured in the working of the ship. If there are several decks, the deck-beams are placed vertically over each other—not a deck-beam of the deck above over a space of the deck below, but beam over beam.

Many ships are constructed, as before stated, with a double bottom, having an inner skin as well as an outer, the space between the inner skin and the outer skin forming the tanks capable of being filled with water as ballast. In ships of 1000 tons, or thereabouts, the depth of the tanks so formed will be from 3 feet to 3 feet 6 inches, and the surface of the frames and the plating of the bottom is usually rendered in Portland cement concrete, thus forming a smooth concrete floor to the ballast-tanks.

What is technically known as "the plating" is the smooth visible outside of the hull of an iron ship. The mode of plating usually adopted is that known as inside and outside strakes, the inside strakes being placed directly against the frames, whilst the outside plating overlaps the plates above and below, the space between the outside plates and the frames, which is, of course, the width of the thickness of the inside plates, being filled up with lining-pieces of the same thickness as the plates. The thickness of the plates of the floor and the sides is according to the rule laid down by Lloyd's, but will average from about half an inch to three-quarters of an inch, and will be from one-sixteenth to one-eighth thicker under the engines and boilers. The length of each plate is not less than from five to eight spaces of frames—that is to say, not less than from 10 to 15 feet. The butts of the plating in adjoining strakes are not put nearer to each other than two spaces of frames, and the butts of the alternate strakes are not placed under each other, and all are double-riveted; and when so double-riveted the holes for the rivets are either arranged zigzag, or the chain method is employed.

In the plating of ships this disposition of the butts is known as the diagonal system, there being always two strakes of plates between two vertical butts in the space between any two frames. All the butts of the plating are planed and fitted close, and the edges of the plating are also planed, so that all surfaces riveted together bear fairly against each other through their whole length and width, so that a knife, the thickness of the blade of which does not exceed No. 26 Birmingham wire-gauge, cannot be put between them at any part.

Most ships are now fitted with water-tight bulkheads, which add materially to the strength and safety of the vessel, as numberless ships that have been in collision can testify. In many ships the foremost or collision-bulkhead extends from the floor-plate to the upper deck, whilst the other bulkheads are pierced, and are fitted with water-tight doors—an unsatisfactory arrangement, because should a collision suddenly occur, the doors at the moment will probably be open, and there may be no time to close them; and even if there be time, the great and sudden strain caused by the collision will often so wrench the bulkhead that the doors jamb, and at the critical moment the whole thing ceases to be what it professes to be—a *water-tight* bulkhead.

There ought to be at least one bulkhead for every breadth of the ship, in her length; thus, a ship, say of 210 feet in length, and of 30 feet beam, should have a bulkhead at every 30 feet of her length—that is to say, she should have six water-tight bulkheads. All bulkheads that are really intended to be of any use in the hour of need should be carried entirely up from the floor to the upper deck without any openings whatever, even although it may involve some extra trouble and cost in working the hold. Such additional trouble and expense is more than compensated for by the additional security given to the ship.

Many of our large liners have their decks plated as well as their sides, as giving greater strength to the ship; but as an iron deck would in many respects be extremely unsuitable, this deck is usually covered over with wooden planking.

Some ships have the bulwarks very high, and plated over on the outside. When this is the case large openings are usually left, the lower part of the openings being flush, or nearly flush, with the upper deck, and fitted with hinged flaps opening outwards, thus affording a ready means of egress for the large body of water that may come on deck in heavy weather. In fact, a ship is far safer with merely open rails, and not with solid bulwarks at all; heavy seas that are shipped being then able to get away at once.

Iron masts are now generally used, as being both stronger and lighter than wooden masts. Some ships have only their lower masts, or the lower masts and topmasts, of iron, the topgallant masts and royals being still of wood; but many other ships are now fitted with iron masts from keel to truck. Iron masts are constructed like any other tubular form of iron. The plates, usually three in number to form the circumference, are bent in the rolling-machine to the required curve, the longitudinal joints having internally T-irons running the entire length of the mast. Sometimes the plates are lap-jointed, with angle-iron at the joints; but this method of construction, although perhaps stronger than the former, does not make so good-looking a mast. Many iron masts are still further strengthened with internal diaphragm plates and angle-irons. The plates forming the mast are usually about 10 feet in length, and are of $\frac{3}{8}$ to $\frac{5}{8}$ iron, according to the size of the mast. Occasionally iron lower masts are used as ventilators to the hold or cabin space; when this is the case, they are then left open at the top, with a moveable cover, to be put on in wet weather. The trestle-trees and all the fittings are also of iron, and the shrouds are of wire rope. The latter are not set up by dead-eyes, but have screw fastenings secured by chain-plates riveted to the vessel's sheer-strake. The centre part has an eye formed in the middle, and screws at the ends, one of which is right-handed, and the other left-handed. The screws work in nuts attached to the chain-plate and to the eye holding the shroud, which when seized has the points of the screws only just entered, leaving the greater part of the screw available for taking up the slack, as may be required. By this means by a turn or two of a marline-spike inserted in the eye in the centre of the screw-fastening, the shroud, or back-stay, or whatever it may be, is readily tautened up.

In most iron and steel vessels not only are the masts of iron or steel, but the yards also, or, at all events, the larger yards, as the main and the fore yards, and very frequently the upper and lower topsail yards. The whole of the standing rigging is of wire rope, whilst a great part of the braces, lifts, and the like, are of chain and wire, so that not only has iron or steel gradually displaced wood for the hull and the spars, but wire rope and chain are now taking the place of hemp in the rigging. Chain and wire rope are used thus: Take, for instance, the topsail braces: chain about two fathoms long is attached to the yard, and then shackled to a block—this chain being called "the tie;" wire rope is rove through the block, and hooked into the maintop, if it be the fore-topsail braces; the other end of the wire rope is stropped round another block, the wire rope then being called "the runner." An ordinary rope is rove through this block, one end of which is hooked on to the bumpkin, or else to a bolt in the ship's side, while the other end is rove through a leading block, and belayed to a pin on the rail, this rope being called "the whip." Precisely the same principle is adopted for the halliards, etc.

In some modern ships chain has superseded certain ropes for their entire length, as, for instance, the lower topsail sheets. It is, however, very awkward to pull on, and is not very easily made fast to a belaying-pin. The fore-tack, again, is now generally of chain. Modern sheets are very frequently made of wire, served over with spun yarn. When the ship gets down into fine latitudes, these wire ropes are usually changed for ordinary rope; and leaving the fine weather the wire is put on again. It is bad stuff to make fast, as it is very springy, and the men have to be exceeding careful in slacking it away, or a man may very easily get badly hurt. If there be any strain on the sheet, the least easing on the bitts will start the whole wire, which will, somehow or other, spring up off the bitts, and run out before you "know where you are."

Chain and wire, again, are mostly used now for mooring, as only a few lines (or lengths) of wire will take the place of several times that length of ordinary cable. Until the early years of the nineteenth century cables of hemp were in general use both in merchant vessels and in ships of war. In 1810, however, the making of iron-chain cables was commenced at Millwall, and these cables gradually have superseded the use of hemp cables, because of the advantages the former have in strength, durability, and convenience in stowage over the cumbrous cables made of hemp. Iron cables with stud-links soon proved superior in strength to the twisted link cables, and they were adopted in the Mercantile Marine of the United Kingdom for many years before the Government authorities considered it proper to discontinue the use of hemp, and to equip the ships of the Royal Navy with iron chain-cables.

Nowadays everything is of iron—the masts, the yards, the bowsprit, with its dolphin-striker, are all of iron, and the two inner guys of the latter are iron rods, the outer guys being of wire. No lanyards are used, but iron screws are used for everything.

The above description of the spars and rigging of a modern ship will probably appear somewhat dry and uninteresting to the lay reader, but it will, at all events, enable him to form some idea as to the manner in which iron and steel have now almost entirely taken the place of wood and hemp in the majority of our larger ships.

CHAPTER XI.

The Transatlantic lines—The Cunard Line—First formation of the Company—The mail contract—The first ships—American opposition—The Collins Line—Loss of the *Arctic*—Loss of the *Pacific*—Recision of the Government rule as to wooden ships—The first iron Cunarder—The *Persia*—The first screw Cunard steamer—The *China*—The *Russia*—Compound engines—The *Batavia*—The first steel Cunarder—The *Servia*—The *Umbria* and the *Etruria*—The *Campania* and the *Lucania*—Rates of speed—Management of the Cunard Company—Immunity from accidents.

THE oldest of the Transatlantic lines of steamers existing at the present time is the Cunard Line, established in 1840, of which we now propose to give some particulars.

Mr. Samuel Cunard, who had for some time been conducting a mail service between Boston, Newfoundland, and Bermuda, about the year 1836, conceived the idea of establishing a regular steam mail service between this country and America; but, unfortunately, he was not possessed of sufficient capital to inaugurate so vast a scheme, nor could he induce his friends in the shipping world, or the merchants of Halifax, to join him in the enterprise. He, however, ultimately fell in with Mr. Robert Napier, the famous Clyde ship-builder and engineer, who introduced him to Mr. George Burns, one of the shrewdest men of the day, who in turn brought him into contact with Mr. David MacIver, of Liverpool. In the course of a very few days Mr. George Burns, whose wealth, influence, and integrity were the strong foundations upon which the great enterprise was built, obtained the requisite subscribed capital of £270,000 to float the Company, which was at first styled "The British and North American Royal Mail Steam Packet Company," but this cumbrous title soon gave way to the shorter and now well-known designation of "The Cunard Line."

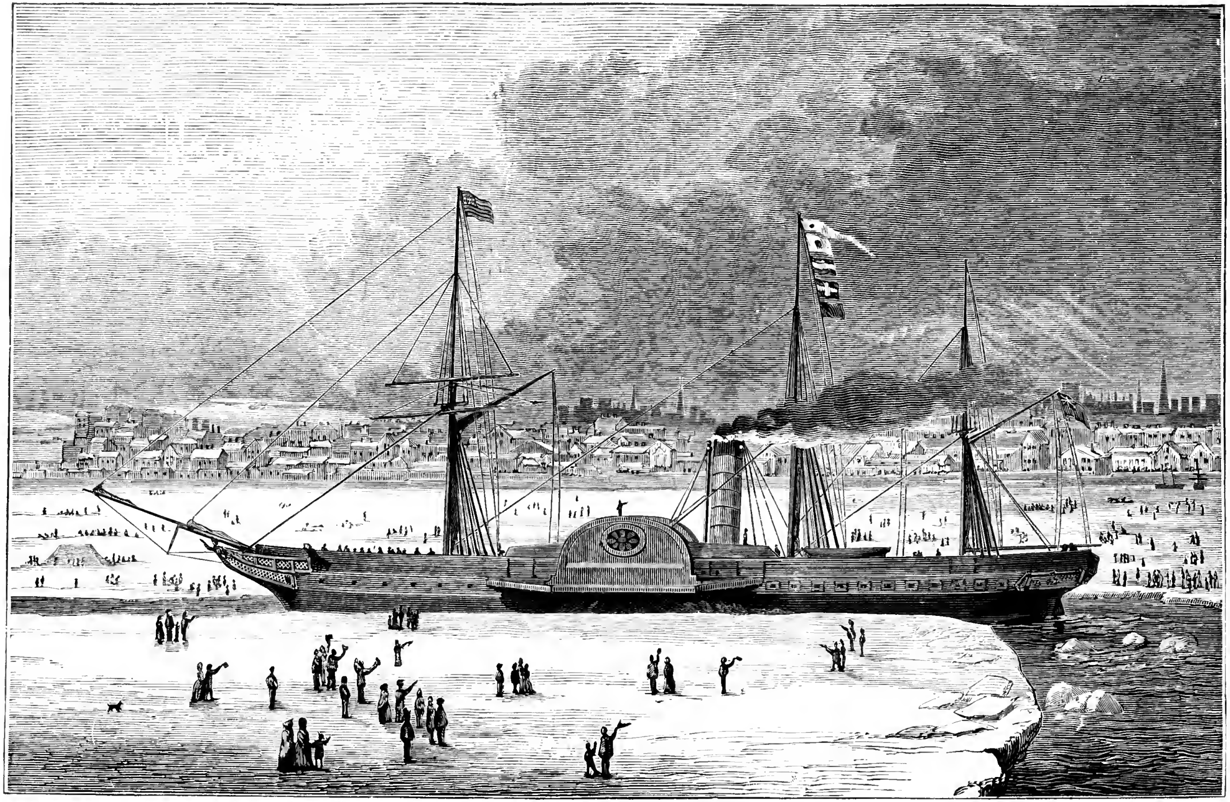
In October, 1838, the English Government advertised for tenders for the conveyance of the United States mails by steamers, instead of, as up to that time had been the case, by sailing ships, for the most part small ten-gun brigs, which, from the frequency of their capsizing, were familiarly known as "coffins," and the tender of Messrs. Samuel Cunard, George Burns, and David MacIver was accepted. They were to have £55,000 per annum, and were to supply three suitable steamers, and to perform two voyages a month from Liverpool to the United States. This arrangement was, however, subsequently altered to four steamers, and the subsidy was increased to £81,000 per annum. The four steamers with which the Cunard Line was first started were—

		Tons.	Length.	Beam.	Horse-power.
The *Britannia* *	(paddle-wheel)	1156	207 ft.	34 ft. 4 ins.	423
,, *Columbia*	,,	1138	207 ft.	34 ft. 2 ins.	425
,, *Acadia*	,,	1136	206 ft.	34 ft. 6 ins.	425
,, *Caledonia*	,,	1138	206 ft.	34 ft. 6 ins.	425

All these four steamers kept up an average speed of about $8\frac{1}{2}$ knots an hour.

The line quickly became exceedingly popular, and, curiously enough, its popularity has never diminished to the present day. The original fortnightly service was soon increased to a weekly one, and since that time has been still further increased, so that now the Cunard boats run twice a week to the States—every Saturday to New York, and every Thursday to Boston, with occasionally an additional boat on a Tuesday. When the more frequent service was determined upon, two new steamers, the *Cambria* and the *Hibernia*, were put on. They were each of 1422 tons, and 1040 indicated horse-power, with an average speed of $9\frac{1}{4}$ knots. By 1848, the expansion of international commerce caused still further demands on the Company, and the *America*, *Niagara*, *Canada*, and *Europa*, all paddle-wheel steamers of 1825 tons, and 2000 indicated horse-power, with an average speed of $10\frac{1}{4}$ knots, were added to the fleet. It will thus be noticed how, in the first ten

* This was the steamer that Charles Dickens crossed in, in January, 1842. An admirable description of the boat and of the passage across will be found in his "American Notes."



THE FIRST CUNARD STEAMER, THE

years of the existence of the Company, both the size of the ships and the power of the engines had materially increased, with a corresponding increase of speed of something like five and twenty per cent.

The success of the Cunard Line naturally excited the jealousy of the American shipowners, and various attempts were made to "run the Cunarders off the Atlantic," but always without avail. The opposition was commenced by an American company fitting one of their fastest sailing ships, the *Massachusetts*, with a screw propeller, so that, while taking advantage of her canvas under favourable circumstances, she might use her steam-power against a head wind. But she was not a success, and in point of speed could in no way compete with the English vessels. In consequence it was determined to start a regular American line of steam-packets to run between New York and Bremen, calling at Southampton, and their first ship, the *Washington*, left New York in June, 1847, on the same day that the *Britannia*, belonging to the Cunard Company, sailed from New York for Liverpool. This was the first race across the Atlantic between American and British steamers, and it resulted in a decided victory for the Cunarder, which arrived two full days before the *Washington*.

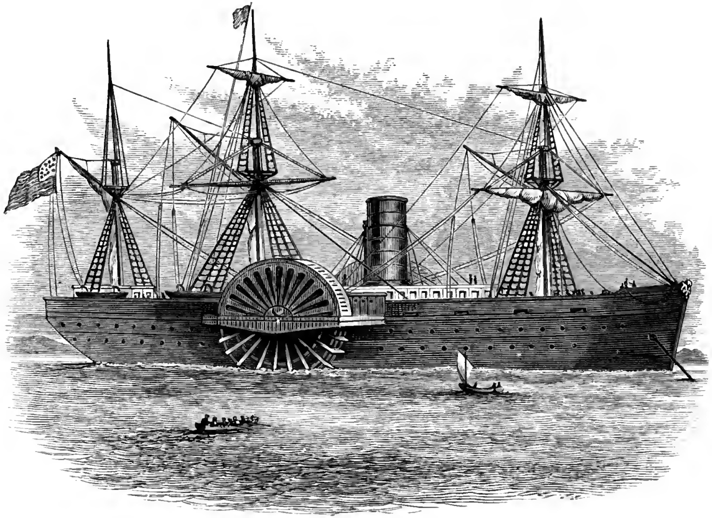
The most formidable opponent was the Collins Line, which started with four fine ships, the *Atlantic*, the *Pacific*, the *Arctic*, and the *Baltic*, which, although all faster than the Cunard boats, for some reason or other never commanded the confidence of the public secured by the English line. These four vessels were all paddle-wheel steamers, averaging each 2856 tons, with engines of 800 horse-power. They were 282 feet long, 45 feet beam, and had a draught of water of 20 feet. They were built chiefly of oak, and were planked with pitch-pine. They had straight bows and rounded sterns; each had three masts, and they were square-rigged on the fore and main-masts. They were by far the handsomest vessels that had yet been built for the Transatlantic service.

When the Collins Line was first established, having secured the United States contract for the conveyance of the American mails from New York to Liverpool, the directors of that

Company determined to put on boats which, at any cost, should beat the Cunarders in point of speed, and this point they attained when, in 1852, their *Arctic* made the passage across from New York to Liverpool in 9 days 17 hours and 12 minutes, the fastest passage then on record. During the first half of 1852, the boats of the Collins Line used to make the passage from Liverpool to New York, on an average, in 11 days and 22 hours, whilst the *Asia* and the *Africa*, the fastest boats of the Cunard Company, used to take, on an average, 12 days 14 hours; the passage from New York to Liverpool being made by the Collins boats, on an average, in 10 days 22 hours, the Cunarders taking, on an average, 11 days 1 hour.

This slight additional speed was, however, costing the Collins Company a heavy expenditure, and in a statement laid before Congress, when the question of the subsidy by the United States Government was being discussed, it was stated on behalf of the Collins Company "that to effect the saving of from a day to a day and a half in the run between New York and Liverpool was costing the Company nearly a million dollars a year."

In 1850, to compete with the Collins Line, the Cunard Company built two larger and faster steamers, the *Asia* and the *Africa* (mentioned above). They were sister ships, each being of 2128 tons. They were 267 feet in length, 40 feet 6 inches beam, and with a depth of hold of 27 feet 6 inches. They were fitted with side-lever engines, by Robert Napier, of 814 horse-power; the cylinders being 96 inches in diameter, with a 9-feet stroke, and the paddle-wheels 37 feet 6 inches in diameter, the steam being supplied by four boilers, with twenty furnaces. Each ship employed 38 hands in the engine-room; and the coal-bunkers held some 900 tons of coal. The vessels were built of oak, planked double, both outside and inside, the intervening space being filled up with rock salt, from keel to gunwale, to preserve the timbers from dry rot. There were berths for 180 passengers; and the ships were so built that, at very little expense, they could be transformed into war-ships. With these two new steamers the Cunard Line quite held its own as regarded passengers; but the establishment of the Collins Line had had a marked effect



THE COLLINS LINE STEAMER "ATLANTIC."

[*To face page* 136.

upon freights; as before the Collins Company started, freights were £7 10*s.* per ton between Liverpool and the States, whilst two years after the Collins boats had been running the price was £4.

The opposition to the Cunarders of this particular line did not, however, last long, the Collins Company being singularly unfortunate with their ships. Their misfortunes commenced in 1854, by their losing the *Arctic.* On Thursday, the 21st of September, 1854, the *Arctic* left Liverpool for New York, with 233 passengers, of whom 150 were first class. At mid-day on Wednesday the 27th, when sixty miles south-east of Cape Race, during a dense fog, with a heavy sea running, the *Arctic* came into violent collision with the French steamer *Vesta,* having on board 147 passengers, and a crew of fifty. After the collision the *Vesta* appeared to be the more injured of the two steamers, and her passengers and crew made the most desperate efforts to get on board the *Arctic.* The rough state of the sea, however, rendered this impossible, one boat, with thirteen on board, being swamped immediately after leaving the French ship, and all on board being drowned, whilst another boat was sunk as soon as she was lowered.

The captain of the *Vesta,* after a careful examination, found that his ship, although badly stove in forward, was not making water very rapidly; he therefore, thinking that the *Arctic* was quite safe, shaped a course for Cape Race, in the hopes of being able to beach his steamer before she should sink. Eventually he not only succeeded in reaching Cape Race, but he was able to take the *Vesta* safely into St. Johns. Those on board the *Arctic* very soon discovered the very serious extent of her injuries. Three large holes had been made in her side, and the ship was seen to be rapidly filling. The captain had her head put about, and he also tried to run for Cape Race, which was the nearest land. By this time a strong gale was blowing, with a heavy sea, and the ship was getting very low in the water. Seeing that matters were getting desperate, the boats were now lowered, but some were swamped in lowering, and others were capsized, two only, with thirty-one of the crew and fourteen passengers, out of over three hundred persons who were on board the *Arctic,* succeeding in safely reaching St Johns, Newfoundland. Four hours after the collision the water reached the furnaces of the *Arctic*, and soon after that the ship went down.

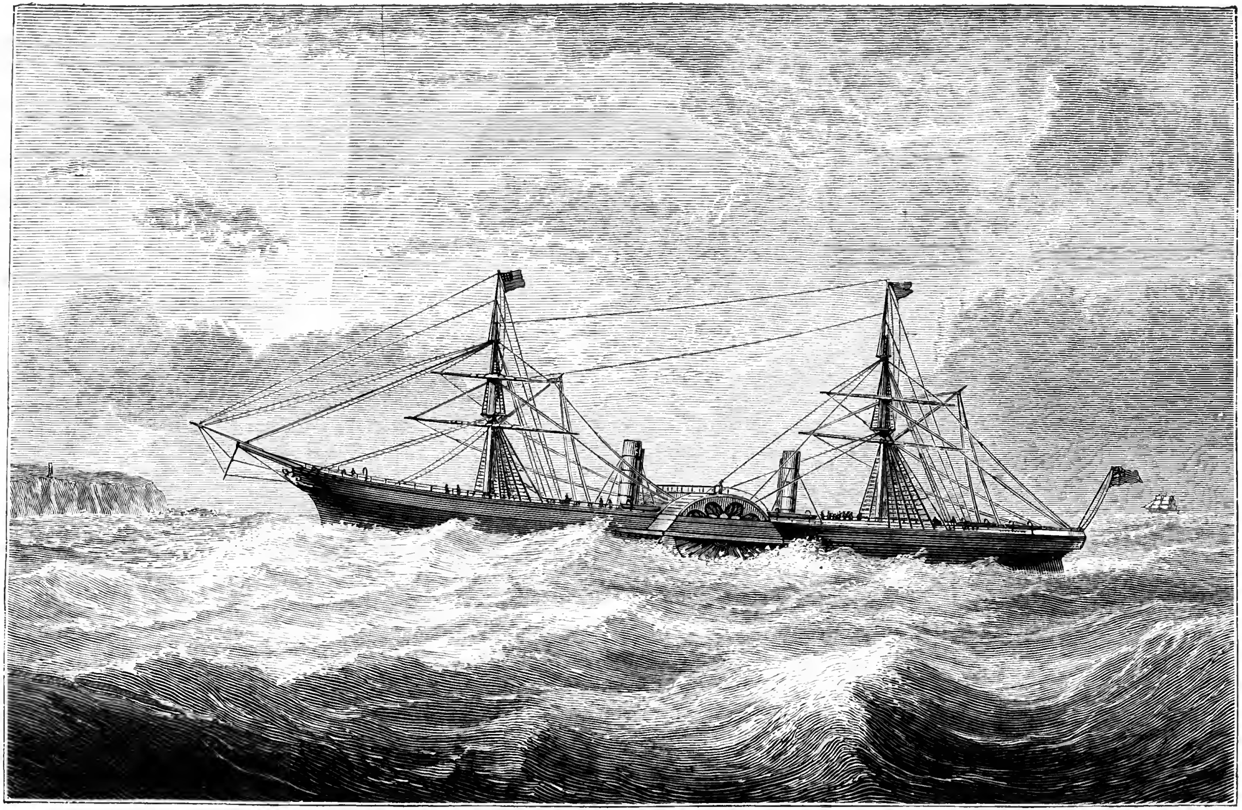
Sixteen months after the loss of the *Arctic* the Collins Line suffered another serious blow. On Wednesday, the 23rd of January, 1856, the *Pacific* left Liverpool for New York with a crew of 141, and with forty-five passengers, the mails, and a valuable cargo, which latter was insured for two millions of dollars. From the time the *Pacific* left the Mersey she was never again heard of. Where, or how, she was lost was never known.

The Collins Line, not to be daunted, built two more steamers, the *Adriatic* and another; but they never recovered from the effect of the previous disasters, and the Company had to be wound up in 1858.

Down to the year 1860, the English Government had absolutely refused to allow the mails to be conveyed in any other than wooden ships; but in 1860, this requirement was at last withdrawn, and Messrs. Cunard commenced the substitution of iron as the material of their ships, and they built the *Persia*, an iron paddle-wheel steamer of 3766 tons. She was 350 feet in length, 45 feet beam, with a depth of hold of 30 feet. She was fitted with a pair of side-lever engines, of 917 horse-power, nominal, but working at sea up to an indicated horse-power of 3600. The *Persia* was the twenty-sixth vessel built for the Company since the *Britannia*.

The last paddle-wheel steamer built for the Cunard Company —indeed, the last great ocean-going paddle-wheel vessel altogether—was the *Scotia*, also an iron vessel, built in 1862, of 3871 tons, and 975 horse-power. She was 367 feet in length, and 47 feet 6 inches beam, and was fitted with a pair of side-lever engines, working up to an indicated horse-power of 4200, the diameter of the cylinders being 100 inches, with a stroke of 12 feet. The diameter of the paddle-wheels was 40 feet. The *Scotia*, which crossed from New York to Liverpool in 8 days 22 hours, was undoubtedly the most magnificent ocean steamer of that date.

The Inman Line, which was now running in opposition to the Cunard boats, had been for some time working screw



THE CUNARD COMPANY'S R.M.S. "SCOTIA."

[To face page 138.

ships, indeed, the Cunard Company themselves were employing screw steamers for their Mediterranean trade—and the time had now come when the Company determined to employ them in their transatlantic service; and when they did come to the determination finally to abandon paddle-wheel steamships in favour of screw steamers, several of the former were at once transformed into sailing ships. The *Scotia* was converted into a twin-screw, and was used as a cable steamer belonging to the Telegraph Maintenance Company.

The first iron screw steamer built for the Cunard Company was the *China,* launched in 1862, followed in 1864, by the *Cuba,* and in 1865, by the *Java.* In 1867, a larger iron screw steamer was built, the *Russia,* of 2960 tons, with engines of 492 horse-power, nominal, working up to an indicated horse-power of 3000. The *Russia* was probably the most beautiful vessel that had, as yet, been put on the service. She was barque-rigged, with a single funnel between the fore and main masts. Her graceful outline and the symmetry of her proportions were considered by nautical men to be perfect; whilst her interior decorations and general accommodation soon gained for her with the public a reputation for comfort and luxury. Her speed averaged 14·4 knots per hour, she being then the fastest vessel in the fleet. She crossed from Queenstown to New York in 8 days 5 hours and 52 minutes; and from New York to Queenstown in 8 days and 28 minutes.*

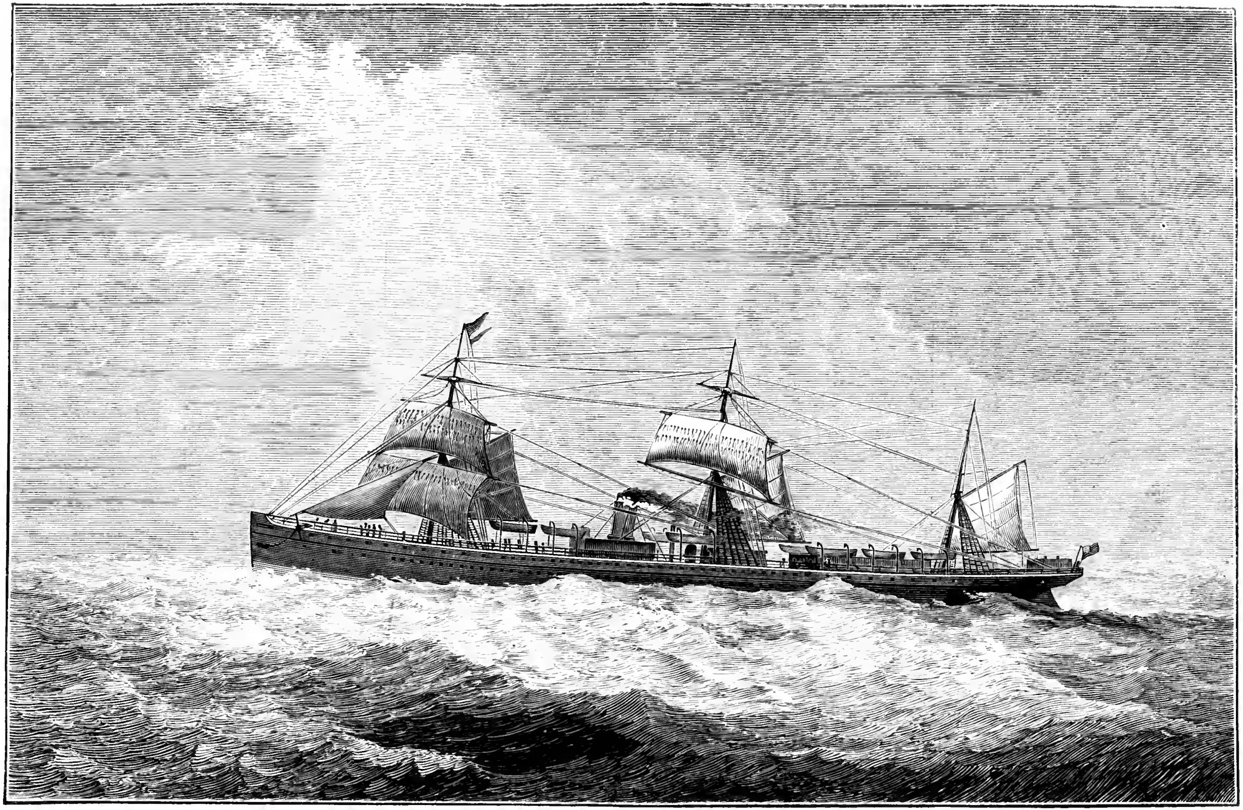
In 1870, the Cunard Company turned their attention to the then new invention of compound engines, and finding that this new method utilized steam at a far higher pressure than had been the case heretofore, and produced increased speed at a smaller cost, they determined upon adopting it. The *Batavia,* of 2553 tons, was the first of their steamers to be fitted with the new machinery; and in the six subsequent years the Company increased their fleet by seven other steamers, all fitted with compound engines. These were the

* It may be noted in passing that the commander of the *Russia,* Captain Cook, navigated this vessel 630,000 miles [equal to five-and-twenty times round the world] on the Atlantic in all weathers without a single accident or a single breakdown of any kind; and safely carried to and fro upwards of twenty-six thousand cabin passengers.

Calabria, *Algeria*, and *Abyssinia*, each of which was of 3300 tons; and these, again, were followed by still larger boats, in the *Scythia* and the *Bothnia*. These vessels were all of iron, the two latter being each of 4535 tons, 455 feet in length, 42 feet 6 inches beam, and 36 feet depth of hold. They had accommodation for 300 first class, and 800 third class passengers. They were barque-rigged, and were fitted with compound engines of 500 horse-power, nominal. The high-pressure cylinder was 60 inches in diameter, the low-pressure, 104 inches. The steam was supplied by eight tubular boilers, with twenty-four furnaces; and the coal-bunkers could take in twelve hundred tons of coal. The largest of these seven steamers was the *Gallia*, of 4808 tons, and 5300 indicated horse-power.

Another advance was now being made in ship-building, and iron, which had superseded wood, was itself to be superseded by steel. The first of the Cunarders to be built of the new material was the *Servia*, of 3900 tons register. She carried 5000 tons dead weight with a draught of 26 feet; but could have carried 10,000 with safety if the depth of harbours had permitted. Her dimensions were: length over all, 530 feet; beam, 52 feet; depth from top of keel to top of upper-deck beams, 42 feet. She had three complete decks and two partial decks, and was divided into twelve main water-tight compartments by transverse bulkheads. The *Servia* was entirely constructed of steel, on the lattice double-bottom system, having capacity for 800 tons of water ballast. Her decks were formed of half-inch steel plates, covered with 4 inches of teak. The upper deck had on it the forecastle for some of the crew, and the necessary wash-houses, etc., for emigrants; hospital, companions to main and lower decks; winches for working cargo, officers' rooms, smoking-rooms, galleys, baker's shop, music-room, ladies' rooms, entrance to the main saloon, and a wheel-house right aft.

The main deck had accommodation for seamen, stewards, and engineers; also 86 state-rooms, capable of berthing 334 passengers; also the main dining-saloon, with the necessary pantries and serving-rooms. The lower deck had 82 state-rooms, berthing 328 passengers; and contained accommodation



CUNARD COMPANY'S R.M.S. "BOTHNIA."

[*To face page* 140.

for 730 emigrants. The ship was lighted throughout by electric light.

The engines of the *Servia* were of the three-cylinder compound direct-acting arrangement, having one high-pressure cylinder of 72 inches diameter, and two low-pressure cylinders of 100 inches diameter each, and 78-inch stroke of piston. The crank-shaft was in three pieces, of steel, and 25 inches in diameter; and the propeller, the boss and blades of which were also of steel, was 24 feet in diameter.

Steam was supplied to the engines by seven boilers, six of which were double-ended, with six furnaces to each boiler, and one was single-ended, with three furnaces; so that in all there were thirty-nine furnaces. Seven tons and a half of coal were consumed every hour, or between thirteen and fourteen hundred tons of coal in the passage across the Atlantic, the bunker accommodation being for 1800 tons. The engines on trial developed 10,500 indicated horse-power, and the average speed at sea of the *Servia* was 17¼ knots per hour.

Magnificent in all respects as was the *Servia*, still the Cunard Company did not consider that perfection had been attained, and in 1884, the *Umbria* and the *Etruria* were launched, larger and more powerful in every respect than their immediate predecessor. They were sister ships, each 500 feet in length, with a gross tonnage of 8127 tons, and each had ample accommodation for 550 first-class passengers and 800 emigrants. Their engines were of 14,500 indicated horse-power, and their speed 19·5 knots per hour. The *Umbria's* fastest run across from Queenstown to New York was 5 days 22 hours (this was her eighty-second trip across), her daily runs being, 461 knots, 502, 500, 427, 502, and 388, making a total of 2780 knots, giving an average speed of 19·57 knots an hour.

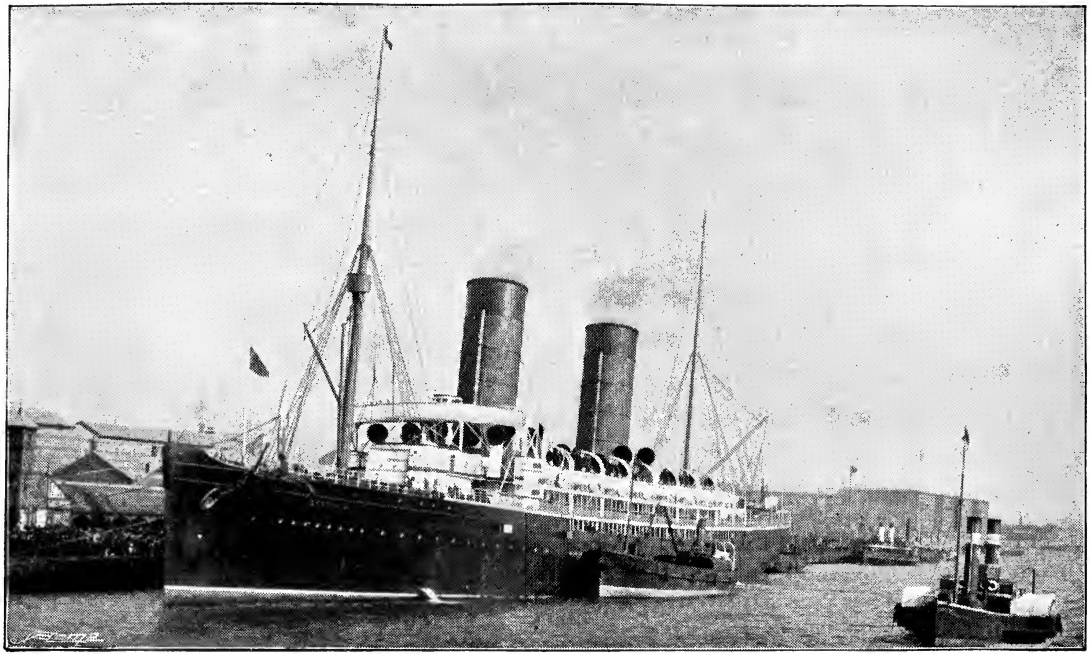
It was thought that the most perfect type of ocean liner had really at last been reached in these two vessels; but their glories were soon to be eclipsed by those of the *Campania* and the *Lucania*, which were ordered by the Cunard Company from the Fairfield Shipbuilding Company in 1891.

On the 8th of September, 1892, and on the 2nd of February, 1893, in the presence of many thousands of interested, and some anxious spectators, there were launched at Govan on the Clyde, from the yard of the Fairfield Shipbuilding Company, the *Campania* and the *Lucania* respectively, the largest vessels—with the single exception of the *Great Eastern*—that had ever been constructed in any shipbuilding establishment in the world, either public or private.

The length of the *Campania* * is 620 feet over all; her extreme breadth is 65 feet 3 inches, and her depth from the upper deck 43 feet. Her nett register tonnage is 4974 tons, her gross tonnage being 12,950 tons. The vessel has a straight stem and elliptic stern, with top-gallant forecastle and poop, and there are two tiers of deck-houses with promenade decks. She has two large funnels, which, like those of all the other boats of the Cunard Company, are red, with black tops; and she has two pole masts. The ship has four decks—upper deck, main deck, lower, and orlop decks—and is divided into seventeen compartments by sixteen water-tight bulkheads, so that it is calculated that she would still float with any two compartments open to the sea. She has been built in conformity with the Admiralty requirements for armed cruisers, the decks being specially constructed with a view to carrying heavy guns; and she has steering-gear of a special type fitted below the water-line. There is a cellular double bottom, with tanks arranged for water ballast.

The *Campania* is fitted with twin screws driven by two distinct sets of powerful triple-expansion engines of 5000 horse-power, nominal, developing 30,000 indicated horse-power. The two sets of engines are in two separate engine-rooms, divided from each other by a water-tight bulkhead, through which, however, are water-tight doors, thus rather giving away the perfect duplication of the machinery. Each engine has five cylinders, two high-pressure, two low-pressure, and one intermediate. The water is circulated through the condensers by four large centrifugal pumps, each driven by an independent compound engine, these pumps being also available for pumping water from the hold in case of emergency. An elaborate system of piping is carried throughout the ship,

* The description applies equally, in all respects, to the *Lucania*.



THE "CAMPANIA" AT THE LANDING-STAGE, LIVERPOOL.

[*To face page* 142.

and connected to various steam-pumps for emptying the ballast tanks, pumping out bilges, supplying the decks with water for washing down, as well as hydrants in case of fire, and for other purposes. There are also four evaporators to produce the necessary fresh water from the sea water, and so to avoid using salt water in the boilers; and besides these there are numerous donkey-engines for the winches for working the holds, warping, and other uses. Steam for the main engines is generated in twelve large double-ended boilers; the boilers with their furnaces being arranged in two groups, having one of the great funnels for each group. These funnels from their lowest section are 120 feet high, or just about the height of the Eddystone Lighthouse; and their diameter is 20 feet, which is rather more than the diameter of the Eddystone Lighthouse.

Although the *Campania* is fitted with twin screws, there is an aperture in her stern precisely similar to that in a ship fitted with a single screw, this being in order that the propellers may work the more freely, they being kept very close to the centre line of the vessel, in order to avoid damage to, or from, quay walls.

The *Campania* has accommodation for 1400 passengers and 400 crew. The third-class passengers are berthed forward, the second-class aft, and the saloon passengers amidships.

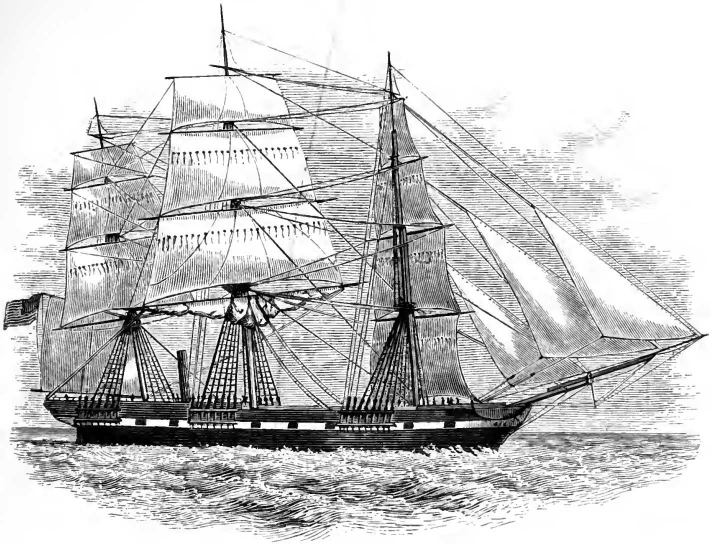
It is somewhat curious that of the two sister ships, identically the same in size and shape, and fitted with engines the same in power, one ship, the *Lucania*, should be slightly faster than the other. Her fastest outward passage was accomplished in 5 days 7 hours and 23 minutes, and her fastest passage homeward in 5 days 8 hours and 38 minutes. The *Campania's* fastest westward passage was 5 days 9 hours and 6 minutes, and her fastest passage eastwards 5 days 9 hours and 18 minutes. The *Lucania's* fastest ocean steaming was at an average speed throughout the passage of 22·1 knots per hour, and the highest day's running 560 knots. The *Campania's* fastest average speed throughout the passage was 21·82 knots an hour, and her highest day's running 584 knots.

On the 7th of August, 1896, the *Campania* arrived at New York, having made the passage from Daunt's Rock, Queenstown, in 5 days 9 hours and 35 minutes; having steamed 2785 knots at an average rate of speed of 21·5 knots per hour; and this rate, with very slight modifications, is about the rate usually maintained by these two ships.

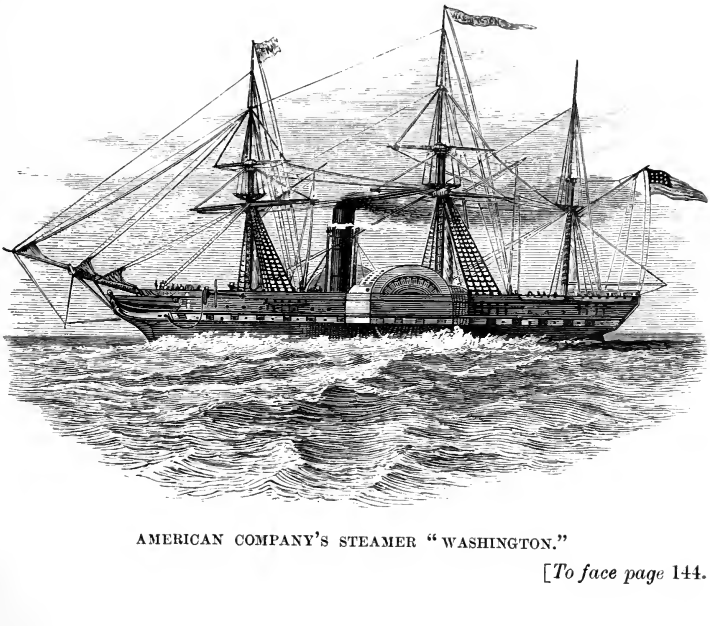
The Cunard Company up to the present time have been able to boast that, although they have occasionally lost a ship, they have never yet lost a passenger. One of the most remarkable disasters that ever did befall them was the total loss of their steamer *Oregon*. She was run into and sunk by some vessel, but what vessel it was, or what became of the vessel—whether she too went to the bottom, or whether she got quietly away—no one knows, and no one probably ever will know.

Speaking generally, the Cunard Company have always enjoyed a peculiar immunity from accident, and it has very frequently been said that a special good luck must have attended them. As a matter of fact, it is no question at all of either good luck or bad luck. All ends are attained by means, and the Cunard Company have from the very first uniformly adopted the means calculated to ensure success, and success has naturally followed. In the construction of the ships everything has always been of the very best, no matter what the cost might be. In the *personnel* of the fleet the same thing is aimed at. The most absolute discipline is enforced upon all the ships, from the chief officer downwards. Neither the chief officer nor the subordinate officers, except so far as the dictates of ordinary courtesy demand, are allowed to hold any intercourse whatever with the passengers, thus devoting their entire attention to the navigation of the ship.

The most rigid punctuality is observed; an admirable look-out is kept in fair weather as in foul; in thick weather, when making the land, the lead is kept constantly going; the officer of the watch is always at his post; the engineers are always in the engine-room to stop or reverse the engines at a moment's notice; and an officer is always at the elbow of the quartermaster to see that the proper course is being kept. The captains have the most stringent orders never upon any occasion to sacrifice the slightest risk of the



AMERICAN COMPANY'S AUXILIARY SCREW STEAMER "MASSACHUSETTS."



AMERICAN COMPANY'S STEAMER "WASHINGTON."

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safety of the ship to any question of speed, or to leave the apparently smallest or most insignificant matter to chance. The result has been simply what might have been expected, an absolute immunity from so-called accidents—accidents which in ninety-nine cases out of a hundred are not only preventable, but are merely the natural outcome of the particular line of conduct pursued.

Among the written confidential instructions given to all captains employed in the service of the Cunard Company are the following orders:—

"It is to be borne in mind that every part of the coast-board of England and Ireland can be read off by the lead; and on making land you should never omit to verify your position by soundings: rather lose time in heaving the ship to, than run the risk of losing the vessel, and all the lives on board.

"You are to understand that you have a peremptory order, that in fog, or snow-storm, or in such state of the weather as appears attendant with risk in sailing, you are on no account whatever to move the vessel under your command out of port, or wherever she may be lying in safety; and at the same time you are particularly warned against being influenced by the actions of other captains who may venture to sail their vessels in such weather.

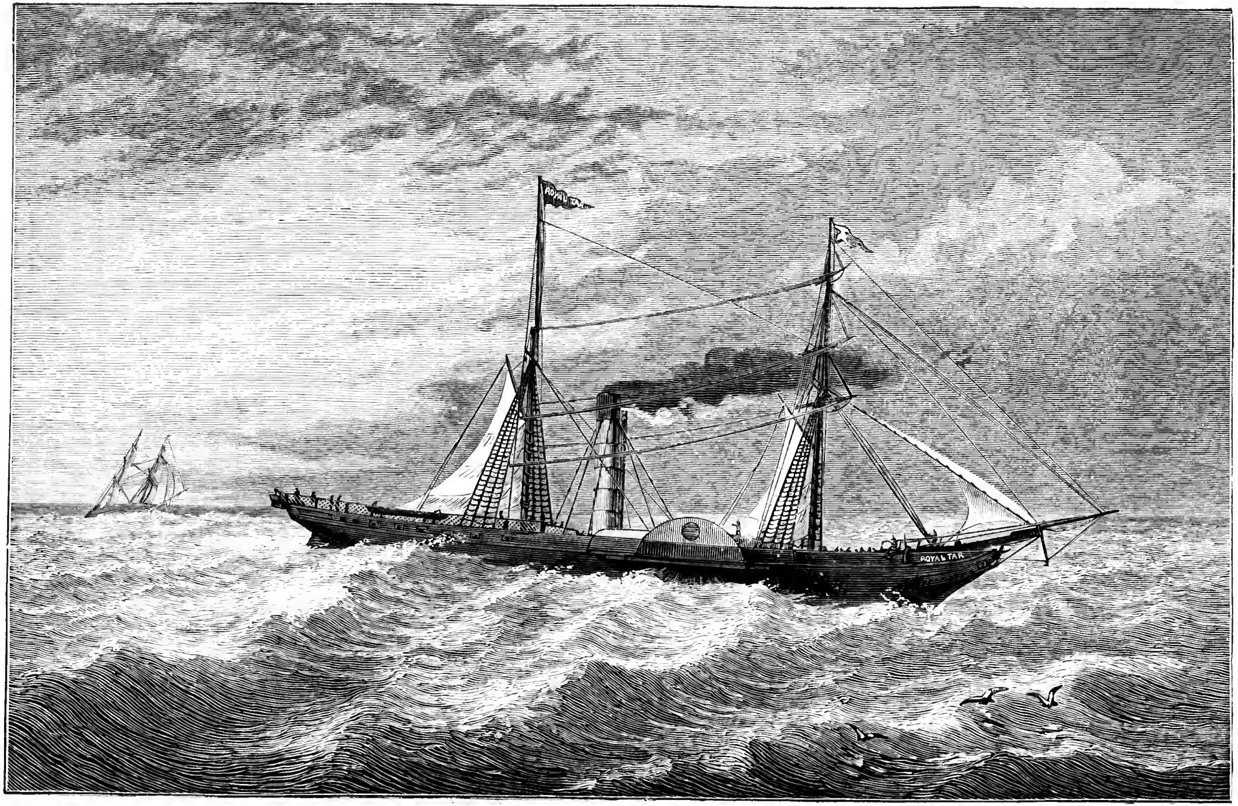
"In any case when, in sailing, you are overtaken by thick weather, fog, or snowstorm, the most extreme caution is to be exercised, and you are not to be actuated by any desire to complete your voyage: your sole consideration being the safety of your ship, and those under your charge; and we caution and instruct you in such circumstances to make *constant use of the lead*, and to enter in your log the fact of your having done so."

CHAPTER XII.

The Peninsular and Oriental Steam Navigation Company—Its origin—Messrs. Willcox and Anderson—Messrs. Bourne's line of steamers to Spain and Portugal—Messrs. Willcox and Anderson's contract for the Peninsular mails, in 1837—The Indian mail—The East India Company—The Peninsular Company—The starting of the P. and O., 1840—The Bombay mail—Opposition of the East India Company—Parliamentary inquiry in 1851—Termination of the East India Company's monopoly—The India and China mails in the hands of the P. and O.—The Overland Route—Coaling-stations—Commencement of the P. and O. line to Australia in 1853—The European and Australian Steam Packet Company—Its final collapse—The opening of the Suez Canal—Opposition to the Canal by the Post Office—The Suez Canal at last adopted by the Government—The present mail contract times—Rules and regulations of the P. and O. Company as to their ships, etc.—Casualties—Loss of the *Bokhara*—Loss of the *Aden*—The loss of the *China*—Burning of the *Ganges*.

There can be but very few Englishmen who have never heard of what is certainly one of the most popular of the great steamship lines, the Peninsular and Oriental Steam Navigation Company, or, as it is more familiarly known, the P. and O., and some details, therefore, of this great company will not be uninteresting.

In the year 1815, a Mr. Brodie McGhee Willcox opened a small office in Lime Street, City, as a shipbroker and commission agent, and soon after starting the business he engaged a youth to assist him, one Arthur Anderson, from Kirkwall, in Orkney. Mr. Willcox had no capital other than a shrewd head and a large stock of perseverance. The business prospered, and in 1825, Mr. Anderson, the quondam office boy, was taken into partnership, and the firm of Willcox and Anderson removed to new offices at No. 5, St. Mary Axe. At this time, besides the shipbroking business, the firm were part owners of a few small sailing vessels trading with Vigo and Lisbon.



THE "ROYAL TAR," 1834.

[*To face page* 146.

Gradually this small coasting trade developed into a regular line of sailing packets, and ultimately into a line of steamers, one of the first of their steamers being the *William Fawcett*, a paddle-wheel vessel of 206 tons, and 60 horse-power, 74 feet in length, and 16 feet beam; whilst another was the *Royal Tar*,* which was rather larger.

In 1834, the Dublin and London Steam Packet Company, of which the chief proprietors were Messrs. Bourne, of Dublin, chartered the *Royal Tar* to run to Spain; and soon after this the Spanish Minister in London induced Messrs. Bourne to put on a regular line of steamers to Spain and Portugal, for which Messrs. Willcox and Anderson were appointed the London agents; a Mr. Allen, who was in the office of the Dublin and London Steam Packet Company, being sent to London to assist Messrs. Willcox and Anderson in the management of the new line. This gentleman afterwards became the secretary, and ultimately the managing director of the great Company.

Previous to the month of September, 1837, the Peninsular mails were conveyed between Falmouth and Lisbon by sailing vessels once a week, but the service was always extremely irregular, and with bad weather the passage from Falmouth to Lisbon, which under ordinary circumstances occupied a week, was frequently extended to three weeks. There was at this time, besides this Lisbon mail, a Government mail to Cadiz and Gibraltar; but the vessels engaged in that service were also very slow, and this mail was nearly as irregular as the Lisbon one.

Messrs. Willcox and Anderson approached the Government upon the subject of an acceleration of these mails, but their proposals were coldly received, and the old state of things was allowed to continue, until loud and constant complaints from the public at last aroused the Government to action. The authorities then inquired officially whether Messrs. Willcox and Anderson had anything in particular to propose, and a detailed scheme for a weekly mail between Falmouth, Vigo, Oporto, Lisbon, Cadiz, and Gibraltar was drawn up by them, and submitted to the Government, who, after having thus obtained all the information and suggestions that they

* The *Royal Tar* was *William IV*.

required, or that Messrs. Willcox and Anderson had to offer, intimated, in accordance with the usual Government practice, that the matter would be thrown open to public competition.

Of the tenders thus invited, that of the British and Foreign Steam Navigation Company was accepted, but when it actually came to the point the Company found out that they were unable to carry out their proposals, and on the 29th of August, 1837, a contract was concluded between the Government and Messrs. Willcox and Anderson, by which the latter agreed to convey monthly the whole of the Peninsular mails for £26,000 per annum, a sum which was afterwards reduced to £20,500 per annum. This service, which commenced the same autumn, was performed with the utmost regularity, and may be considered as the actual commencement of the now well-known P. and O. Company, the first steamer despatched under the contract being the *Iberia*, built by Messrs. Curling and Young, which left England in September, 1837.

Down to the year 1840 the mails to and from India were conveyed by the East India Company in their own steamers between Bombay and Suez, and by steamers of the Imperial Government between Alexandria and Gibraltar, where they were transferred to the boats of the Peninsular Company. Both the steamers of the East India Company and those of the Imperial Government were excessively slow, and were nearly always behind time, the mail from Alexandria to England invariably taking three weeks, and often a month, so that at last public opinion forced the Government to take some steps towards bringing about a better state of things, and an arrangement was entered into with the French Government for the transit of the Indian mail through France to Marseilles. This route turned out to be quite as uncertain and quite as much fraught with delay as was the former one, and the managers of the Peninsular Company were then applied to on the subject.

They submitted a scheme for fast steamers to run direct from England to Alexandria, stopping only at Gibraltar and Malta. The plan was approved by the Government, who, having again got gratuitously all the information they required, then publicly advertised for tenders to carry out the scheme. Four competitors tendered for the contract, at sums ranging from £34,000 to £51,000 per annum, the Peninsular Company being the lowest; and as they also offered to convey all military and naval officers travelling on the public service at reduced rates, and to convey all Admiralty packages gratuitously, their contract was accepted by the Government, not, however, without very considerable opposition on the part of many persons who wished to see the Indian mails conveyed round the Cape of Good Hope.

In the *Times* of the 11th of November, 1838, appeared the following notice of a new steamer for that route:—

> "The *Queen of the East*, 2618 tons burden, and 600 horse-power, is the first of a line of steamers to ply between England and Calcutta by way of the Cape of Good Hope. This magnificent vessel is designed by Mr. W. D. Holmes, the engineer to the Bengal Steam Committee, for communication between England and India; and when these vessels are ready, we understand the voyage between Falmouth and Calcutta will be made in thirty days."

The Government, however, stood by their agreement with the Peninsular Company, and the two first vessels put on by Messrs. Willcox and Anderson, under the terms of their contract, were the *Oriental*, of 1600 tons, and 450 horse-power, and the *Great Liverpool*, a steamer originally built for the Transatlantic service, of 1540 tons, and 464 horse-power. These vessels were despatched with the Peninsular and the Indian mails, thus constituting the Peninsular and Oriental Company, and in 1840, the business was made into a joint stock company, with a charter of incorporation from the Crown, under the style of "The Peninsular and Oriental Steam Navigation Company."

Down to this time, as before stated, the mails between Bombay and Suez were conveyed by steamers belonging to the East India Cmpany. They were small vessels of a very inferior description, but so reluctant were the directors of the East India Company to admit "interlopers" into their service that it was some time before any change in the Bombay mail could be effected. At last a contract was entered into by the Home Government with the P. and O. Company for a line of steamers between Calcutta, Madras, Ceylon, and Suez, this being the commencement of the P.

and O.'s business on the farther side of the Isthmus of Suez; and on the 24th of September, 1842, the *Hindostan*, of 1800 tons and 520 horse-power, was sent from Southampton round the Cape to open the line.

Early in 1844, the P. and O. Company again laid proposals before the Home Government to undertake a monthly line of steamers between Suez and Bombay at a saving to the Government of £30,000 a year, as compared with the ascertained cost of the very irregular service performed by the steamers of the East India Company; but the directors of the East India Company were still most jealous of any interference with that particular line of communication, which they insisted upon keeping in their own hands, and which they did, in fact, so retain, down to 1854.

In 1845,* a further contract with the Government was entered into for the extension of the P. and O. line to Singapore and Hong-Kong, the subvention payable for the service being £160,000, which was at the rate of 17*s.* per mile over the whole line from Suez to Ceylon and Calcutta, and from Ceylon to Singapore and Hong-Kong.

When it became known that the P. and O. Company were carrying the India and China mails at the rate of 17*s.* a mile in steamers of 500 horse-power, whilst the East India Company, for very inferior and much slower ships, were getting 30*s.* a mile between Suez and Bombay, the public naturally demanded that this Bombay line should be taken out of the hands of the East India Company.

A Parlimentary Committee was appointed in 1851, to consider the whole matter, and it ultimately reported that "this service, in point of economy, the comfort of the passengers, and the requirements of trade, could be performed to greater advantage by private enterprise than by vessels of the Indian Navy." The directors of the East India Company, even after this, however, were very averse to giving up the mails, and would probably have continued their

* In 1845 the fleet consisted of fourteen ships, with a united tonnage of 14,600 tons, the *Hindostan*, the *Bentinck*, and the *Precursor*, of 1800 tons being the largest ships, with the old *Royal Tar* and several vessels of as little as 500 tons.

opposition much longer than they actually did, had not an accidental circumstance at once brought the matter to a head.

The Bombay mails upon a certain occasion, owing to the breaking down of an East India Company's steamer, had to be transferred at Aden to a native sailing-vessel, the Company not having another steamer ready at hand. The native sailing vessel was totally lost in the Red Sea, and with it the whole of the Bombay mail.

Communications were then at once entered into with the P. and O. Company, and they offered to undertake the Bombay branch for £24,700 per annum, or at about the rate of 6*s.* 2*d.* a mile, for which the East India Company had been getting 30*s.*, thereby effecting a saving to the Post Office of over £80,000 a year.

The whole of the vast ocean mail system to India, China, and the Straits Settlements was now practically in the hands of the P. and O. Company, and a most extensive organization had to be completed before the new lines could be considered in working order. It must be remembered that not a single coaling-station existed along the whole route from Suez to Calcutta and Hong-Kong, and that every ton of coal required for the steamers had to be sent out from this country in sailing ships by the Cape of Good Hope. There was practically no hotel accommodation for passengers on the route. At some places, such as Suez and Aden, there was not even fresh water; whilst docks for the repairs of the fleet had also to be provided first at Calcutta, and then at Bombay, where the Company's China steamers had their head-quarters. But perhaps the most arduous task of all was the organization of the transit across Egypt of the large traffic which naturally followed the extension of the Eastern lines, and which now began to be known as the "Overland Route."

The Overland Route, as it is called, between the Mediterranean and the Red Sea, is as old as history; but to Lieutenant Waghorn belongs the credit of having revived it. Those who have only known the Overland Route by travelling rapidly across the Isthmus of Suez by railway, or in still more recent times by going through the Suez Canal on board the steamer, can form but little idea of the discomforts of the journey before the days of either.

After landing from the steamer at Alexandria, the first part of the transit was by the Mahmoudieh Canal, the great work of Mahomet Ali for connecting Alexandria with the Nile. This journey of 48 miles was accomplished in a large canal boat, towed by a steam-tug at the rate of about 5 miles an hour. From Atfeh, where the canal joins the Nile, steamers started for Cairo, a distance of 120 miles, and accomplished the journey in about 16 hours. Passengers then had to remain the night in Cairo, and sometimes even two or three days. From Cairo the route lay across the desert for 90 miles, and the journey was performed in two-wheeled omnibuses, holding six persons, drawn by four mules or horses, the road being merely a cutting in the sand, which in the night-time was not distinguishable from the desert itself.

A journey of some eighteen hours under these circumstances could hardly be called enjoyable, still the experience was one which impressed the imagination in no ordinary degree. A moonlight journey across the desert was most striking. The seemingly boundless expanse, the silence only broken by the voice of the driver and the muffled sound of the horses' feet, which seemed somehow to accentuate the sense of stillness, the caravans loaded with mails and baggage passing with silent and stealthy tread, the whitened bones of countless troops of camels which had died in harness glistening in the moonlight; then the sudden daybreak, the solitary Bedouin family mounted aloft on their desert ship, the mirage, so wonderful when first seen,—these and other impressions remain indelible in the minds of people who knew the Overland Route as it once was.

The transport of cargo by these primitive methods was almost more difficult than that of passengers, more especially between Cairo and Suez, where every package had to be carried on camels' backs the distance of nearly a hundred miles. Many thousands of these animals were employed in connection with this work, which embraced not only the transport of mails and cargo, but of water from the Nile for the several desert stations, and for Suez; and what seems in the present day even more strange, the coal for the steamers in the Red Sea had actually to be carried across the Isthmus in the same manner. It is a curious fact that it was cheaper to send coal from Alexandria across the desert in this way than to send it round the Cape by sailing vessels to Suez. Indeed, not more than half a dozen vessels ever found their way up the Red Sea with coal during the whole time that the Company required to take fuel on board there. It is needless to say that the directors of the P. and O. Company were the first to urge upon the Pacha of Egypt the necessity of constructing a railway across the Isthmus, and the final accomplishment of this task in 1859, changed the character of the Egyptian transit to that with which the public has been familiar in later times.

Coal was then, as it is now, one of the Company's heaviest items of expenditure. The accounts from 1856, to 1865, inclusive, showed an expenditure for coal of no less than £5,250,000 sterling; or on an average, £525,000 per annum. During this time about 90,000 tons of coal were usually kept in stock at the different coaling-stations, distributed thus:—

Southampton	2,000 tons.	Calcutta	4,000 tons.
Malta	5,000 "	Singapore	8,000 "
Alexandria	6,000 "	Hong-Kong	10,000 "
Aden	20,000 "	Shanghai	6,000 "
Bombay	8,000 "	Yokohama	2,000 "
Point de Galle	12,000 "	King George's Sound	4,000 "
Madras	500 "	Sydney	1,500 "

In 1853, the P. and O. commenced running to Australia, but only in a small way as compared with the Australian service of the present time. A steamer, carrying the mail, was sent every other month to Sydney by way of Singapore, the arrangement with the Post Office being that the vessels on the main lines should keep up a speed of 12 knots an hour; upon the branch lines of not less than 10½ knots, and of not less than 8½ knots between Singapore and Sydney, in each instance without the aid of sails.

About this time there was a good deal of public complaint about the Indian mails, and the mails to the East generally, it being said that the P. and O. Company were specially favoured, whilst their ships were not of the best or fastest.

The Company, probably with the view of regaining its prestige, began then to put on some larger and finer ships, the first of these being the *Himalaya*, which was the largest steamer that, up to that time, the Company had owned; she was 340 feet in length, 44 feet 6 inches beam, and was fitted with engines of 2050 indicated horse-power. The *Himalaya* cost, when completed and ready for sea, £132,000. She was speedily followed by the *Candia*, of 1898 tons, which cost £69,200. After this came the *Nubia*, the *Pera*, and the *Colombo*, of 1840 tons each; then the *Simla*, of 2417 tons, the *Valetta*, the *Bengal*, and the *Vectis;* the cost of the whole of these vessels being upwards of £650,000.

In 1854, by the breaking out of the Crimean War, the mail service was much interrupted. Ships were wanted by the Government for the conveyance of troops to the Black Sea and the Baltic, and many of the P. and O. steamers had to be withdrawn from the mail service; the Bombay and China mail being made monthly instead of fortnightly, and the Australian mail discontinued altogether.

The interruption of the Australian mail service by the Crimean War induced the Colonial Legislature to come forward in 1856, with liberal grants towards the establishment of a regular monthly independent communication with Australia, and in May, 1856, advertisements were issued inviting tenders for such a service. Four tenders were sent in, two of which were at once set aside as ineligible, and the choice lay between the P. and O. Company, at £140,000 per annum, and an entirely new company called the European and Australian Steam Packet Company, at £185,000 per annum. The Treasury showed marked favour towards the new company by accepting its tender in spite of the large difference (£45,000 a year) between the two prices.

The European and Australian Company at this time actually owned only two steamers, which had been employed in the Crimean War, and when its directors learned that their tender had been accepted, they offered to dispose of the contract to the P. and O. provided that that company would purchase their two steamers. This the P. and O. declined to do, and the European and Australian Company at once entered upon what proved to be a most disastrous career. They opened the line in 1857, by chartering a Cunard steamer, the *Etna,* to leave Southampton, and a P. and O. steamer, the *Simla,* to leave Sydney, simultaneously. A few months later the European and Australian Company invoked the aid of the Royal Mail Company, and the most strenuous efforts were made to carry out the contract, but without success, and in less than two years the European and Australian Company was placed in liquidation, with a loss of over £700,000, according to a very circumstantial statement made on the subject by Lord Overstone in the House of Lords on the 24th of March, 1859. After this, for a number of years, the mail service to Australia was exclusively in the hands of the P. and O.

On the 17th of November, 1869, the Suez Canal was opened. It is strange to look back now to the incredulity which prevailed in England as to the prospect of that undertaking ever reaching a successful issue, and ever becoming, even in a minor degree, the channel of maritime communication between the East and the West. Its success was generally disbelieved in up to the very day when a fleet of vessels steamed through its course from the Mediterranean to the Red Sea. It would be impossible to keep the sand out; it would soon silt up;—all kinds of obstacles and difficulties were said to render the achievement impossible, and the very utmost that people ventured to admit was that it might perhaps become some day a channel for the transport of merchandise, in barges, in competition with the Egyptian Railway. The fallacy of these prognostications was very early made to appear, and the Suez Canal quickly revolutionized the entire maritime commerce of the East.

The Post Office utterly opposed the Canal, and Mr. Gladstone's Government, in 1870, altogether declined to allow that route to be adopted for the mails unless the P. and O. Company would consent to a very large reduction of the mail subsidy. To this the P. and O. very naturally objected, and the Post Office, therefore, on its part, objected to the mails being taken through the Canal. For nearly two years, therefore, the mails were actually landed at Alexandria, and were forwarded across Egypt in the old way, the steamer going through the Canal, and re-embarking the identical mails at Suez, a proceeding which the Post Office had no power to prevent, but which was regarded with the utmost disfavour.

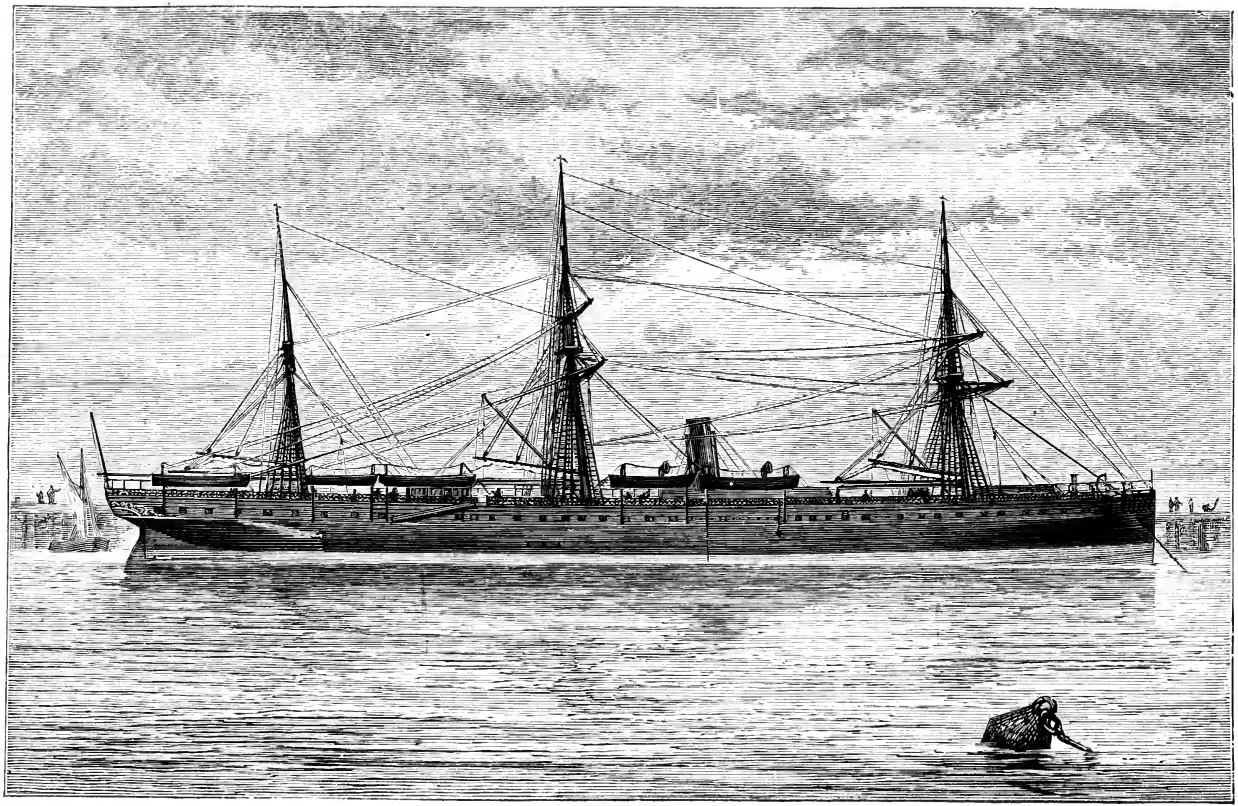
The thing was so manifestly absurd that at last an arrangement was come to by which the Company was allowed to take the mails through the Canal, but only in consideration of their relinquishing the sum of £20,000 a year out of the amount of the subsidy. The opposition of the English Government to the Canal was, however, not yet at an end; and in 1886, Mr. Gladstone being again in power, fresh tenders were invited for the whole of the India and China mails, it being made an essential part of the contract that the transit of the mails should be carried on exclusively by the Overland Route from Alexandria, and not through the Suez Canal. While submitting tenders in accordance with these conditions of the Post Office, the Directors of the Peninsular and Oriental Company felt that the time had now really come when the Suez Canal should be made the exclusive route for the mails, and that the transhipments and quarantine drawbacks involved by the land transport should be definitely abolished; and at last they induced the Government to acquiesce in this arrangement, and to withdraw their condition that the mails should be sent overland; since which time the Suez Canal has been the regular mail route to the East.

Immediately after the opening of the Canal, the P. and O. put on some larger ships built specially for the through service. Perhaps the finest of these was the *Khedive*, built in 1871, by Messrs. Caird and Company, of Greenock, by whom her engines were also constructed, at a total cost of £110,000, or a little more than £33 per ton, builder's measurement.

The contract times for the transit of the Eastern mails from London at present in operation are as follows:—

India mails	Bombay, 16½ days.
China mails	Shanghai, 37½ days.
Australian mails	Melbourne, 35½ days.

That we have not yet reached perfection, and that the times



P. AND O. STEAMER "KHEDIVE."

[*To face page* 156.

of transit of the various mails to the East may with advantage be still further reduced, will be seen from the following table:—

AVERAGE OF THE LAST THREE YEARS.

Terminal ports.	No. of arrivals.	No. of arrivals before the contract time.	No. of arrivals late.	Average number of hours that the steamer was before her time.
Melbourne	78*	77	1	71
Shanghai	78	77	1	74
Bombay	156	150	6	26
Brindisi (homeward)	156	153	3	42

Thus out of 468 mail deliveries during the last three years, only eleven instances occur in which the mails have been late; whilst, on the other hand, 457 mails were delivered considerably in advance of the contract time.

It will be interesting to note the following extracts taken from the official "Book of Regulations" and "Circulars" for "the safe and efficient navigation of the Peninsular and Oriental Steam Navigation Company's steamships:"—

"The Commander is responsible for the safe and efficient navigation of his ship; for internal discipline, and the comfort and satisfaction of the passengers; for receiving and delivering of cargo, and all questions arising thereon. He will take care that the several officers under his command are acquainted with these Regulations, and will remember that although the Engineers and other Officers on board may have specific, and to some extent, independent duties entrusted to them, yet that *he* will be held responsible by the Board for the *entire* management of his ship, and for the proper and efficient discharge of their duties by the several Officers of all departments. On the other hand, the Officers, Engineers, and all others borne on the ship's books, must distinctly understand that they are in all respects subject to the control and orders of the Commander, and that leave of absence, in all cases, can only be granted by the Commander, or the Commanding Officer for the time being, and the return to duty must be reported in like manner.

"*The Chief Officer.*—At sea, the Directors hold the Chief Officer jointly responsible with the Commander for the safe navigation of the ship, as well as for any accident by stranding, or otherwise; it is, therefore, his duty to be on the alert when the ship is making the land, or in narrow waters.

"*Navigation.*—The ship is never to be left without an Officer in charge of

* That is, once a fortnight; the alternative weekly mail being now taken by the steamers of the Orient Line, who now share the mail contract with the P. and O.

the deck, either at sea or in harbour. At sea the Officer in charge is to keep his watch on the upper bridge, and when on duty is not to converse with any person, or allow his attention to be diverted from his work. In case he believes the ship to be running into danger, it is his duty to act at once upon his own judgment, and take the necessary precautionary measures; he will, however, immediately, pass the word to call the Commander. No Officer is on any occasion to leave the deck during his watch, nor until he is relieved of his duty.

"With a view of providing for greater security, and to lessen the risk of collision, when the Company's vessels are navigating the English Channel, between a meridian line drawn from Ushant to the Lizard, and Gravesend, when crossing to any Continental Port, or using the Irish or North Sea Channels, between any ports there situated and the Thames, the Officers are to be divided into two watches for the purpose of look-out, etc., but only the Commander or Chief Officer will be recognized as in charge of the ship, and one of those Officers is to be on the bridge, no matter whether there is a pilot on board or not.

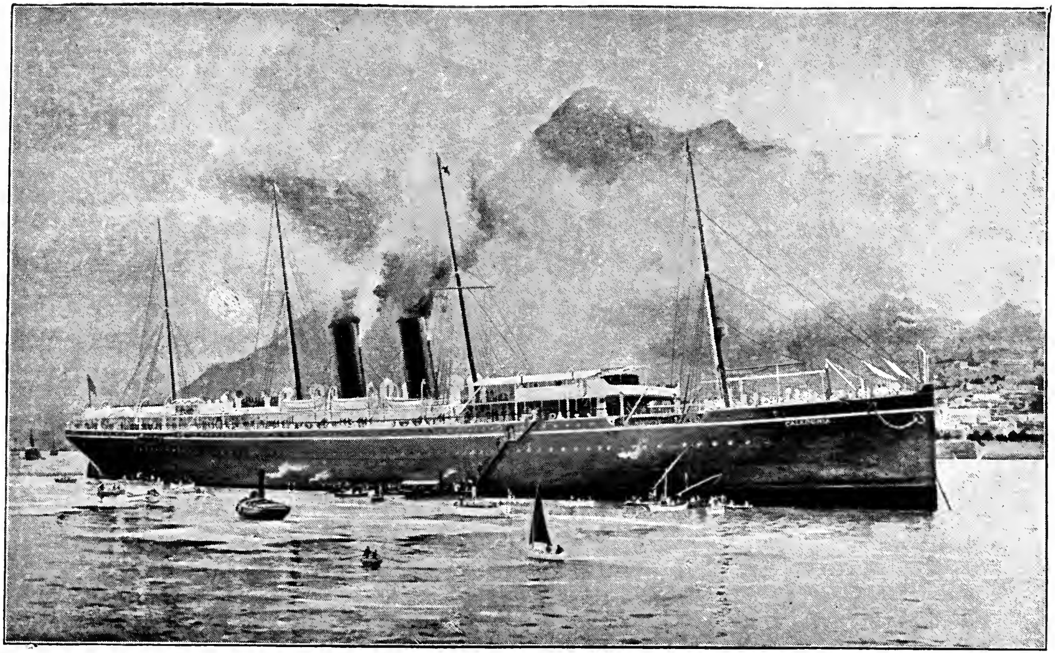
"Whenever a ship is in the vicinity of land—as, for example, the Gulf of Suez, Straits of Gibraltar, or Malacca, or running along the coast, such as the coast of Spain and Portugal, Malabar Coast, and Ceylon—then only two watches shall be kept, or, in other words, the duty shall be carried on watch and watch, the Chief Officer in charge of one, and the Second Officer the other, as provided for in the English Channel by the present Regulations.

"On approaching port, or when in narrower waters than the above—as, for example, the Straits of Perim, Bonifacio, or Mesina—then all hands shall be on deck and at stations for the purpose of ensuring a proper and efficient look-out.

"A most careful and vigilant look-out is to be kept at all times, both by day and night. By day there must always be one man on the look-out forward, under every circumstance of time and place. At night an A.B. and one Lascar forward, and a Lascar on the bridge, who are to call their stations when the bell is struck. This latter regulation is to be carried out also by day when the weather is thick or foggy, or extra precaution is desirable from the proximity of land, or shipping, or steaming in narrow waters. A look-out man is to be kept at the mast-head when in the vicinity of land, reefs, or shoals, and when any lights, or other leading marks on the line of route are expected to be made, either by day or night.

"A prudent berth is to be given to all headlands, islands, shoals, and the coast generally, and the Commanders are particularly enjoined, on nearing the land, or in places of intricate navigation, to take frequent cross-bearings of any well-defined landmarks that may be visible, and suitable for verifying the ship's position. Should the weather be either so dark, or so thick, as to obscure the usual landmarks, and the exact place of the ship not be accurately and unmistakably known, the engines must be eased, and, if necessary, stopped, and the lead kept going.

"The Directors desire to impress on the Commanders and Officers the great importance they attach to the use of the lead; not only must it be used on entering or leaving port, but at night, and in thick weather; whenever the



P. AND O. R.M.S. "CALEDONIA" AT GIBRALTAR.

[To face page 158.

land is being approached, or the ship is in proximity of danger. The use of the lead must not be confined to occasions where doubt as to the position of the ship may exist, but must be employed to verify the supposed place, even when there is every reason to presume that the same is correctly known."

The total present fleet of the P. and O. Company is 53 ships, with a total register tonnage of 142,320 tons.

The P. and O. has not, any more than any of the other great steamship companies, been entirely exempt from casualties, although upon the whole they have been exceedingly fortunate. Of recent years, perhaps, one of their worst misfortunes was the total loss of their steamer *Bokhara*, a ship of 2944 tons, and 2500 horse-power, which in 1893, in the midst of a typhoon, struck on the dangerous rocks which surround the Pescadores, a group of islands near Formosa, in the China seas, and foundered with all on board, only seven Europeans and sixteen Lascars escaping alive. The survivors found shelter in a deserted hut on the island, where they managed to subsist for a few days. Eventually the Mandarin at Makung heard of the wreck, and of the fact that there were a few survivors, and he accordingly sent for them, receiving them in splendid style, giving them champagne, excellent food, and new clothes. The whole party, in fact, lived for three days "like fighting cocks" at the Mandarin's expense. A steamer then took them to Faiwan Foo, and ultimately they got to Hong-Kong on board H.M.S. *Porpoise*.

In recognition of the friendly offices of the Mandarin of the Pescadores, the English Government presented him with a valuable piece of plate, and the presentation was publicly made to him on the quarter-deck of the *Porpoise*, a large body of Chinese being invited to witness the ceremony.

Their worst disaster of still more recent years was the total loss of the *Aden*, which occurred off the island of Socotra, at the mouth of the Gulf of Aden, in 1897. The *Aden*, Captain R. E. Hill, R.N.R., left Yokohama on the 23rd of April, 1897, with a number of passengers and a valuable cargo, calling at Colombo, which port she left on the 1st of June. She was a steel ship, built at Middlesborough in 1892, 366 feet in length, with a net registered tonnage of 2517 tons, her gross tonnage being 4200 tons; and she was fitted with triple-expansion engines working up to 3000 horse-power. The *Aden* was not one of the first-class mail-boats, but was what is termed an "intermediate boat," carrying some passengers, but relying principally on cargo. She carried six ordinary boats and three lifeboats, besides other life-saving appliances; she had a crew of 83 all told, of whom 23 were Europeans and 60 Lascars; and upon this occasion had 34 passengers on board.

The *Aden* had bunker capacity for 470 tons of coal, and as a great part of this had been burnt during the passage from Yokohama, she filled up with coal at Colombo, taking on board an extra 75 tons, which was for the most part placed on deck. These extra coals were taken on board in order to avoid calling at Aden, vessels touching at that port being at that time subject to quarantine. Having finished coaling at four o'clock in the afternoon of the 1st of June, the *Aden* left Colombo for Havre and London.

Owing to very bad weather in crossing the Arabian Sea, on the 5th and 6th of June, there being a strong south-west monsoon and a very heavy sea, it became necessary to lower the coal on deck; and in order to get the coal into the bunkers, the ship was brought head to sea at half speed on Monday morning, the 7th, so as to enable her to ride as easily as possible while the coal was being shifted. As soon as this work was completed, which was next day, full speed was resumed, the ship's course being altered more to the north, with the object of passing to the north of the island of Socotra.

After leaving Colombo the weather had been so bad that no observations had been possible until Tuesday, the 8th, when the ship's position was ascertained. At about 2.30 a.m. on Wednesday, June 9th, the weather being then very bad, and the night pitch dark, the ship struck heavily. The water at once began to pour into the engine-room and the stoke-hold, and in ten minutes the fires were extinguished and the electric light went out, the cabins and the saloon being filled with steam. Blue lights were burned and rockets discharged, and the boats were got ready for lowering as soon as daylight should appear.

All the boats on the weather side were destroyed by the heavy seas breaking over the ship, and attention was concentrated on those to leeward. One of the starboard boats on being lowered was struck by a sea, and broke adrift with three lascars in her. The chief officer, seeing this, jumped overboard and swam to recover her. The second officer was then sent in the cutter to recover the chief officer and the boat; but the fury of the wind and the tremendous seas swept both boats away, and neither of them was ever seen again.

Only one lifeboat, forward, on the starboard side, now remained, and this, with the third officer in it, was lowered to the rail, so as to embark the passengers, but continuous heavy seas pouring over the ship from windward carried away the after fall, and swept everybody out. The fourth officer let go the foremost fall, slid down and unhooked it, and so the boat righted. He then swam after the stewardess, who had been washed out of the boat, and got her on board again, the third officer saving two other non-swimmers.

The boat was again manned by the third and fourth officers, the surgeon, three stewards, the carpenter, and some lascars; and seventeen of the passengers, all ladies and children, were then lowered down into her. The order was issued—"No husbands in that boat"—so that some of the ladies absolutely refused to go, preferring to remain on the ship with their husbands rather than be separated from them at that terrible moment.

As the boat could not possibly remain alongside for a minute longer than was absolutely necessary, the captain ordered her to shove off at once, and to make for the land, which by this time was visible through the mist and spray. All on board the wreck anxiously watched the boat as she rose on the crests of the great waves. Twelve were pulling, apparently with all their strength, but instead of nearing the land, she was gradually being carried away from it by the tremendous force of the storm. She was visible until she was about a mile and a half off, and then was lost to sight in the gloom and haze. After this she was never seen or heard of again.

The captain, the third and fourth engineers, and seventeen of the passengers, together with the greater part of the lascars, remained on board the ship, the former taking refuge amidships, of whom eight were, one by one, washed away; whilst the lascars crowded together in the fore part of the vessel.

After the boat left the ship the weather became, if possible, worse, and from early morning on the 9th until four o'clock in the afternoon green seas kept continually pouring over the ship. One of these seas caught the captain, dashing him over to leeward, and breaking his leg in two places; and before any one could go to his assistance another great sea came and washed him away altogether.

For seventeen days the survivors, Europeans and lascars, remained upon the wreck, which was firmly fixed on the rocks, a mile south-east of Ras Radressa, at the eastern extremity of the island of Socotra, an island which is 70 miles long and 25 broad. During this time several steamers were seen to pass, and the lascars did all they could to signal them; but either the signals were not seen, or the weather was too bad for a vessel safely to approach the scene of the disaster; the consequence being that these people were left on the wreck until the 26th of June, when they were ultimately rescued by the *Mayo*, a Government steamer, which, with two P. and O. steamers, the *Rohilla*, and the *Hydaspes*, had been sent out to look for the *Aden*, and to render any assistance that might be required.

The whole of the Red Sea, although the highway for innumerable ships, is very insufficiently lighted, if it can be said to be lighted at all; and the need of some kind of a light on Cape Guardafui, or on Socotra, has long been urged upon the authorities. A correspondent of the *Times*, writing shortly after the *Aden* disaster, quoted a remark of the captain of the Orient liner *Orizaba*, who once said, "They never will put a light on Socotra until some P. and O. boat has been lost there." This condition has now been fulfilled.

Since the loss of the *Aden* the P. and O. have suffered another very heavy blow in the total loss of the *China*, one of their newest, largest, and finest boats, which was put ashore off the island of Perim at the entrance of the Red Sea. Fortunately upon this occasion no lives were lost, so that it was a matter which chiefly concerned the shareholders of the Company and the captain, whose certificate was dealt with by the Court of Inquiry, held after the wreck.* More recently still —that is to say, on July 1, 1898, another of their large steamers, the *Ganges*, was burnt in the harbour at Bombay, so that during the last year or two the P. and O. would appear to have had their full share of misfortunes.

* See the Company's Regulation, page 158, "On approaching port, etc." In September, 1898, the *China*, which had been ashore, and full of water, for over three months, was successfully got off the rocks, and taken into the harbour of Perim, to be temporarily repaired, preparatory to sending her to England.

CHAPTER XIII.

The Royal Mail Steam Packet Company—Commencement of the Company—The first subsidy—The first year's balance-sheet—The first ships—The amount of the subsidy reduced—The *Tasmanian*—Disasters among the fleet—The loss of the *Amazon*—Further disasters—The recent mail contracts—The present fleet—Freights—Treasure and specie.

The Royal Mail Steam Packet Company, perhaps more generally known as the West India Mail, was started in 1839, the Charter of Incorporation being dated September 26th of that year; it is consequently one of the oldest of the existing steam-packet companies. It runs two lines of steamers from Southampton, one fortnightly to the West Indies and Central America; the other, once a fortnight, to Brazil and the River Plate.

In March, 1841, the Royal Mail Steam Packet Company entered into a contract with the Government for the conveyance of the mails between England and the West Indies; and they commenced business upon a larger scale than any other company had ventured to do up to that time. They began with fourteen large steamships, representing a tonnage of 25,000 tons, all of them being fitted with engines of not less than 400 horse-power.

The conditions of the contract between the Company and the Government were for a fortnightly mail service to the island of Barbadoes, *via* Corunna and Madeira. After staying at Barbadoes not longer than six hours, the steamer was to proceed, *via* St. Vincent, to Grenada, where the stoppage was not to exceed twelve hours; and from thence the course was to be *via* St. Thomas, Hayti, Santiago-de-Cuba, to Port Royal, Jamaica. At Port Royal a longer stay was not to be made than twenty-four hours; and the steamer was then to proceed to Havana. For this mail service the Company was to receive £240,000 a year for ten years, from the 1st of January, 1842.

Large as this subsidy appears, yet from the total inexperience of the directors in the management of steamships, and from the fact that the commanders of the steamers were, for the most part, naval officers, who knew but little of steam, and nothing whatever of the requirements of a merchant ship, the first year's balance-sheet showed a deficit of no less than £79,790!

The first steamer carrying the mail under this contract was the *Thames*, which left Falmouth on the 3rd of January, 1842; and she was followed at intervals of a fortnight by the *Dee*, the *Medway*, the *Teviot*, and the *Trent*. For eight years the Royal Mail ran only to the West Indies, but in 1850, upon the Company undertaking to provide a monthly mail service to Brazil, to accelerate the speed of the West Indian line from eight knots an hour to ten knots, and to add five new steamers to their fleet, each of 2250 tons, and 800 horse-power, the Government granted a renewal of the mail contract for another ten years, with the annual subsidy increased from £240,000 to £270,000.

After a time a public outcry was raised against such large sums being annually paid to the Royal Mail Company for the mail service, and several members of the House of Commons insisted upon the matter being thrown open to public competition. The directors, seeing clearly that one of two things would happen; either that they would have to do the work for less money, or that they would lose it altogether, adopted the former alternative, and in 1874, accepted an annual subsidy of £86,750, being considerably less than a third of what they were receiving in 1850.

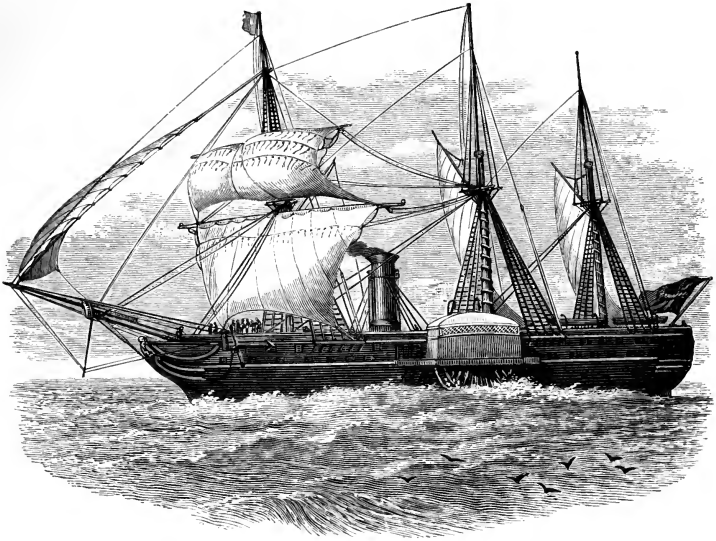
The Company at the same time resolved to maintain a higher state of efficiency in their fleet, and determined to build some new steamers which should attain a higher rate of speed than any of their existing ships; and in the year 1871, the *Tagus* and the *Moselle* were launched from the yard of Messrs. John Elder and Co. The *Tagus*, which was a vessel of 2789 tons, and 600 horse-power, attained a mean speed of 14·8 knots per hour on her trial trip; whilst the *Moselle*, a sister ship, of 3200 tons, surpassed her, having made 14·9 knots per hour as the average of four runs over the measured mile.

About the same time the Company purchased the *Tasmanian*, an iron screw-steamer, from the unfortunate European and Australian Steam Navigation Company.* This steamer, which in 1871, was fitted by Messrs. John Elder and Co. with new compound engines, made her first voyage to St. Thomas in 338 hours (14 days 2 hours) with a consumption of only 466 tons of coal, although before she was newly engined she consumed 1088 tons of coal on a run of 349 hours.

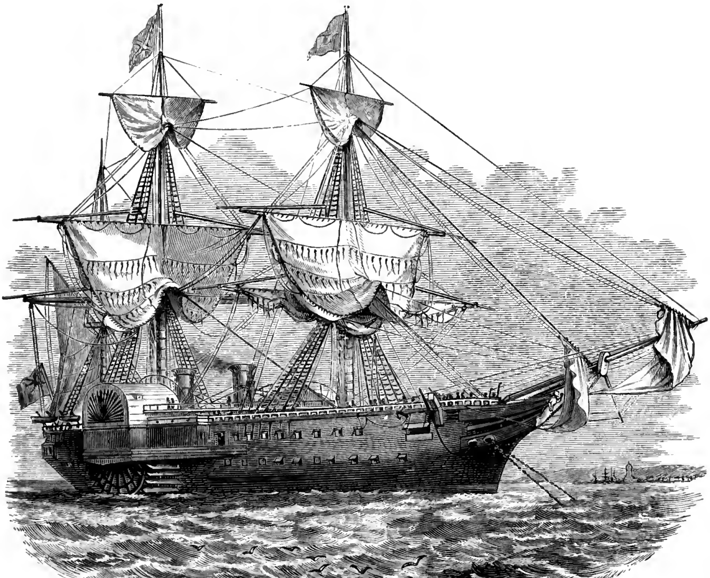
The steamers of the Royal Mail Steam Packet Company were all exceptionally strongly built, with a view to their carrying heavy guns, and that they might, should war arise, with very little cost be made serviceable for the purposes of the Royal Navy. In spite, however, of their being provided with fine ships, the Company was singularly unfortunate, losing in the first ten years of its existence no less than seven large steamers. The first catastrophe was the loss of the *Isis*, off Bermuda, on the 8th of October, 1842. This was succeeded, on the 15th of April of the following year, by the loss of the *Solway*, twenty miles to the west of Corunna, when the captain, some of the officers, crew, and passengers, sixty in all, were lost. The third ship was the *Medina*, which was wrecked on the 12th of May, 1844, on a coral reef near Turk Island, in the Bahamas. The fourth ship was the *Tweed*, which was lost on the 12th of February, 1847, on the Alicranes reef, off Yucatan, in the Gulf of Mexico. Her crew and passengers amounted upon that occasion to 151 persons, of whom 72 were drowned. On the 1st of February, 1849, the *Forth*, which was one of the largest steamers of the Company, being of 1900 tons, and 450 horse-power, was totally lost on the same reef; and in 1850, the *Actæon* was wrecked off Carthagena. But perhaps the most terrible catastrophe of all that befell the Royal Mail Steam Packet Company was the loss of the *Amazon*, which occurred in 1852.

The *Amazon* was built by Messrs. R. and H. Green at Blackwall in 1851. She was the largest wooden merchant ship that had been constructed up to that time, being 300

* See the reference to this Company in the preceding chapter.



ROYAL MAIL COMPANY'S STEAMER "FORTH."



ROYAL MAIL COMPANY'S STEAMER "AMAZON."

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feet long, 41 feet beam, and 32 feet in depth. She was 2256 tons register, and was, like all her predecessors, a paddle-wheel steamer. Her engines, constructed by Seaward and Capel, of Millwall, were of 800 horse-power, the diameter of the cylinders being 96 inches, and the stroke 9 feet. The paddle-wheels were 41 feet in diameter, and made fourteen revolutions per minute, giving a speed by log of 11 knots per hour on her trial trip.

When surveyed by the Admiralty previous to her departure from Southampton, she was reported capable of carrying, in case of being wanted for warlike purposes, fourteen 32-pounders, and two 10-inch pivot-guns of 85 cwt. each, on her main deck. Her coal-bunkers were constructed to carry 1000 tons of coal; and as she was reckoned to burn 60 tons a day in her 26 furnaces, it was calculated that she would carry over sixteen and a half days' supply, if she were going at full speed. She was magnificently fitted up, and had cost, when ready for sea, rather over £100,000.

On Friday, the 2nd of January, 1852, the *Amazon*, under the command of Captain Symons, left Southampton for the West Indies, with a crew of 110, together with 50 passengers, and a large and valuable cargo. She was to go direct to St. Thomas, at which point branch packets were to meet her for the various West India Islands, and for the Gulf of Mexico.

On the day after she left Southampton, while steaming at the rate of nine knots in the teeth of a strong gale from the south-west, some of the bearings of the engines showed signs of heating, and twice the engines had to be stopped in order to cool them, in one instance for over two hours and a half. After this the engines appeared to work better, and showed no further signs of heating. But the next day, at midnight, when the ship was about 110 miles west-south-west of the Scilly Islands, the watch on deck discovered, to their dismay, that a fire had broken out suddenly, on the starboard side, forward, between the steam-chest and the galley, the flames at once rushing up the gangway in front of the forward funnel.

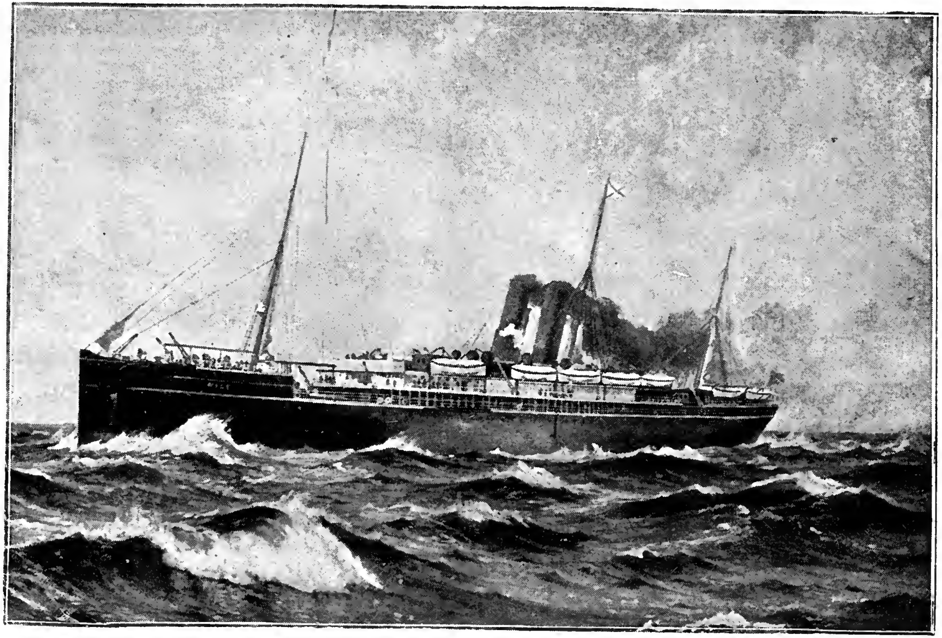
The alarm-bell was at once sounded, and immediately Captain Symons and the officers were on deck, but only to find that the flames were being spread by the gale in every direction, and that already the fire was far beyond anything that buckets of water or wet blankets could do to allay it. Unfortunately, it was some little time before the fire-pumps could be rigged, and meanwhile the fury of the fire remained entirely unchecked.

The greatest terror and confusion ensued. Passengers and crew rushed on deck in the wildest dismay; and to make matters worse, the fire and the smoke had driven the engineers from the engine-room, so that the engines could not be stopped, and the *Amazon* was dashing through the waves at full speed, which with the strong gale that was blowing, caused the fire to rage with additional fierceness.

Recourse was now had to the boats, of which there were nine on board, five of them being lifeboats; but, as is too often the case, they were not clear, and could not easily be lowered. Two of the largest boats were stowed on the top of the sponsons, just where the fire was at its worst, and they could not even be got at. The mail-boat was lowered, and was instantly filled, five and twenty people crowding into her; but before she could get away from the ship she was swamped, and the whole of her occupants were drowned. The pinnace, when lowered, sheered across the sea before the people in her could unhook the fore-tackle, and they too, were all washed out and drowned, except two men who clung to the thwarts, and were able to scramble back to the ship. The boat itself, which hung by the single tackle, was soon afterwards dashed to pieces against the sides of the ship.

At last, by great efforts, fourteen of the crew and two of the passengers succeeded in lowering one of the starboard lifeboats, and managed to get clear of the ship; whilst nineteen of the crew and six of the passengers got away in another. A young midshipman named Vincent, the chief steward, one young lady passenger, and two sailors, managed to lower the dinghy, and so escape. These forty-six persons were all that were saved out of a hundred and sixty-one who had left Southampton in the *Amazon* only two days previously.

Between three and four o'clock in the morning the main-mast of the vessel fell over to starboard, and almost immediately



R.M.S. "NILE."

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afterwards the fore-mast went over to port. The mizen-mast and the two funnels were still standing, but the ship was then simply one great furnace. Even then, at the extreme end of the jib-boom, was seen one poor fellow clinging on, but he, too, soon after perished. At five o'clock the gunpowder in her magazine exploded; and in about a quarter of an hour later the mizen-mast went over the side, and the *Amazon* went down bow foremost, the funnels still standing, but red hot.

Besides the loss of the *Amazon* the Company received another heavy blow in the loss of the *Demerara*, which was stranded at Bristol; while still more recently,—in 1886—one of their steamers, the *Humber*, left Southamptonon the 1st of December, for Brazil, with a crew of 56 hands and a number of passengers, and was never again heard of.

The Company are their own underwriters, and even in spite of all these disasters the insurance fund has proved a fairly remunerative one for the shareholders, who have received nearly fifty per cent. of the amounts transferred to it; in other words, the Company have done fifty per cent. better than insuring outside.

A new West Indian contract for five years was commenced on July 1, 1880, the subsidy being £80,000 per annum. In 1885, it was renewed for £90,000 a year. In 1890, it was again renewed for five years' at £85,000; whilst in 1895 another five years' contract was taken at £80,000 a year.

At the present time the Royal Mail Steam Packet Company owns twenty-two fine steamers, representing a tonnage of nearly 80,000 tons; the most recent addition to the fleet being the *Nile*, an extremely handsome ship, of 5946 tons, and 7500 indicated horse-power. She is employed in the Brazilian service, to Rio de Janeiro and the river Plate, as also is her sister ship, the *Danube*. There are six arrivals and six departures each month, four being mail steamers—the fortnightly mail to the West Indies and the fortnightly mail to the Brazils, and two what are called intermediate boats.

The Company has a large passenger and freight trade from England, and there is a large emigration trade from the Spanish and Portuguese peninsula to Brazil and the River

Plate. Freights, however, as is the case with every other line of steamers, are very low now compared with what they used to be. For what, in 1850, the Company were getting seven or eight pounds a ton, they are now getting about thirty shillings. The same remark applies equally to treasure and to specie, the trade being cut into, not only by other English companies, but also by foreign vessels. About 1855, a French line of steamers was started to the West Indies, and later on a French line to Brazil, and the River Plate, both heavily subsidised by the French Government; so that as a rule there is now, besides the Royal Mail boats, a large steamer from Europe arriving in Rio de Janeiro nearly every day. Most of the treasure and specie came from the Pacific ports north and south of Panama, and from the Gulf of Mexico. The greater part was silver, and the rate of freight was over one per cent., so that it was exceedingly remunerative; now the rate is not half that, whilst at the same time the amount of silver coming to this country is nothing like what it used to be; the great bulk of the silver going now to San Francisco, and thence across the Pacific to China and Japan.

In September, 1860, one of the West India boats arrived in Southampton with treasure to the value of £1,243,000. The weight was 156 tons 5 cwt., and the money and bars of silver were contained in 2124 packages, which filled thirty-six waggons, drawn by a hundred and thirteen horses from Nine Elms to the Bank of England.

CHAPTER XIV.

The Orient Line—The early ships—The *Orient*—The present fleet—The *Ophir*—Auxiliary steamships—The Union Steamship Company—The first ships—Their present fleet—The *Scot*—The lengthening of the *Scot*—The *Norman*—The *Briton*—The Castle Line—The steamers of the Castle Line—The loss of the *Drummond Castle*—The Allan Line—The White Star Line—The American Line—The Inman Line—Other great steamship lines.

The trade to the Mediterranean and to the Australian Colonies by way of the Suez Canal was clearly of far too valuable a nature to be left very long exclusively to the P. and O.; and in 1877, the two well-known shipping firms of Anderson, Anderson and Co., and F. Green and Co., started a new line of steamers to Australia under the name of the Orient Line, and the first steamship to leave London under the new flag of the Orient Steam Navigation Company was the *Garonne*.

Besides the *Garonne*, the other original steamers of the new Company were the *Lusitania*, the *Chimborazo*, and the *Cuzco*, ships previously employed in the trade between Liverpool and the Pacific ports of South America. The *Cuzco* was built in 1870, by the firm of John Elder and Co., and the *Chimborazo*, a sister ship, was launched from the same yard in 1871. The *Garonne* was also built in 1871, but by Robert Napier and Sons. These ships were all very much alike, and although large for their time, yet look small now, when seen in proximity to the much larger ships of the present day. They were each 370 feet in length between perpendiculars, 41 feet beam, and 35 feet depth of hold, and were all of about 3850 tons, gross tonnage. They used to make the voyage from Liverpool to Valparaiso in forty-two days.

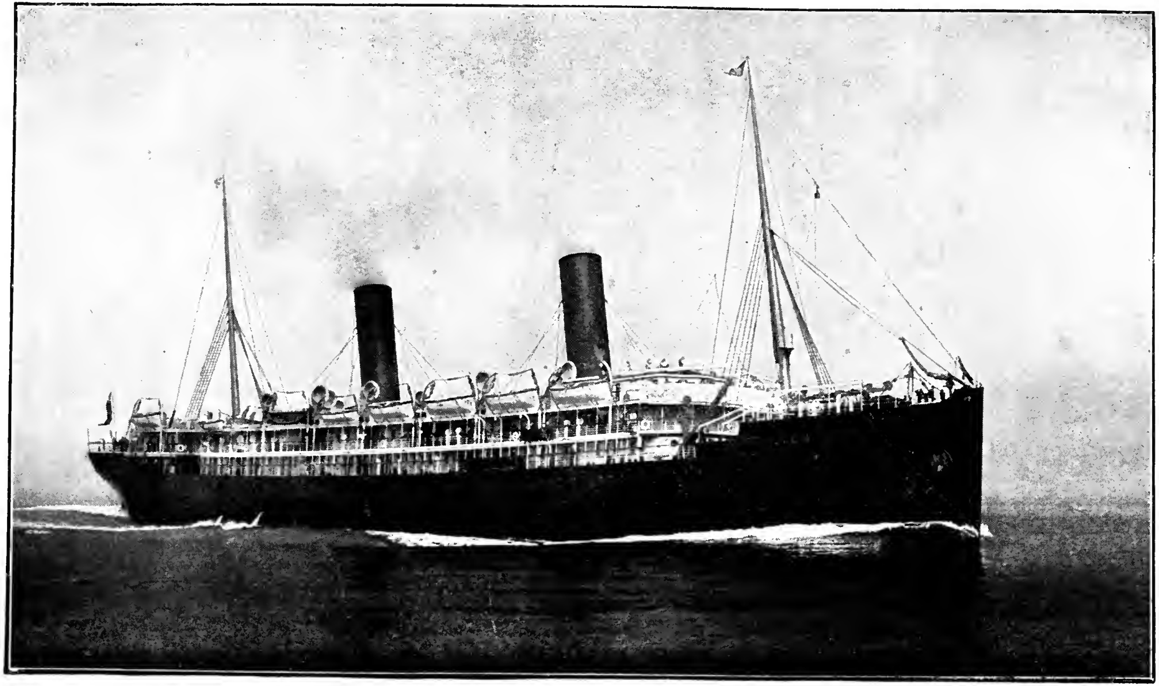
These comparatively small vessels were very soon supplemented, and afterwards entirely superseded, by much larger and faster ships, the first to be placed on the line being the *Orient*. She was built and engined on the Clyde by Messrs. Elder and Co. Her principal dimensions are: length between perpendiculars, 445 feet; breadth, 46 feet; depth, 36 feet 10 inches; gross tonnage, 5385 tons; and displacement weight 9500 tons. Her engines are of 5500 indicated horse-power, and her average speed at sea is 14½ knots.

The *Orient* has four masts, three iron decks, and is divided by bulkheads into thirteen water-tight compartments. She can carry, in addition to 3000 tons of Welsh coal for her own consumption, 3600 tons of measurement cargo. She has passenger accommodation for 120 first-class, 140 second-class, and 300 third-class passengers. If she were required as a transport, and was entirely devoted to troops, the *Orient* could convey 3000 men and 400 horses, with all their proper stores, at one and the same time.

The *Orient* is fitted with compound engines, having three cylinders—one high-pressure cylinder of 60 inches diameter, and two low-pressure cylinders, each of 85 inches diameter. The propeller is four-bladed, the diameter of the screw being 22 feet, and the pitch 30 feet. The steam is supplied by four boilers, each 15 feet 6 inches in diameter by 17 feet 6 inches long. The vessel is fitted with steam steering-gear, steam windlass, five steam winches, and has in all sixteen separate steam-engines for different purposes on board.

The present mail fleet of the Orient Line consists of nine ships, with an aggregate register tonnage of 28,066 tons; some of the ships, however, sailing under the Orient flag—as, for example, the *Oroya*, the *Oruba*, and others—belong to the Pacific Steam Navigation Company, and simply sail in the Orient Line.

The latest addition to the Orient fleet is the *Ophir*, twin-screw, which, although a larger and much more powerful steamer than the earlier ship, the *Orient*, is hardly as handsome a vessel as that ship. She is 3223 tons register, 6900 tons gross, and her displacement at the load-line is 12,362 tons. Her length is 482 feet; beam, 53 feet 6 inches; and depth, 37 feet.



ORIENT LINER, THE "OPHIR."

[To face page 172.

She is fitted with triple expansion engines, working up to 9500 horse-power. The two sets of engines for working the twin screws are placed side by side in the ship, with a water-tight bulkhead running fore and aft between them, so that if from collision or any other cause one set of engines were disabled, and one of the engine-rooms full of water, the ship could still steam ahead with the other set of engines. The high-pressure cylinder of each engine is 34 inches diameter, the intermediate cylinder 51½ inches, and the low-pressure 85 inches, the stroke being 54 inches. The two screws have a pitch of 23 feet 4 inches, and at 102 revolutions made a knot on the measured mile in 3 minutes 12 seconds, or at the rate of 18·75 knots per hour; but with an average of 82 revolutions the *Ophir* steamed from the Cloch Light, in the Clyde, to Southend, at the mouth of the Thames, in 48 hours. For 500 miles of this trip she gave a speed of 16 knots, with a coal-consumption of 110 tons in 24 hours.

The boilers are seven in number, and they work at a pressure of 160 lbs. to the square inch. They are divided into two groups, four of the boilers being placed in a compartment next the engines, while the other three are in a separate boiler-room thirty feet distant, with coal-bunkers between. This arrangement has necessitated the great distance, more than a hundred feet, between the two funnels. The *Ophir* has simply two pole-masts, as, being fitted with twin screws, she is not required by the Board of Trade to carry any canvas. This, of course, is a practical, common-sense arrangement, but not an arrangement at all conducive to the beauty of the ship. As a partial preventative against rolling, the *Ophir* is fitted with deep bilge-keels.

The Orient boats leave the Tilbury Docks for Australia every other Friday, working the weekly Australian mail alternately with the P. and O. boats; and for this they receive from the Government an annual subsidy of £85,000. The steamers call at Plymouth to embark the heavy portion of the mails the day after leaving Tilbury; four days later the ships are due at Gibraltar; and nine days after leaving Tilbury they are at Naples. The ships go through the Canal, calling at Colombo, and arrive at Albany, Australia, in 39 days from the

Thames, and Sydney in 48 days. The mails, which leave London a week later than the steamer, and which travel by Dover, Calais, and Paris into Italy, are taken on board at Naples, thus reaching Albany in 32 days from London, and Adelaide in 36 days; from whence they are sent on by rail to Sydney.

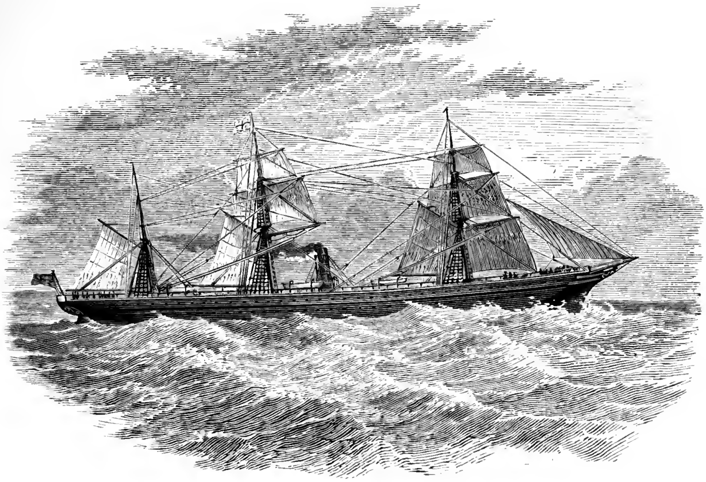
The Orient Company, when first established, sent their ships, on the outward passage, round the Cape of Good Hope, and they came home by the canal; now they go through the Canal both going out and coming home.

Before steam had made such progress as it has done during the last forty years, a kind of compromise was proposed between steam and sails, resulting in what were called auxiliary screws; and in 1856, Mr. W. S. Lindsay undertook to convey in seven steamers of this description the mails between London and the Cape of Good Hope.

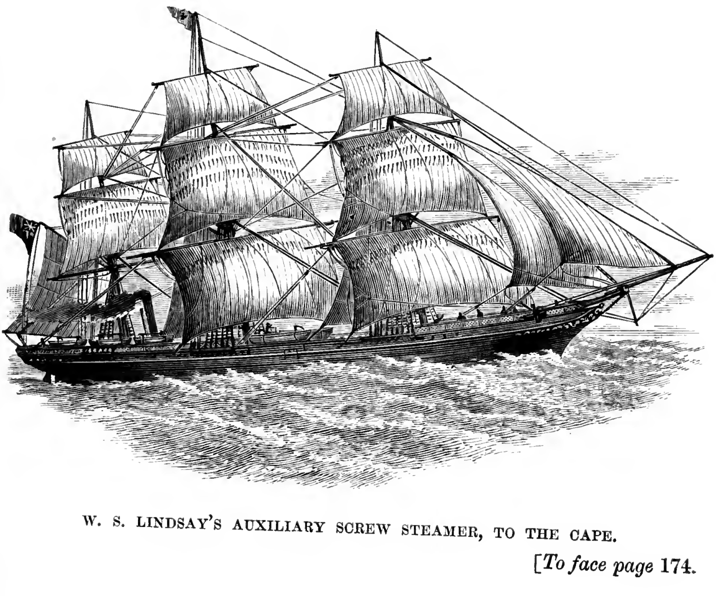
The vessels thus employed were built entirely of iron, and were ship-rigged; and as their engines were only from 80 to 120 horse-power, nominal, on a tonnage of from 800 to 1500 tons, gross, they were purely auxiliary steam vessels. Under sail their speed was from 10 to 11 knots with a favourable wind, and under steam alone from 6 to 7 knots in light breezes or calms; but with adverse winds they made little or no progress, a fact arising in great measure from their small steam-power, and from the resistance that their heavy spars presented to the wind, so that after running for twelve months these vessels were taken off and the scheme was relinquished.

At the present time two large companies practically divide the trade between England and the Cape of Good Hope, the Union Steamship Company and the Castle Line, the latter belonging to Messrs Donald Currie and Co.

The Union Steamship Company was the first in the field. It was started in 1853, under the title of the "Union Steam Collier Company," and commenced business with a fleet of five steamers, the *Briton*, the *Saxon*, the *Union*, the *Norman*, and the *Dane*. In 1857, a contract was obtained for a monthly mail service to the Cape of Good Hope, for five years, at a subsidy of £30,000 per annum. The charge made by the Post Office for carrying letters at that time to the Cape was a shilling



ORIENT LINE STEAMER "CHIMBORAZO."



W. S. LINDSAY'S AUXILIARY SCREW STEAMER, TO THE CAPE.

[*To face page* 174.

per half-ounce, and the contract time between England and Cape Town was thirty-seven days. At the expiration of the first contract it was renewed, and for some years the Union Company had a monopoly of the mail service to the Cape; but a further extension of their contract in 1868, by Mr. Robert Lowe, then Chancellor of the Exchequer, met with so much opposition that the House of Commons refused to ratify it, and the Union Steamship Company's rights were allowed to expire in 1876.

When the postal contract was renewed in 1876, the mail service was equally divided between the Union Company and the Castle Line, which had then been started some three or four years, an arrangement ever since adhered to, and recently confirmed for a period of seven years dating from October, 1893, the Post Office charge for letters being reduced to the uniform rate of 2½*d.* the half-ounce, and the contract time to nineteen days.

After obtaining the mail contract larger vessels were continually being added to the fleet, eventually entirely superseding the original small boats; the *Arab*, of 1962 tons register, being in 1870, the largest of the Company's ships. This steamer was followed by still larger vessels, among them being the *Moor*, the *Spartan*, the *Mexican*, and others. The *Mexican*, which may be taken as a representative of the rest, was of 2941 tons register, and 600 horse-power, nominal, working up to 4600 horse-power. Her length was 378 feet, breadth 47 feet, and depth 29 feet 3 inches. Her speed usually averaged 14 knots. Her fastest passage out from Southampton to Cape Town was 17 days; and her fastest passage home from Cape Town to Southampton, 17 days 12 hours.

Now a new departure was to be taken in the type of ship. Hitherto, in common with all the lines of ocean steamers, the vessels were sailing-ships fitted with engines and screw-propellers; and as a rule they had three masts, with yards on the fore and main masts, the sails being largely relied upon for the safety of the ship. A new pattern was now to come into vogue; and nautical men all allow that it is by vessels of the new type that the greatest triumphs have been won,—the greatest victories over time and space. Instead of masts the new ships have merely poles, useful for signalling purposes. The vessel is not a modified sailing-ship, but a steamer expressly built for going by steam alone, and not by wind.

Of such a type was the *Scot*, twin-screw, launched on the 30th of December, 1860, from the yard of Messrs Denny, of Dumbarton. She was the largest steamer up to that time in the Cape trade, being of 3169 tons register, fitted with engines of 1254 horse-power, nominal, working up to 12,000 horse-power. Her length over all was 500 feet, breadth 54 feet 6 inches, and depth 37 feet 6 inches. Her speed was 17 knots; her fastest passage out from Southampton being 14 days 11 hours; and her fastest home, 13 days 23 hours.

The performances of the *Scot* were, however, not considered entirely satisfactory, and in 1895, it was determined to have her cut in half and lengthened. Although the cutting in half, and the lengthening of a great ship is not altogether an unusual or by any means a rare occurrence, yet it is not an everyday operation, and as it is one involving a considerable amount of skill, care, and nicety, it may be well to describe the lengthening of the *Scot* somewhat in detail. When the determination was come to that the *Scot* should be lengthened, it was decided to send the ship to Messrs. Harland and Wolff, of Belfast, who had then just completed the *Norman* for the Union Company, and to have her length increased by 54 feet amidships. Messrs. Harland and Wolff engaged the Alexandra Graving Dock at Belfast, one of the largest dry-docks in the world, in which to execute the somewhat delicate operation of cutting the *Scot* in two just forward of the foremost boiler-room bulkhead, hauling the two halves asunder, and adding the required 54 feet.

When the ship had been docked, the water was pumped out of the dock, and time allowed for the settlement of the ship on the keel blocks, specially prepared, of hard wood capped with iron plates. The work was then commenced for moving the forward part of the hull. Regular launching-ways were laid underneath the vessel, supported at short intervals on blocks of timber and wedges extending from amidships to between fifty and sixty feet beyond the stem. Thoroughly level and well-greased blocks of timber in pairs, 18 inches square, were laid as a base for the cradle, to support the ship and to steady the whole during the operation of moving. Meanwhile drillers were hard at work boring out all the rivets in the shell-plating, frames, stringers, etc., in line with the midship water-tight bulkhead. The stanchions carrying the promenade deck were also removed as far aft as the line of separation, strong shore-timbers being firmly fixed to the edge of this deck by angle-irons and chains, the lower ends resting on wedges. The lower edges of the various houses on the under-deck were then severed by all the rivets being bored out, chains and screws for tightening being attached at the bottom to short lengths of angle-iron bolted to a stringer, their ends being securely bolted to the outer edges of the framing of the promenade deck.

A cradle was gradually erected under the vessel, and kept in place at the head by angle-irons at the top and sides where it touched the hull, rivetted to the skin of the ship; and at bottom by stretchers of timber, and chains made fast to eye-bolts passing through the bottom binder. Strong chains were slung from the top binder, passing under the keel to prevent lateral motion. To enable the hauling-gear to be attached to the hull a pair of heavy angle-iron bars were bolted near the keel almost amidships, to which massive chain cables were connected by shackles, and then led forward inside the launching ways with heavy blocks at the outer end, through which the hauling-ropes were rove; straps of bar-iron and double angles were bolted to the ship's sides—four on each side—to which chains and steel hawsers were attached, further to assist in the hauling. Two steam winches were placed on each side of the dock-gates bolted to great logs of timber, and secured to the ground by angle-bars, and further rendered immovable by some tons of pig-iron resting on the logs. The winches were supplied with steam from one of the harbour-commissioners' boilers, these winches being assisted by a couple of capstans.

Everything being now ready, operations were begun shortly before ten in the morning, and in an incredibly short space of time the huge mass of the fore part of the ship, set in motion by hydraulic jacks placed inside amidships, commenced to move ahead. The winches and capstans coming into play kept it going, and in ten minutes the cradle-supports coming in contact with the stop-blocks, 54 feet ahead, showed that the great undertaking was successfully completed. It was subsequently found that there had not been the slightest deviation—horizontal or vertical—in the parts moved, thus showing how mathematically accurate had been the calculations, and how adequate the preparations for the operation.

The work of filling in the new portion of the vessel was but a small matter in comparison with the difficulties attendant on the cutting asunder and moving the fore part of the ship, although even here, by means of frames and stringers, every endeavour was used to make the ship stronger than she originally was.

On Saturday, July the 18th, 1896, the *Scot*, fifty-four feet longer than she was before, left Southampton again for the Cape.

In November, 1894, the steel twin-screw steamer *Norman*, the next addition to the Union Company's fleet, sailed on her first voyage from Southampton to the Cape. She was built by Messrs. Harland and Wolff, and was, until the advent of the *Briton*, the largest ship in the Cape trade. Her length between perpendiculars is 490 feet; length over all, 502 feet; beam, 53 feet; depth, 37 feet 6 inches. Her gross tonnage is 7537 tons; register tonnage, 4005 tons; and her engines are of 1393 horse-power, nominal. She is built throughout of steel, and is fitted with twin screws, each screw being driven by a separate set of triple expansion engines, the steam for which is supplied by seven boilers. The main shafts are $17\frac{1}{4}$ inches in diameter, and 149 feet in length. The amount of coal burnt in twenty-four hours when steaming full speed is 145 tons, the average speed of the ship being from 16 to 17 knots. The *Norman* is very handsomely fitted up with all the luxury of the most up-to-date ocean liner; she has accommodation for 420 first, second, and third-class passengers, and is capable of carrying in addition about 4000 tons of cargo. She is painted white externally, and has two buff-coloured funnels and two pole-masts.

THE UNION COMPANY'S R.M.S. "BRITON."

(*From a sketch by W. L. Wyllie, A.R.A.*)

[*To face page* 178.

It may be mentioned, as affording another instance of the immense progress that has been made in ocean mail steamers during the last forty years, that in November, 1857, the first *Norman* of this Company left Southampton for the Cape, being only of 460 tons burden, having accommodation for 20 passengers, and carrying in addition 500 tons of cargo. Her average rate of steaming was 7 knots, and she usually made the passage to the Cape in 42 days. The present *Norman* has made the passage from Southampton to the Cape in 14 days 21 hours, thus keeping up an average speed during the whole passage of 16·75 knots per hour.

The most recent ship of the Union Company is the *Briton*, a twin-screw of 10,248 tons. She is 530 feet long, and 60 feet beam, and is the largest and finest vessel which has ever connected England with South Africa. She is entirely constructed of steel, of which no less than 5600 tons were used in her hull alone; the frames number 214, whilst many of the plates are 29 feet long by 4 feet 6 inches in width, varying in thickness from $\frac{17}{20}$ of an inch to $1\frac{1}{20}$ inches. There is a double bottom extending the whole length of the ship capable of taking 1300 tons of water ballast, and she is fitted with nine water-tight steel bulkheads extending from the floor of the ship to the upper deck.

The *Briton* has accommodation for 280 first-class passengers, 182 second-class, and a large number of third-class passengers, whilst her officers and crew, including deck-hands, engineers, and firemen, stewards, cooks, waiters, and the like, number no less than 240. Her fitting-up is of the most luxurious description, so that below deck she is really more like a large first-class hotel than a ship, all the marvels of the upholsterer's and the decorator's arts having been called into requisition.

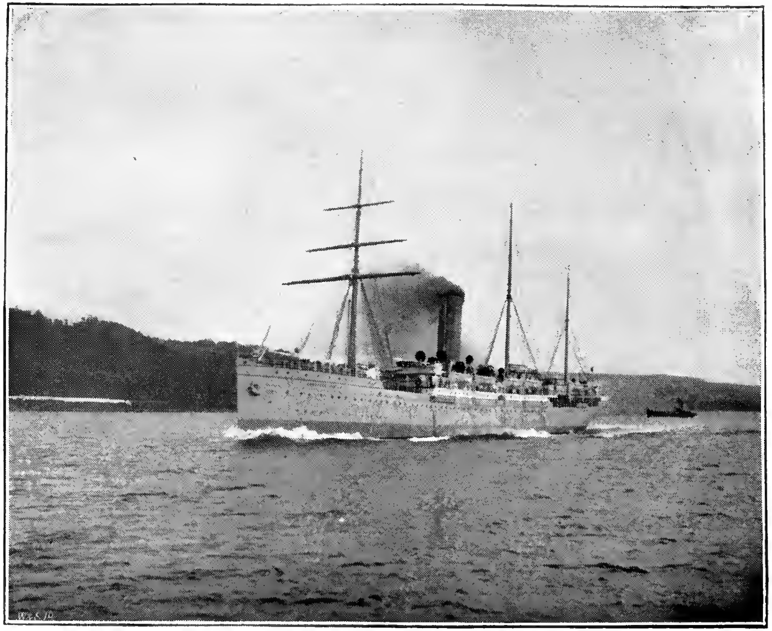
The ship is lighted throughout by electricity. Her side and masthead lights are electric, and electric lights are fitted to all the holds for working cargo by night, so that in all respects the *Briton* may be considered as a vessel entirely up to date.

The Castle Line commenced operations in 1872, with two steamers, the *Iceland* and the *Gothland*, both vessels of about

1400 tons. In 1873, an arrangement was come to with the Cape Parliament for a mail service between Cape Town and England, and an allowance was made to the Castle Line for the conveyance of the mails, with an additional bonus of £100 per diem for their delivery within the stipulated period of 37 days, a concession which resulted in a net gain to the Company of about a thousand pounds a voyage. From 1872, to 1876, the Castle Company's fleet still consisted of only the two vessels, with a united tonnage of 2800 tons; at the present time it consists of no less than seventeen large ships, with an aggregate tonnage of 66,035 tons. One of the latest additions to Sir Donald Currie's fleet is the *Dunvegan Castle*, built by the Fairfield Shipbuilding Company, she being the eighth steamer for the Castle Line built at the Fairfield works. Her gross tonnage is 5958 tons; her length over all is 465 feet; breadth, 51 feet; and depth, 35 feet. The vessel is rigged with three masts, being square-rigged on the foremast. The hull is of steel throughout, built under special survey to class 100 A1 at Lloyds. She has a cellular double-bottom fore and aft arranged for carrying water ballast, and is subdivided into separate compartments by ten water-tight bulkheads carried up to the upper deck. There are three decks in all, two of which are steel-plated, and there is a very long forecastle, which with the promenade bridge and the poop forms practically a fourth deck.

Accommodation is provided, in addition to that for the ship's complement numbering 187 persons, for 380 first and second-class passengers, and 130 third-class. The vessel is fitted with triple expansion engines, the steam for which is supplied by five boilers of the multitubular marine type, with, in all, twenty-six furnaces, and there is one large funnel. The *Dunvegan Castle*, in common with all the boats of the Castle Line, is painted externally a delicate French grey, with a red funnel with black top.

Among very many recent additions to the Castle Line is the *Tintagel Castle*, a particularly handsome single-screw steamer of 5531 tons. She is 440 feet in length, 50 feet beam, and 33 feet depth of hold. She has a straight stem and elliptical stern, and is rigged with four masts, square-rigged



CASTLE LINE R.M.S. "DUNVEGAN CASTLE."

[To face page 180.

on the foremast, and she carries fore and aft canvas on the other three. She is fitted with triple expansion engines, the steam for which is supplied by four tubular steel boilers. Her average rate of speed kept up all the passage is $13\frac{1}{2}$ knots, not being, of course, at so high a rate as that of the mail boats, the *Tintagel Castle* being what is known as an "intermediate" boat.

At the present time the Castle boats carry the Cape mail of the Imperial Government every other week, the Union Company's boats taking the alternate weeks.

The Castle Line for many years enjoyed a singular immunity from losses at sea, the greatest calamity that ever befell them being the total loss of their ship, the *Drummond Castle*, off the island of Ushant on the 16th of June, 1896.

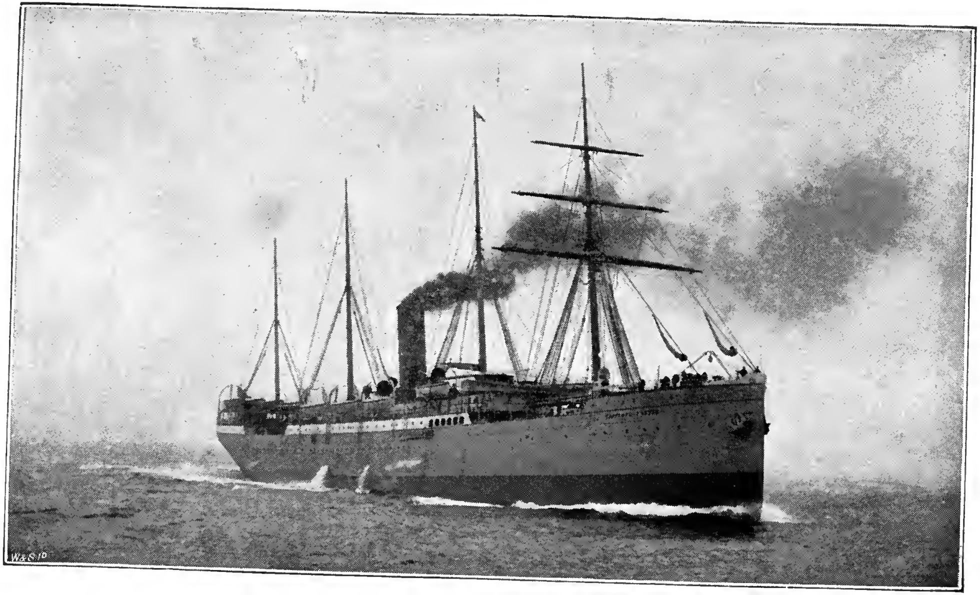
The *Drummond Castle* was homeward bound from the Cape, having on board 245 persons—that is to say, a crew of 102, and 143 passengers, of which large number only three persons were saved—two of the crew, and one of the passengers. The night of Tuesday the 16th of June, off the mouth of the Channel was dark but fairly clear, with some fog in patches, and a drizzling rain. At seven o'clock in the evening the steamer *Werfa* left Brest for Cardiff, and about eleven at night, when well outside, and holding a course N.W. by N.$\frac{1}{2}$N., the mate of her saw the green and masthead lights of a large steamer on his port beam apparently steering N.N.E. When about a quarter of a mile off, the large steamer ported her helm, and showed her red light, passing under the *Werfa's* stern. The mate of the *Werfa* remarked to the man at the wheel of his ship, "She mustn't go far that way, or she'll soon be ashore." No human eye, outside the ship, ever saw the *Drummond Castle* after this.

At the official inquiry subsequently held as to the loss of the ship, according to the evidence of the single passenger who was saved, "two soundings were taken at about half-past seven o'clock in the evening of the fatal Tuesday, when the depth was given as 42 fathoms. The engines were then stopped, and a third cast of the lead was taken, with the result, 75 fathoms." From that time to the time the *Drummond Castle* was lost no further soundings appear to have been taken. About eleven o'clock the ship suddenly struck, and heeled over slightly to starboard, afterwards righting herself, but being then considerably down by the head. Orders were at once given to clear away the boats, the captain giving his orders from the bridge.

Charles Wood, one of the quartermasters, who was saved, on hearing the order to clear away the boats, immediately went to his station, and had his boat ready to swing out, when, the *Drummond Castle* being by this time very low in the water, a heavy sea came and washed him away.

William Godbolt, A.B., the other seaman saved, was slacking up the awning on the quarter-deck when the ship struck. Hearing the boatswain's mate give the order to clear away the boats, he ran to his station, which was No. 2 boat on the port side; but as he was clearing the falls of the boat, the same sea that washed the quartermaster away, caught him, and washed him overboard. He got hold of a spar, and ultimately of a grating, to which he held on until he was eventually picked up by a French fishing-boat. The passenger who was saved, immediately on hearing the ship strike ran to his cabin and put on a life-belt, and then went and quietly sat on the rail until he found himself in the water; only from seven to ten minutes having elapsed from the time the ship struck until she finally disappeared. When the ship had gone down he saw Mr. Ellis, the fourth officer, on a grating, and at once made for it, and they both kept on the grating until they were rescued by the fishing-boat, but Mr. Ellis was either then dead, or he died soon after he was taken into the boat.

There is but little doubt that Captain Pearce thought that he had run farther to the north than he really had, having been set in by a strong easterly current, and the probability is that those on board the *Drummond Castle* thought from the *Werfa's* lights that she was a vessel coming out of the Channel. Had soundings been taken, however, before shaping a Channel course, the dangerous position of the ship would have been immediately revealed, and there would have been ample time for her to have altered her course. The finding of the Court of Inquiry that was



CASTLE LINE STEAMER "TINTAGEL CASTLE."

[*To face page* 182.

held as to the loss of the ship was, "that the casualty was primarily caused by sufficient allowance not having been made for the easterly current, the effect of which would have been averted had the captain made sufficient use of the lead."

For some little time the exact site even of the disaster was not known, until the French Admiralty caused a search to be made for the wreck; and the result of the inquiry, which was instituted by Admiral Barrera, was telegraphed from Brest to Sir Donald Currie on the 1st of July, as follows:—

> "Just returned from wreck. The position is 3½ miles due south of Stiff Lighthouse. Both the Government tugs, *le Laborieux* and *le Chameau*, grappled the ship. *Le Chameau's* grapple brought up, first, three pieces of pine, evidently parts of a mast, then portions of steel stays with metal ring from mast attached, also the gilded topmast ball, with the halliards. The hawsers of both tugs were smeared with brownish paint. The following soundings were taken at low water:—16 fathoms, believed to be the rigging; 26 fathoms, believed to be the side, or the deck of the ship; 33 fathoms, found close beside the last soundings."

No shipwreck of recent times created a deeper sensation in England than did the wreck of the *Drummond Castle*, and the kind and charitable conduct of the islanders of Ouessant and Molène elicited the unqualified admiration of every one in this country, from her Majesty the Queen downwards, whilst the deepest sympathy was felt for Sir Donald Currie and the directors of the Company, who have always made the safety of their passengers their first consideration.

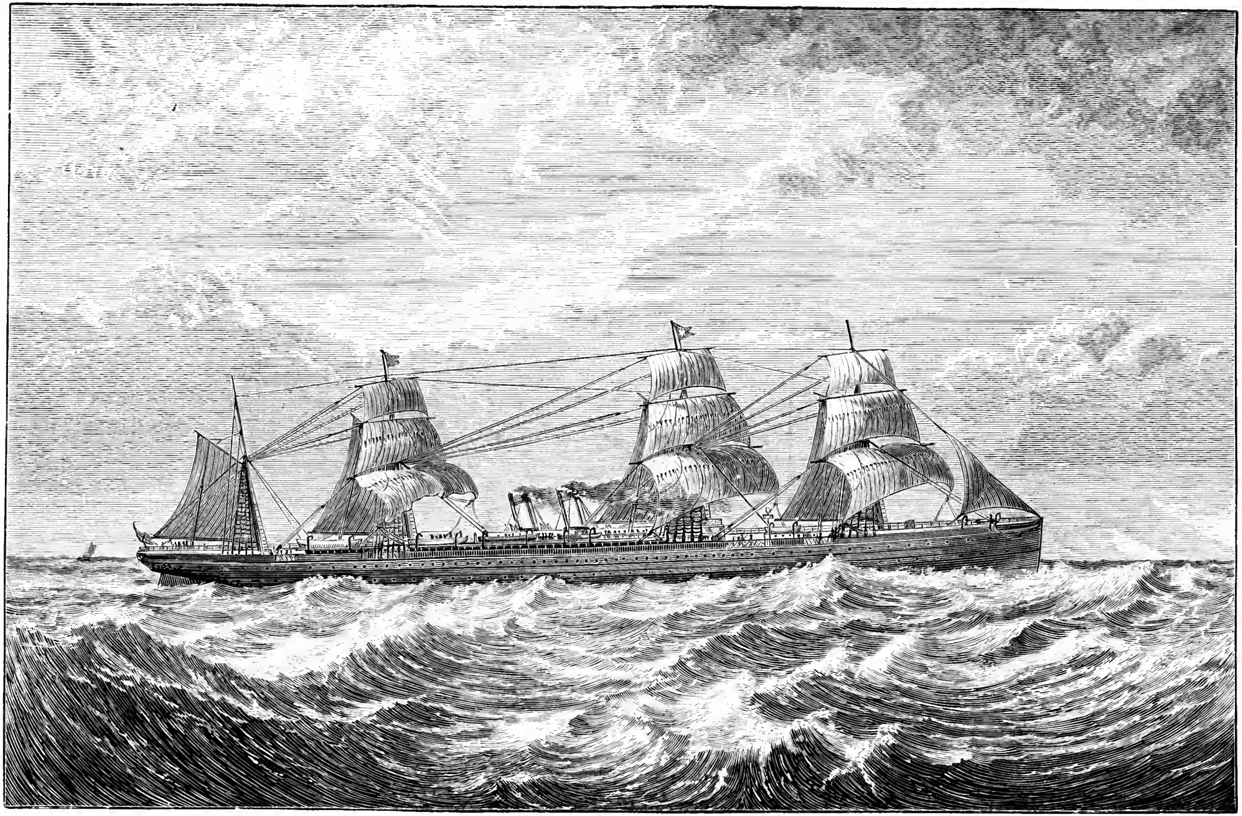
The foregoing steamship companies, of which a very brief outline has been given, are simply one or two out of the many important lines of ocean steamers regularly sailing from the various ports of Great Britain; a mere enumeration of all the rest would fill pages, but a few bare notes as to some of them will not be out of place.

After the Cunard Line the next oldest Transatlantic line of steamers is the Allan Line, which is of Canadian origin, having been originally started with a line of sailing ships in 1820. In the year 1852 the Canadian Government determined, in order to meet the growing requirements of the Colony, upon subsidizing a line of mail steamers between Canada and the mother country, and in 1856, Sir Hugh Allan, of Montreal, obtained the mail contract for a weekly service of steamers between Quebec and Liverpool, and a fortnightly service between Liverpool and Halifax and St. Johns.

The ships of the Allan Company leave Liverpool for Quebec and Montreal every Thursday, and the following steamers out of the Allan fleet are at present employed in this service: the *Parisian*, of 5365 tons; the *Laurentian*, 4522 tons; the *Mongolian* and the *Numidian*, of 4900 tons each; and the *Sardinian*, of 4384 tons. The *Parisian*, the commodore ship of the fleet, was built for the Company by Messrs. R. Napier and Sons, of Glasgow. She is 450 feet long, 46 feet beam, and has a depth of 36 feet 2 inches. For the special navigation of the river St. Lawrence, which in some places is extremely shallow, she has no keel, and in case this peculiarity should cause her unduly to roll in a sea-way, she is fitted with two bilge-keels. She is built almost entirely of mild steel, and as an additional element of strength has a double bottom, which is utilized for water ballast, being divided into many water-tight compartments. The hull is also sub-divided by ten water-tight bulkheads. She has four strong decks—the orlop deck, the lower deck, the main deck, and the upper deck, besides the promenade deck.

The *Parisian* is fitted with a set of compound vertical engines of the three-cylinder type, capable of developing 6000 indicated horse-power, which propels the ship in favourable weather at a speed of from 15½ to 16½ knots per hour. She has two low-pressure cylinders, each 85 inches in diameter, with a 5-feet stroke, and between the two low-pressure cylinders is a high-pressure cylinder 60 inches in diameter, also with a 5-feet stroke. The necessary steam is supplied by four double-ended tubular boilers, with twenty-four furnaces.

The *Parisian* has made the passage from Moville, in the north of Ireland, to Rimouski, the mail station 160 miles below Quebec, a distance of 2300 knots, in 6 days and 20 hours, being at a uniform speed of 14 knots per hour. The entire fleet of the Allan Company numbers now some 30 large steamers, with a united tonnage of 107,194 tons. The same Company also run a line of steamers fortnightly between



THE WHITE STAR R.M.S. "BRITANNIC."

[*To face page* 184.

Glasgow and New York, under the title of the "Allan and State Line," the service being performed by the *State of Nebraska*, 3986 tons, and the *State of California*, of 4244 tons.

Another important trans-Atlantic line is the White Star Line which was established in 1871, and their first steamer was the *Oceanic*, of 3807 tons. The Company was started by Messrs. Ismay, Imrie, and Co., of London and Liverpool, who adopted the name of a once celebrated line of sailing ships, a line that included in its fleet some of the fastest clippers of the day, among them being the *Blue Jacket*, the *Champion of the Seas*, the *White Star*, the *Shalinar*, and others, sailing to Australia. After Messrs. Ismay, Imrie, and Co. had succeeded to the old original White Star Line, they carried on a White Star Line of sailing ships of their own, with the magnificent iron clippers the *Belfast*, the *Knight Commander*, the *British Commerce*, the *Glengarry*, the *Knowsley Hall*, and others. Eventually these fast sailers all had to give way to steam, and the steam fleet of the White Star Line now contains some of the finest steamships in the trans-Atlantic service.

Among the earlier boats of the Company were the *Baltic*, the *Celtic*, the *Adriatic*, the *Germanic*, the *Britannic* and others. The *Germanic* and the *Britannic* were built in 1874, by Messrs. Harland and Wolff, of Belfast. They were sister ships of 3174 net register tonnage, with a length between perpendiculars of 455 feet; length over all, 468 feet; beam, 45 feet 3 inches; and depth of hold, 34 feet. They have each accommodation for 1300 passengers, besides the crew of 150.

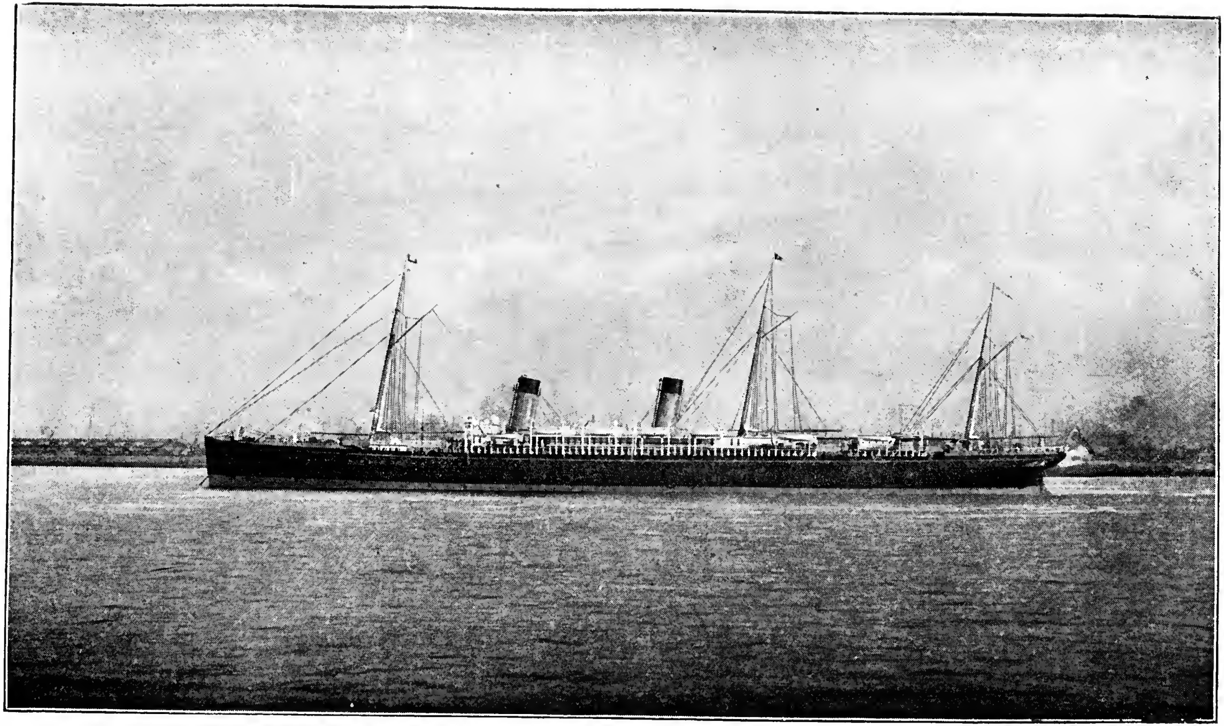
At the end of the year 1897, the *Britannic* had completed exactly two hundred and fifty round trips, which is a record of 1,750,000 miles, without a renewal of either the engines or the boilers. Since she was built, in 1874, up to the Christmas of 1897, she had carried in safety 57,400 cabin passengers, and 165,500 steerage, which was an average of just over 400 passengers for each passage. During that time she had been under steam for 114,000 hours, and under way 106,800 hours, consuming meanwhile 513,000 tons of coal, and her engines making no less than three hundred and fifty millions of revolutions. When she was twenty-one years old she made her own best time of 7 days 7 hours and 30 minutes from Queenstown to New York. The *Britannic* is said to be still as sound in every respect as when she was first built in 1874.

The *Adriatic*, which is a smaller ship than the two last-mentioned, was a fast ship for the time she was built, much faster than the ship of the same name built by the Collins Company. In 1872, she made ten voyages between Liverpool and New York—that is to say, ten passages out and ten home—the quickest outward passage from Queenstown to New York being in May, when her time was 8 days 14 hours and 30 minutes, and the quickest homeward passage from New York to Queenstown in April, in 8 days 3 hours and 50 minutes.

In 1889, the *Teutonic*, twin-screw, of 4245 tons' register, and 18,000 indicated horse-power, commenced running, leaving Liverpool for New York for the first time in the August of that year. This fine ship was followed in 1891, by the *Majestic*, also a twin-screw of 4340 tons register, and 18,000 indicated horse-power. Both ships were built by Harland and Wolff, and they were the two first steamships specially constructed under arrangement with the Admiralty for employment as armed cruisers, and as such, they receive an annual subvention from the Government. The *Teutonic* was present as an armed cruiser at the naval review in August, 1889, and she was also present in the same character at the Diamond Jubilee Naval Review at Spithead on the 26th of June, 1897.

The *Majestic*, in July, 1891, made the passage from Queenstown to New York in 5 days 18 hours and 8 minutes, the fastest passage on record up to that date; but in August of the same year the *Teutonic* beat her, making the same passage in 5 days 16 hours and 30 minutes, being at an average rate of 20·35 miles an hour during the whole of the passage. The *Germanic* has been recently fitted with new engines and boilers, and runs now with the larger ships in the mail service. The mail boats of the White Star Line leave Liverpool every Wednesday for New York.

The White Star Company have an extensive business in



WHITE STAR LINE R.M.S. "MAJESTIC" IN THE MERSEY.

[*To face page* 186.

the importation of foreign cattle, and have a number of large cattle-boats employed solely in that trade. They are the *Georgic*, the *Cevic*, the *Bovic*, the *Nomadic*, the *Tauric*, and the *Cufic*, ships ranging from 5000 to 10,000 tons gross. Besides these steamers there are two fine ships that also belong to this Company, but which run in the Shaw, Saville, and Albion line to New Zealand; they are the *Gothic* and the *Ionic*.

Messrs. Harland and Wolff are now engaged in building a new *Oceanic* for the White Star Line. She will be the largest steamship engaged in the Transatlantic trade, having a length over all of 704 feet, or 84 feet longer than the *Campania* of the Cunard Line, and it is said that she will be the fastest liner afloat.

The American Line runs its boats from Southampton to New York. Strictly speaking, this line ought not to be included in the annals of the British Mercantile Marine, as its vessels sail under the stars and stripes; but as the American Line is practically the old Inman Line, some particulars of it may not be altogether uninteresting.

The Inman Line, which was at first called the Liverpool and Philadelphia Steamship Company, was established in 1850, but subsequently it took the name of its founder, Mr. William Inman. The first ship of the Company was the *City of Glasgow*, of 1600 tons, and 350 horse-power. She was the first trans-Atlantic steamship built on the Clyde, and also the first to carry emigrants across the Atlantic, sailing from Liverpool on the 17th of December, 1850, for Philadelphia. Many more ships were now rapidly added to the fleet. In 1851, the *City of Manchester* was built. She was of 2125 tons, and 400 horse-power; her length on deck was 274 feet, and her beam 38 feet. She had four masts, the fore and main lower masts being of iron; she was square-rigged on the fore and main-masts, and fore and aft rigged on the mizen and jigger-mast.

Between 1851, and 1856, the *City of Baltimore*, the *Kangaroo*, and the *City of Washington* were added to the line. In 1857, the Inman boats began running to New York, at first fortnightly, and in 1863, weekly. Although Liverpool was their port, the *City of Glasgow* made four successful voyages from Glasgow to New York at a time when there was no regular service between Scotland and America.

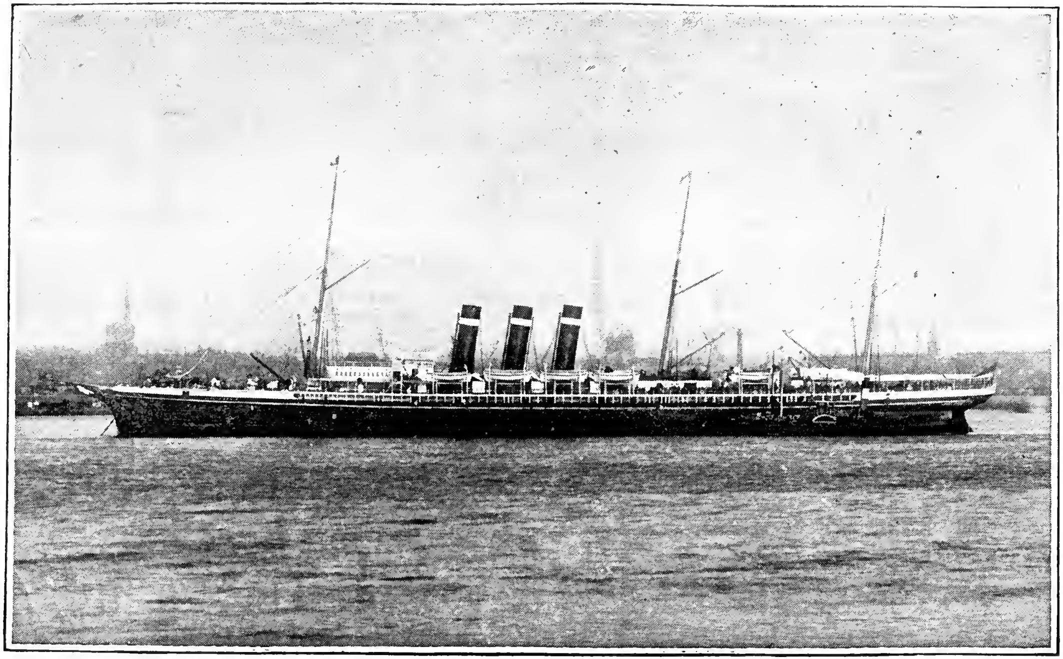
In 1873, the *City of Chester*, 2944 net tonnage, and the *City of Richmond*, 2977 net tons, were built for the Company by Caird, of Greenock; and after these still larger vessels were put on the service, the largest being the *City of Paris*, 5568 net tonnage, and the *City of New York*, 5573 net tons; these two ships, while sailing under the British flag, being subsidized by the English Admiralty as armed cruisers, the *City of Berlin* being also held at the disposition of the Admiralty, but without subvention.

The speed of the *City of Paris*, which is a twin-screw, has exceeded 20 knots. In May, 1892, she made the outward passage from Liverpool in 6 days 1 hour and 56 minutes, or at a uniform rate of 19·8 knots the entire passage; in the same month she made the return passage in 6 days 8 hours, and 30 minutes, or at the uniform rate of 19·2 knots. The *City of Paris*, however, has always had the reputation of rolling badly in a heavy sea.

In 1893, the Inman Line became merged in the American Line, and in the March of that year the *City of Paris* and the *City of New York*, as the *Paris* * and the *New York*, hoisted the United States flag in lieu of the English colours, their port of departure and arrival being henceforth Southampton instead of Liverpool. The other steamships of the American Line running between Southampton and New York are the twin-screws *St. Louis* and *St. Paul*, built in the United States specially to "lick the Cunarders," the *Campania* and *Lucania*, a thing they have never yet succeeded in doing.†

* Upon the outbreak of the war between the United States and Spain the four largest steamers of this Company—the *Paris*, the *New York*, the *St. Paul* and the *St. Louis*—were purchased by the United States to be used as armed cruisers, the name of the *Paris* being altered to the *Yale*, and that of the *New York* to the *Harvard*.

† As showing the superiority of the twin-screw system over the ordinary single screw, may be cited a recent experience of the *Paris*. The *Paris* left New York for Southampton on Wednesday, March 2, 1898, with 185 passengers, a valuable cargo, including 225,000 dollars in specie, and 1140 sacks of mails. She was due at Southampton on Wednesday, March 9th, and much anxiety was felt at her non-arrival, she not coming in until Sunday, the 13th. The day after leaving New York she broke her starboard shaft,



THE "PARIS" (NOW THE U.S. ARMED CRUISER "YALE").

[*To face page* 188.

The Anchor Line began their trans-Atlantic business in 1856 with a small vessel called the *Tempest,* originally a sailing-ship employed in the East India trade, but altered for this service into a screw steamer. Messrs. Handyside and Henderson, the projectors of the line, finding it to be a success, established a weekly line of Anchor boats between Glasgow and New York. The present fleet of the Anchor line now numbers some thirty-eight large steamers, of which some are employed in the trans-Atlantic trade; some in a service between Glasgow and Liverpool and Kurrachee, Bombay, and Calcutta; and others in the Mediterranean.

The commodore ship is the *City of Rome,* employed in the New York service, an iron vessel of 8453 tons, and 11,153 horse-power. She is 600 feet in length, 52 feet 3 inches beam, and has a depth of 37 feet 6 inches. She is divided by 10 water-tight bulkheads into 11 water-tight compartments, and has tanks capable of taking in 380 tons of water ballast. There are four decks, and there are state-rooms for 290 saloon passengers, and accommodation for 1000 emigrants. The main saloon is the entire width of the ship by 72 feet in length, and can seat 250 people at dinner. The engines are of the compound inverted type; and it may be noted that in the surface-condensers the total length of tubes is no less than 17 miles. The ship has three black funnels in line fore and aft.

The Dominion Line, whose steamers run between Liverpool and Quebec and Montreal, was established in 1872. The Dominion boats leave Liverpool every Thursday, and go round the north of Ireland, calling at Londonderry the day after leaving Liverpool. The fleet at the present time consists of seven magnificent steamers, four of which are twin-screws, the largest of these ships being the *New England,* of 11,000 tons, followed by the *Canada,* of 9000 tons; the *Dominion*

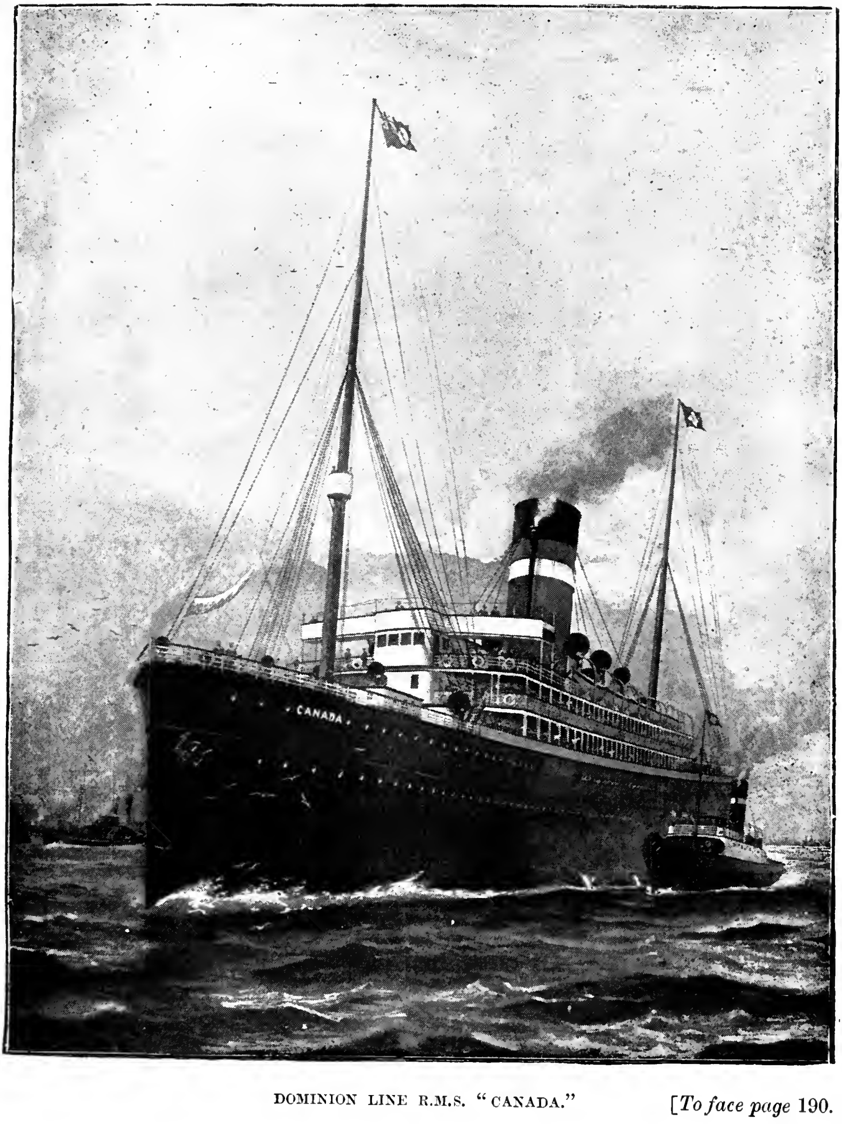
and the ship was stopped for three hours whilst a thorough examination was made in order to ascertain the exact nature of the injury. It being then found impossible to repair the damage to the shaft at sea, Captain Watkins determined to continue the voyage with the port engines alone; and although with only the port screw at work, on one day she made 312 knots, and on another 314 knots, or at an average speed of rather over thirteen knots with only the single screw.

and the *Scotsman* being each of 6000 tons. On Friday, the 9th of August, 1895, the *Labrador* of this line embarked passengers and mails at Moville (Ireland) at 2.15 p.m. On Wednesday, the 14th, at five minutes past seven in the morning, the ship reached Belle Isle, Newfoundland, thus making the run across in 4 days 17 hours—the fastest passage on record.

The Pacific Steam Navigation Company.—This Company was incorporated by Royal Charter in 1840, and received a small subsidy for the conveyance of the British mails along the Pacific shores of South America. The first two steamers despatched to commence operations at the close of 1840, were the *Chili* and the *Peru*, two wooden paddle-wheel vessels of only 700 tons, and fitted with engines of 150 horse-power; but, being the first steamships ever seen in those waters, they were received at Valparaiso with great rejoicings and with salvos of artillery, the President of the Chilian Republic with his ministers being the first to welcome the steamships to the shores of the Pacific.

During the first five years the Company had many difficulties to overcome, the difficulty of obtaining fuel being one of the greatest, and the steamers were worked at a loss. Notwithstanding this, however, the shareholders resolved to persevere, and the fleet was gradually augmented. In 1852, four new steamers, also paddle-wheel boats, the *Lima*, the *Santiago*, the *Quito*, and the *Bogota*, each of 1100 tons, and 450 horse-power, were added to the line, to be employed in a fortnightly service between Panama and Valparaiso; and from that time the trade in the Pacific rapidly developed, new and hitherto unthought-of branches of commerce being opened up, so that the success of the Company seemed to be assured.

In 1865, the chartered powers of the Company were extended to the establishment of a line between the west coast of South America and the River Plate, including the Falkland Islands; and in 1867, it was determined still further to extend operations by adding a monthly line of steamers from Liverpool to the west coast of South America, *via* the Straits of Magellan, and in May, 1868, the paddle-wheel steamer *Pacific*,



DOMINION LINE R.M.S. "CANADA."

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of 1630 tons, and 450 horse-power, was despatched from Valparaiso to Liverpool as the pioneer of the new mail line.

The project was so successful that in 1870, it was determined to extend the voyages beyond Valparaiso, making Callao the terminal port, and to increase the number of sailings from fortnightly to three in the month, which number was soon afterwards still further increased to a regular weekly mail service between Liverpool and Callao, the steamers calling in at Bordeaux, Lisbon, Rio de Janeiro, Monte Video, and Sandy Point in the Straits of Magellan.

To carry out and to maintain this service efficiently the Company had no fewer than 54 steamers in commission, with an aggregate tonnage of 120,000 tons, these vessels being among the finest and the best-appointed ships then to be found in the British Mercantile Marine. But the promises of a lucrative traffic were eventually not fulfilled; the trade with South America gradually fell off, and an extraordinary increase in the price of coal and of other necessaries added so much to the cost of working the line that the weekly sailings had to be abandoned, and the fortnightly service (which is still in force) had to be reverted to.

Employment had then to be found for the steamers which were not required for the West Coast business, and an opportunity was soon afforded by the establishment of the Orient Line from London to Australia, which was commenced with the steamship *Lusitania* early in 1877. In January, 1880, an arrangement was entered into with the Orient Company, and a fortnightly line to Australia was established, four of the finest vessels of the Pacific Steam Navigation Company, namely the *Oroya*, the *Orizaba*, the *Oruba*, and the *Orotava* being now engaged in that trade, and sailing as part of the Orient Line.

The latest additions to the fleet are the *Oropesa* and the *Orissa*, twin screws, each of 5137 tons, and 5000 horse-power, built by Harland and Wolff, and fitted up with all the most recent appliances of the best of our ocean liners. A still larger vessel is now building for the Company at Barrow-in-Furness, in the twin-screw *Ortona*, of 8000 tons, which will be fitted with engines of 8000 horse-power. The *Ortona* is intended to run in the Orient Line to Australia, and will undoubtedly be one of their finest boats. The total tonnage of the Pacific Company at the present day is 132,461 tons.

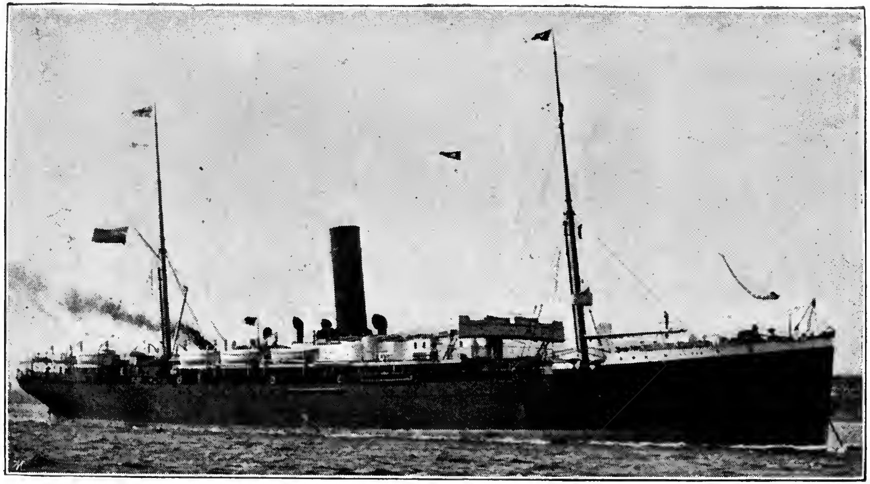
The Bibby Line.—This line, which was first established as a line of sailing ships in 1821, trades from Liverpool to Egypt, Colombo, and Rangoon, *via* Marseilles. The steamers of the "Bibby" Line now carry the French and Egyptian mails between Marseilles and Egypt, and between Suez and Colombo; they also carry supplementary English mails between Rangoon, Colombo, and England.

The steamers, named after English counties, as the *Derbyshire*, the *Staffordshire*, the *Shropshire*, and so forth, have all been built by Harland and Wolff, and average from five to six thousand tons each, many of them being twin screws. One of the first of the steamers to leave Liverpool for Rangoon was the *Lancashire*, and she made the run out in 24 days 18 hours, the fastest time yet on record; but the average passage from Liverpool to Rangoon is 28 or 29 days, and from Marseilles 22 days.

There are very many other great steamship lines—mail lines and passenger lines—in fact, their name is legion. The New Zealand Shipping Company, the Shaw, Saville, and Albion Line, and the Aberdeen Line, compete for the Australian and the New Zealand trade; the Clan Line, the City Line, the Hall Line, the Shire Line, and many other companies, all try for a share of the trade with India, China, and the East; the African steamship Company, Elder, Dempster, and Co., the Natal Line, and others, seek to divide the trade with Africa; and the West India and Pacific Company, Lambert and Holts' boats, and many more, connect England with South America; whilst the steamships of the British India Company are to be met with in every port of every part of the world, many of the ships of this Company being remarkably handsome models.

Among the many steamship companies, is one which although not of the importance of the great ocean liners, yet is one of the oldest; and this is the General Steam Navigation Company, whose vessels, besides running to home ports, trade to Hamburg, Bordeaux, Oporto, Amsterdam, and the like.

When the Queen went to Scotland for the first time in



PACIFIC STEAM NAVIGATION COMPANY'S S.S. "OROPESA."

[To face page 192.

1842, she went in her own yacht, the *Royal George*, attended by a considerable squadron of ships of the Royal Navy, among them being the *Pique*, 36-gun frigate, the *Daphne*, the *Salamander*, the *Rhadamanthus*, and a number of other vessels. When off Flamborough there was a heavy sea on, and the royal yacht rolled so badly that the Queen wished to go on board the *Pique*, which was a much larger vessel than the Royal yacht; but Admiral, then Captain, Bullock would not undertake the responsibility of transferring her Majesty in an open boat from the royal yacht to the frigate, and the Queen was necessitated to go on to Leith in the yacht. She would not, however, return in the *Royal George*, and one of the vessels of the General Steam Navigation Company, the *Trident*, was specially engaged to bring her Majesty back to London.

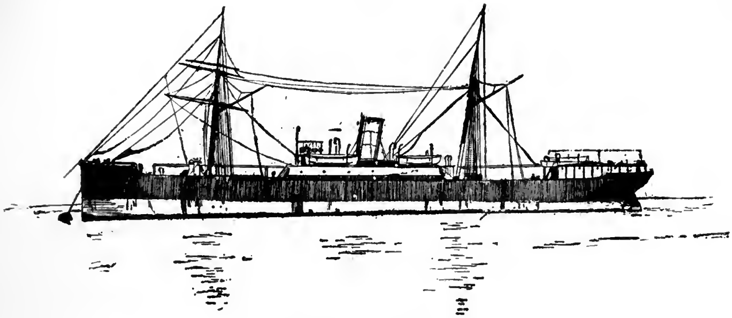
CHAPTER XV.

Cargo steamships—Ocean tramps—The loss of the *La Plata*—Steam colliers—The first screw collier—The *Q.E.D.*—The *King Coal*—Cattle-boats—The frozen-meat trade—The New Zealand ships—The tea-steamers—The *Stirling Castle*—Grain-steamers—Oil-tank steamers—Loss of the *Edenmoor*—Well-decked steamers—Cotton-carrying steamers—Dangerous cargoes.

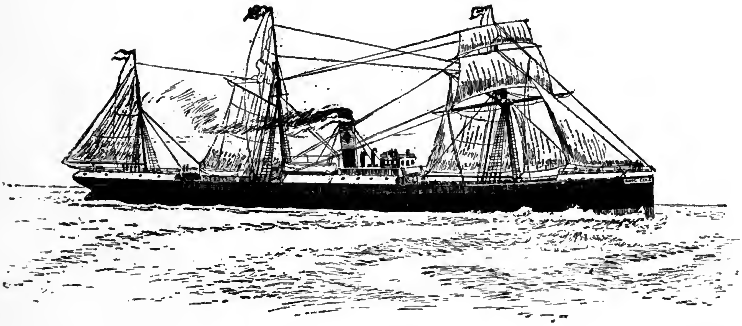
Having seen something of some of the principal British mail and passenger lines, it will be well to glance at that still larger class of steamships included in the category of cargo-boats, a description of steamship taking more and more every year the place of the old sailing merchantman of the earlier part of the century.

Numbers of these cargo steamships are very fine and exceedingly well-found vessels; perhaps not as sumptuously fitted up, but from a sailor's point of view, quite as good ships as many of the steamers that are running in the mail lines. As an example we give a portrait of a well-known regular Indian trader of the "Clan" line.

The greater number, perhaps, of these vessels are specially built for some particular trade, but still a very large number have no speciality about them; they are intended to pick up a living anywhere—to go "where cargo offers." These are the genuine Ocean Tramps. Many of them undoubtedly are good vessels enough; very many more, unfortunately, are precisely the opposite. Every one knows the long lines of villa residences in the suburbs of London and other great towns. These are, for the most part, the work of the jerry-builder. Far too many of the ocean tramps are the work of the marine jerry-builder. Run up by contract at a cost of from seven to eight pounds a ton, engines thrown in,—blind rivet-holes filled up



A TYPICAL OCEAN TRAMP.



A STEAM COLLIER.

[*To face page* 194.

with putty, cracked plates neatly painted over, frames and deck-beams of very insufficient scantling, are peculiarities not altogether unknown among this class of ocean tramps.

Perhaps our particular tramp is chartered to take a general cargo to East London, or Algoa Bay; to go from thence to Rangoon for rice to be taken to Rio de Janeiro, or Valparaiso; and then she will have to look out for another job. As she lies in the West India Docks taking on board iron tanks, boxes of biscuits, cans of sheep-dip, glazed stoneware drain-pipes, cases of sewing-machines, and the thousand and one articles that make up a "general cargo," she does not look a bad-looking vessel, and to the eye of the uninitiated not very different from the really well-built steamer that is lying astern of her. But when she is making bad weather of it, crossing the Bay in a south-west gale, things are apt to look somewhat different. Perhaps when everything depends upon her jerry-built engines, they suddenly give out, or her steering-gear breaks down, and her name appears about a week or so afterwards in that particular portion of the *Shipping Gazette* devoted to Wrecks and Casualties.

Here is the experience of one such vessel. In the winter of 1874, a submarine cable was to be laid on the coast of South America, and the contractors in London had chartered a steamer called *La Plata* to take out the cable, together with the staff of electricians who were to superintend the laying it. *La Plata* was an iron vessel, with the engines and boilers well aft, thus affording a good deal of room forward for the tanks in which the cable was to be stowed.

Having then, the telegraph cable stowed in the tanks in the hold, and the winding engines to be used for paying it out on the deck forward, *La Plata* left Woolwich on Monday, the 23rd of November, 1874. She was fairly deep in the water, being pretty heavily laden, but at Gravesend she took in a quantity more stores, so that when she left the Thames she had, to say the least, quite as much on board as she ought to have had.

On Thursday, the 26th of November, *La Plata* left Gravesend in charge of a pilot, with fine weather, and a light breeze from the south-west. On Friday, at six o'clock in the morning, the ship was off St. Catherine's, and the pilot went ashore.

She then continued to steam down Channel; but towards evening the wind, which had been light all day, began to blow strongly from south to south-west, and as the ship was very deep in the water, she did not make more than four, or four and a half knots, an hour.

All day on Saturday the weather continued gradually to get worse, and by night it was blowing a heavy gale from the south-west. About midnight *La Plata* shipped several very heavy seas in succession, and the chief officer gave orders to set the fore and aft canvas. The gale continued rapidly to increase in fury, and in less than half an hour after the canvas was set, the sheets were carried away and the sails blown clean out of the bolt-ropes. About one o'clock on Sunday morning a heavy sea broke over the vessel and carried away one of the boats on the port side, started the deck-house, and smashed in some of the pens for the live stock, one sheep being actually washed into the cabin, and two pigs into the stoke-hold. About five o'clock the other boat on the port side was swept away, and the seas continued to pour over the ship in quicker succession.

At half-past eight the carpenter, having sounded the well, reported that the ship was making water, and it was found that although dry forward, there was a good deal of water coming in aft. The steam-pumps were at once started, but the water steadily gained on them. After breakfast it was decided to lighten the ship by throwing overboard some of the telegraph cable from the forward tank. The weather was so bad that it was utterly impossible to take the hatches off, so the tank was got at through the store-room, and a good deal of the cable was got up and thrown overboard.

By this time the water was fast filling the lower hold, and by ten o'clock it had so much increased that the furnaces in the stoke-hold were extinguished, the engines brought to a stop, and the steam-pumps could no longer be worked. It became then necessary to get up steam in one of the donkey-engines on deck in order to keep the pumps going; but it was very difficult to start the fire, as the heavy seas kept pouring over the deck, putting the fire out the moment it was lighted. At last all the spare hands, by dint of breaking up dry packing-cases in the store-room, and by steeping cotton waste in paraffin, got the fire fairly alight, and at eleven o'clock steam was up in the donkey-engine, and the pumps were started again.

At noon the firemen found it utterly impossible to keep the donkey-engine furnace going any longer, as the sea was making a clean breach over the vessel. The captain, who was then on the bridge, which he had not quitted since Friday morning, even to take his meals, managed, however, to get the ship before the wind, thus heading up Channel again, under fore and main topsails and fore staysail. The pumps having ceased work, the water now continued to rise rapidly, and it soon became evident that the ship must go down. Orders were therefore given to get the boats ready.

In the hold there were pontoons for two life-rafts, and these were now got up on deck; and all hands worked hard at getting up stores and provisions for the boats and the rafts. Officers and men alike worked well, and with the greatest coolness, assisted by the staff of electricians, and there was not the slightest confusion or panic. Most of the men seemed to prefer to take their chance on the rafts rather than in the boats, and when everything was ready, and there was nothing more to be done, they flocked round the rafts as they lay on the deck.

There is no doubt but that a great mistake was made, and that the rafts ought, if possible, to have been lowered over the side; but the impression seemed to be that when the ship went down they would float off the deck—a terrible error, as the event showed.

At half-past twelve the ship was so low in the water that the deck was on a level with the sea, and in order to get to the boats, which were on the starboard side, the men were up to their middles. At twenty minutes to one a heavy sea struck the ship, which seemed to stagger for a moment, and then went down stern first. As the stern sank the bows came up right out of the water, and the bridge, funnel, and a quantity of heavy machinery that there was forward, fetched away and fell upon the rafts, crushing the crowd of men upon them.

The two quarter-boats fortunately floated out of the chocks, and by the greatest exertion were pulled clear of the wreck;

but they had hardly got clear when one of the boats, which was under the command of the chief officer, capsized, and all in her, with the exception of one man and two boys, who managed to get on board the other boat, were drowned. The sea was now running very high, and it seemed hardly possible that a small boat could live in it; but by the most careful steering the boat's head was kept to the sea, and by watching the waves very little water was shipped.

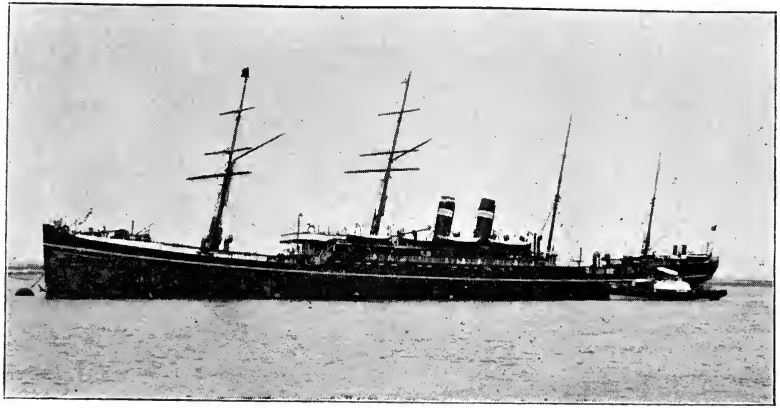
Soon after sunset, just as it was getting dusk, a steamer hove in sight, and a white handkerchief was hoisted on an oar to attract her attention, but she passed on without seeing the signal. It now became dark, and with such a terrific sea running there seemed every prospect that the boat must founder long before the morning. The men, however, kept steadily at the oars, and just as the day was beginning to break they sighted a large ship under close-reefed topsails.

The weather was now moderating a little, but there was still a heavy sea on. Fortunately, as the boat rose on the crest of the large waves, their signal was seen from the ship, which now altered her course to bear down upon them. By ten o'clock she was close to the boat, and proved to be the *Gare Loch*, from London to New Zealand, with emigrants.

With a good deal of difficulty all in the boat were got on board the *Gare Loch*, and in less than an hour a homeward-bound steamer, the *Anthony*, from Hong Kong for London, hove in sight. She was signalled, and took the survivors on board, and landed them at Gravesend at half-past three on Wednesday afternoon.

Besides those saved by the quarter-boat, the only other survivors from the wreck were the quarter-master and bo'sun. These two men succeeded in getting upon one of the rafts that was floating upside down; and although, of course, without either food or drink, and with the seas continually washing over them, they managed to hold on from mid-day on Sunday till four o'clock on Wednesday morning. Their sufferings during the long, dark, cold November nights were terrible.

On the Sunday night they did not either sleep or doze, keeping a sharp look-out for a passing ship. On Monday they saw several vessels, but all a long distance off. On Tuesday an



BRITISH INDIA COMPANY'S STEAMER "GOLCONDA."

[To face page 198.

American three-masted schooner actually came within half a mile of them. The shipwrecked men could see what was passing on her deck—the man at the wheel, and the hands going to and fro; but they failed to attract her attention, and she too passed on her course.

Tuesday night came and went without any vessel coming in sight; but about four o'clock on Wednesday morning a small schooner was seen bearing down on them from the northward. They hailed her, and she rounded to, as though she were waiting for them to come on board; but they had no means of steering their raft, and they gradually drifted away to leeward.

The schooner lay to for about ten minutes, and then went off. Presently they saw her lights again as though she were about to return; but this time she did not come so near as before, and when the day had fully dawned she was not to be seen at all. In about half an hour, however, to their great joy, she hove in sight again, and this time bore down close to them. When she was about two hundred yards off she hove to, and the men left their raft and swam to her, when they were taken on board, and were most kindly treated by her crew. She proved to be a small Dutch schooner, the *Wilhelm Benklezoons*, from Rotterdam for Valencia, for fruit. The men were taken to Spain, and from thence found their way back to England.

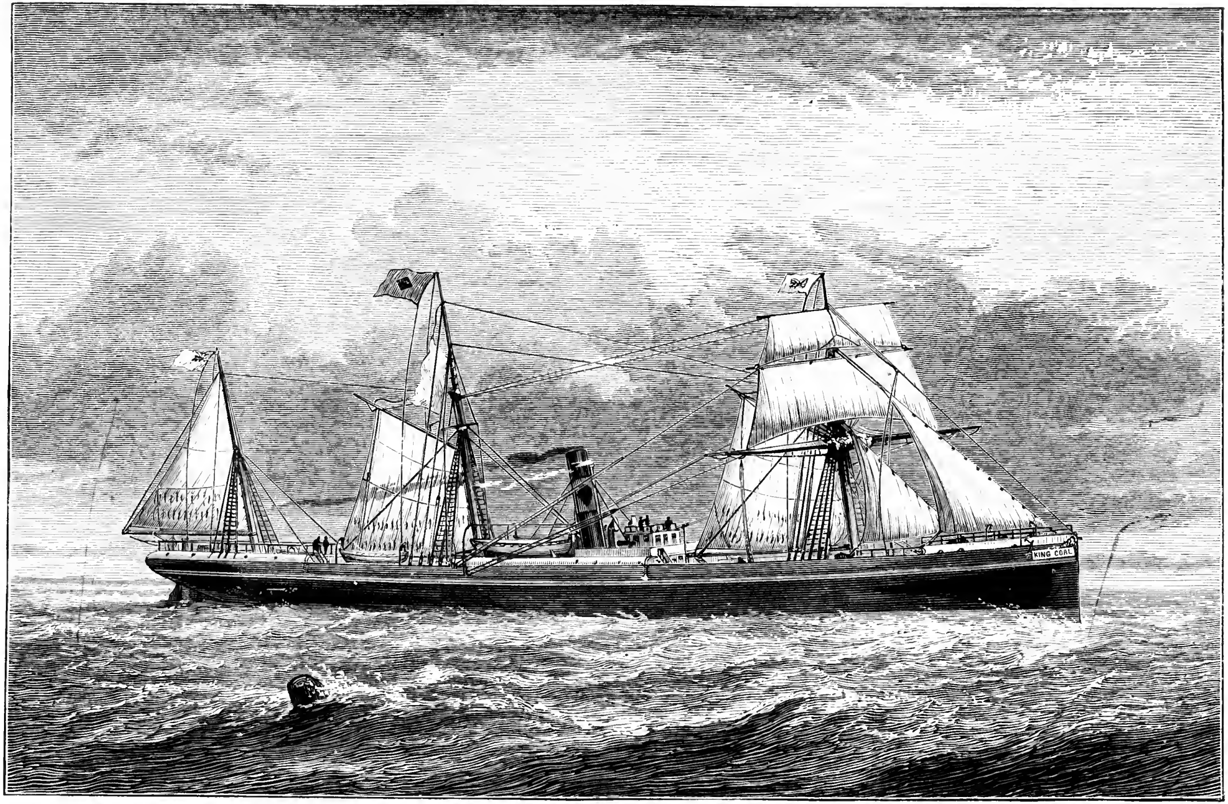
One numerous class of cargo steamers is that of the screw colliers, and wretched vessels some of them are, whilst, however, a very large number are fine, well-built, and well-found steamships. Forty years ago nearly the whole of the coal brought from the north of England to London was brought in the then regulation "Geordie," or coal-brig. Every ebb tide saw any amount of these craft, light, in ballast, drifting down the reaches of the Thames on their way north for a fresh cargo.

Scientific navigation was not the strong point of the Geordie skippers, but somehow or other they usually managed to blunder along up to Sunderland, or to Hartlepool, and to get back again to the Thames with their two or three hundred tons of coal—that is to say, if the weather were fairly propitious; if it were not, they were likely to be heard of on the Long Sand, or the Gunfleet.

There is a well-known sailor's yarn of a Geordie coming out of the Thames, going north in ballast. An autumn evening, just getting dusk, hazy, light breeze from the westward, a light-ship looms up on the starboard bow. "Lightship ahoy! What light is that?" "The Mouse." Skipper continues his course. As the dawn is just beginning to break skipper judges he must be well up for Lowestoft, but sights a lightship that he doesn't remember. "Lightship, ahoy! What light is that?" "The Mouse." "What the —— are you doing up here?" The old Geordie had just been cruising around.

About forty years ago the first screw collier appeared in the London river. She had come round from the Tyne with three hundred tons of coal on board, and was called the *Q.E.D.* She was what would be known now as an auxiliary screw, being fully rigged as a barque, and sailing when there was a fair wind, but steaming with the wind ahead. Her mizen-mast was an iron tube, and served as a funnel, so that when under steam the smoke might be seen issuing from about her mizen cross-trees. In 1870, the first screw collier of the present type came up the Thames. This was the *King Coal*, an iron vessel, built on the Tyne, and she had cost, when ready for sea, £15,000. She was rather a handsome vessel, with a straight bow; she had three masts, being square-rigged on the foremast; her funnel, which was between the fore and main masts, having a white band with a black diamond. She carried 900 tons of coal as cargo, and had bunker-space for 100 tons more, and she was fitted with water-ballast tanks, enabling her to make the return passage with as little delay as possible. Against head winds, with a full cargo of coal, her speed was eight and a half knots an hour; when going back light, in fair weather, nine and a half to ten knots. Her engines were of 90 horse-power, nominal, working up to 600 horse-power, and the voyage from Newcastle to London and back usually occupied from six to eight days.

Hoisting sails, lifting anchor, and other heavy work was done by steam-winches. She had an excellent cabin on deck for the captain, with cabins for the chief mate and the steward; her crew consisted of seventeen persons, all told, accommodated in a roomy, well-ventilated forecastle on a level with the main



THE "KING COAL," SCREW COLLIER.

[To face page 200.

deck, the seamen occupying one side of it, and the firemen the other, with a bulkhead between them. The engineers had cabins on deck, in the bridge-house, whilst on the bridge was the wheel-house, so arranged that whilst the helmsman could see everything ahead, he was protected from the inclemency of the weather. From the above description it will be seen that the example set by the *King Coal* has been very closely adhered to until the present day.

There are a few of these screw colliers that in recent years have made fifty-two voyages from London to the north and back in the year, the appliances for loading being now so excellent on the Tyne, at Cardiff, Barry, and other places, that with a vessel such as the *King Coal*, when she is once alongside, the actual loading of the ship is merely a question of a few hours. The coal comes on board in bulk, a railway-truckful at a time, so that it only requires to be trimmed. The chief detention now is in getting alongside, as while one steamer is being loaded, half a dozen others are waiting to take their turn.

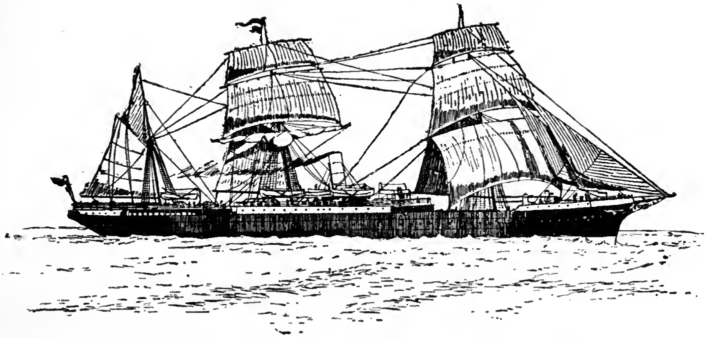
But all this hurry in getting the coal aboard and in getting the ship away often leaves no time for trimming, and a cargo of coals loaded in this fashion is apt sometimes to be quite as dangerous a cargo as grain in bulk would be if it were loaded in a similar way. During 1875, 1876, and 1877, no less than 200 coal-laden British vessels foundered or were missing, entailing the loss of 991 lives; whilst during the three years 1881, 1882, and 1883, the number of coal-ships lost was even greater; 314 such vessels being either lost or missing, involving the loss of no less than 1849 lives, being at the rate of two ships and nearly twelve lives lost every week during the three years. Admiral De Horsey once tritely remarked, "With unskilled stevedores and *fully insured* ships and cargoes, the *safety* of the ship appears to be a matter of very *secondary importance*."

Two kinds of steamers are engaged in the meat-carrying trade—the cattle-boats, specially fitted up for the conveyance of live stock across the Atlantic, and the ships fitted up with refrigerating apparatus for bringing from the Colonies the dead carcases of sheep and of oxen.

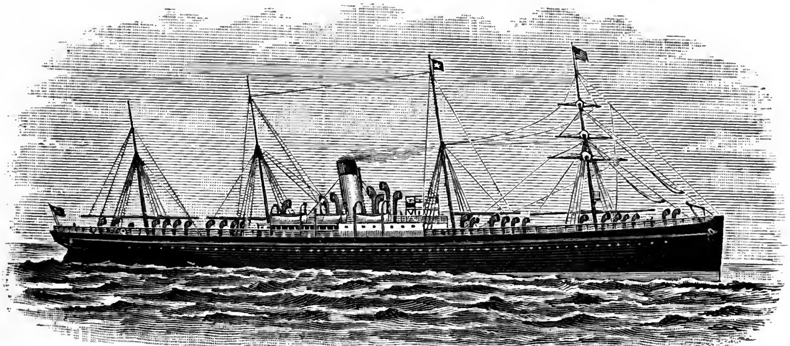
Many of the great shipping firms do, in addition to their passenger trade, a large cattle-carrying business, the White

Star Line, for instance, having upwards of 40,000 tons engaged in this particular trade, their cattle-steamer the *Georgic*, of 10,077 tons, being the largest cattle-steamer afloat. The cattle are stowed in lines fore and aft, with their heads next the gangways, a fair space being allowed to each beast, and they are of necessity well looked after; but as they suffer a good deal during rough weather, the cattle-decks are not usually the pleasantest places in the world. The bellowing and the moaning of the poor beasts is painful to hear, whilst the perpetual trampling and scraping of their hooks on the decks adds to the general discord.

The New Zealand Shipping Company, and the Shaw, Saville, and Albion Company, among others, do a very large business in the frozen-meat trade from New Zealand to this country. The hold of one of these frozen-meat ships presents a curious sight, the sides being lined with the pipes of the refrigerating apparatus, covered, when the apparatus is at work, with snow; whilst the floor, and everything in the hold, is covered with hoar frost. In the height of a New Zealand summer, when the thermometer on deck is standing at 80° or 90°, the men, when they go down to sweep out the hold, and get it ready for taking in the meat, if the apparatus is "on," may be seen with thick pea-jackets and woollen comforters. Their breath falls as white hoar frost on the deck, the temperature being several degrees below zero, and so it continues from the time the ship leaves Wellington until her arrival in the Albert Docks, a period of forty-three days. The shortness of the time occupied in the passage, however, is only a question for the shipowner, because as far as the meat itself is concerned, when once in what the sailors call "the freezer," it could just as well stay there a hundred and forty-three days as forty-three. Of course, the refrigerating apparatus is worked at very considerable expense, and a day more or less is a consideration, so that no sooner is the ship in the docks, and alongside and moored, than discharging at once commences; indeed, before all the passengers have landed, a gangway will be got out forward, and a continuous stream of men may be seen bringing cargo ashore. By means of the powerful electric lights now used in the docks as much work is done after dark as during the day; and the



A FROZEN-MEAT SHIP: NEW ZEALAND SHIPPING COMPANY'S S.S. "RUAPEHU."



WHITE STAR LINE CATTLE-STEAMER "GEORGIC."

[To face page 202.

next day after the great New Zealand liner is in, a great part of her cargo will be in the London market.

Some of the smartest and fastest cargo steamers afloat are those employed in the tea trade. Previous to the opening of the Suez Canal the China tea trade was entirely in the hands of sailing vessels, and magnificent sailers they were. Even after the opening of the Canal it took some years for the steamers entirely to supersede these splendid clippers, particularly as the China merchants had an idea that the great heat of the passage of the Red Sea and the transit through the Canal, would prove injurious to the delicate flavour of the leaf, and it was not until 1873, that the sailing ships had entirely disappeared.

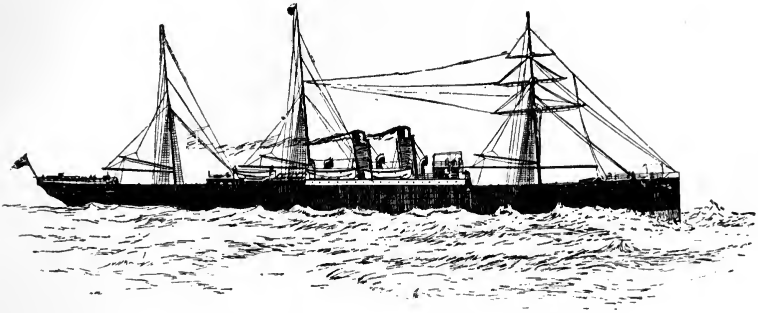
It was in 1863, that the first steamer was employed in the tea trade. She brought a cargo from Hankow to London, and the venture proved so successful that other steamers very soon followed. One of the most remarkable of these China tea-steamers was the *Stirling Castle*, her history being sufficiently curious. She was built in 1882, at the Fairfield Works, Glasgow, and was specially designed to beat all other vessels employed in the Eastern trade, her mean rate of speed being eighteen knots an hour, which was faster than any other merchant steamer then afloat. She was of 5000 tons burden, 421 feet in length, 40 feet beam, and 30 feet 6 inches deep, her horse-power being 1500 nominal; she had two funnels and three masts, being square-rigged on the foremast. After a couple of years in the tea trade, during which she made some remarkably fast passages, she was sold to a firm of Genoese merchants, and was by them employed in carrying Italian emigrants to Buenos Ayres. Before being put into this trade her name was altered to the *Nord America*. In 1885, upon the occasion of the Russian war-scare, the English Admiralty being anxious to retain the services of as many large mercantile steamers as possible, for service either as transports or as armed cruisers, Mr. Adamson, a London shipowner, made an offer to the Genoese owners of the *Nord America*, and repurchased her, altering her name back again to the *Stirling Castle*. She was at once taken up by the Admiralty, and was sent to Malta to refit. The war-scare passing over, the *Stirling Castle* was re-sold to the Genoese, and once more became the *Nord America*, and she still continues to be one of the finest and most powerful ships of the Italian mercantile marine.

The wool trade of Australia gives employment to a very large amount of shipping. During the year 1896, the value of the wool exported to the United Kingdom alone, from New South Wales, Victoria, Queensland, and Western Australia was £9,810,716. With the great passenger liners of the P. and O., and of the Orient Company, it forms the chief item of their cargo, whilst numbers of fine ships are employed solely in the wool trade.

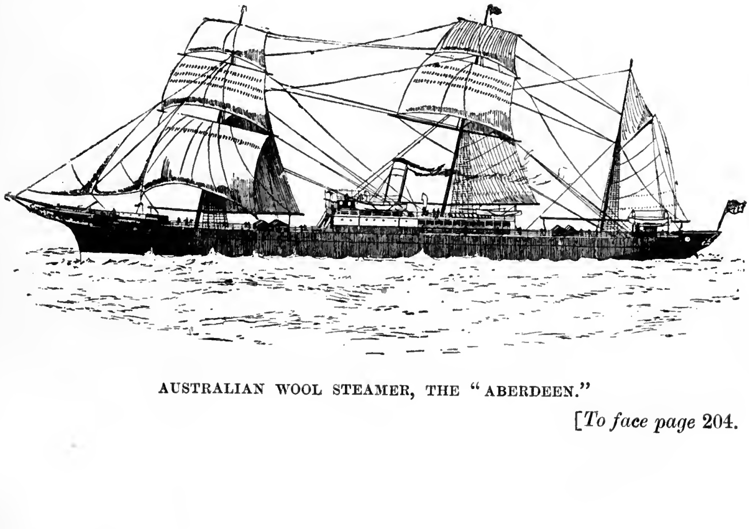
Formerly the greater part of the fruit coming to this country from Spain and Portugal, the Azores, and the ports of the Mediterranean, came in smart little schooners, tiers of which might generally be seen lying alongside the wharfs at Billingsgate, discharging at one time of the year boxes of oranges, at other times grapes, and fruits of every possible description. From the Spanish ports alone, in 1896, fruit to the value of £3,045,810 was brought to this country, and this was not a tithe of what was brought from other countries. The bulk of this now comes in steamers, and many such steamers are solely employed in the fruit trade.

Grain, although often brought to this country by the ordinary "tramp," as an occasional cargo, is for the most part imported in regular grain steamers, specially built for this particular trade; and as every additional quarter that can be crammed into the steamer is a consideration, her shape, when seen in dry dock, approaches to that of an elongated iron box. The following is extracted from the *British Merchant Service Journal*, and represents the views of the Chairman of the Shipmasters Society upon such vessels. He says—

"The causes which make grain-cargo ships founder are very clear to those who take the trouble to search for the reasons. First of all, a man desires to make his ship carry something like double the quantity of that of his neighbour. What does he do? If you take one of their midship sections and look at it you will see. It is simply like a box, with the lower corners rounded off for bilges. He carries that midship section to a most enormous length forward and aft, and then closes in the ends of her as best he may, to get the best entrance and exit for the water that the length of the vessel will allow him. Go down to the docks where the steamers are lying. There is one in the South West India dock now, although, of course, I cannot mention



A CHINA TEA STEAMER, THE "STIRLING CASTLE."



AUSTRALIAN WOOL STEAMER, THE "ABERDEEN."

[*To face page* 204.

names. You never saw such a thing in your life. If she were rigged as a ship you would find the midship section somewhere about the foremast and the mizen-mast, leaving very little for the entrance and exit. The builder says, 'I will build to a certain class at Lloyd's.' 'Yes,' says the other contracting party, 'but do not put into her one pound of scantling that you can possibly keep out, because every pound put into her will rob me of a pound of freight.' Starting with such a condition of things as that, what sort of vessels are they likely to produce to carry heavy cargoes across the North Atlantic, with a proper and due regard to the lives of those on board her, and the safety of the ship? Why, nothing but a coffin!"

These ships, each laden with perhaps two or three thousand tons of grain, hurry backwards and forwards across the Atlantic as fast as possible, very little time being wasted in the loading and discharging. All the important American grain ports are fitted with "elevators," which enable a large ship to be loaded in a very few hours. The following description of grain-loading at Galveston, Gulf of Mexico, may be taken as a fair sample of what takes place at the other grain ports. On Monday, the 12th of October, 1896, six large steamers were waiting their turn to go alongside the elevator. The grain goes up the elevator in pockets running on an endless belt; when it gets to the top it runs into large bins, where it is weighed, and then goes down shoots into the ship's hold. At eight o'clock in the morning the *Deramore*, of Liverpool, a steamer of 3000 tons, went under the elevator, and 2160 tons of wheat and maize were put on board of her in three hours and five minutes. The grain comes down each spout in a continuous stream about nine inches in diameter, and there were eight spouts continuously running into the ship. Obviously there is not much time for great nicety in trimming, and unless grain is loaded close up, and kept close up, this kind of cargo has a very nasty habit of shifting in bad weather. Nearly all the grain, however, that comes to this country comes in bulk. To bring it in bags would be far too expensive, and the grain in sacks would take up too much room in the ship's hold. A sack costs tenpence, so 1*s.* 8*d.* a quarter would have to be added to the original cost of the grain. Seven quarters go to the ton,* so that if our Galveston

* That is with wheat at 40 lbs. to the bushel, which is about a fair average weight.

steamer had brought her cargo of wheat in bags, supposing that she had had room to stow it, without reckoning the extra freight, the extra cost of the cargo itself, delivered in London, would have been £1260.

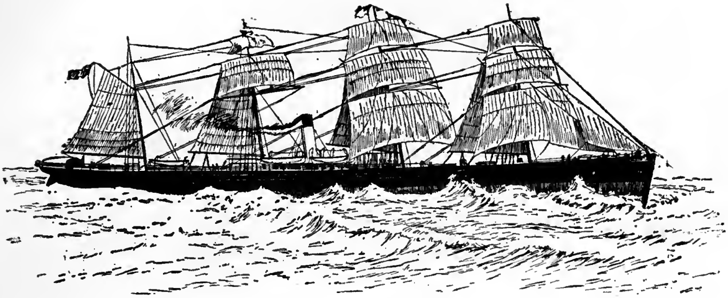
Maize is always sold in London by weight, and is reckoned as 60 lbs. to the bushel, or 480 lbs. to the quarter, so that with maize the "quarter" is merely a term, and simply means 480 lbs. It, like wheat, is always brought to this country in bulk, except a small quantity brought from South America, called "Plate maize,"* which is imported in bags.

Another class of cargo steamers specially constructed for carrying cargoes more dangerous than grain are the petroleum steamers, or, as they are more usually known, "oil-tank steamers." The first steamship built for this particular trade was launched in the Tyne in 1886. She was 300 feet in length, 37 feet beam, and had a depth of 23 feet; and on her first voyage from New York to Bremen brought across the Atlantic 2880 tons of petroleum, which her pumps were able to discharge in twelve hours.

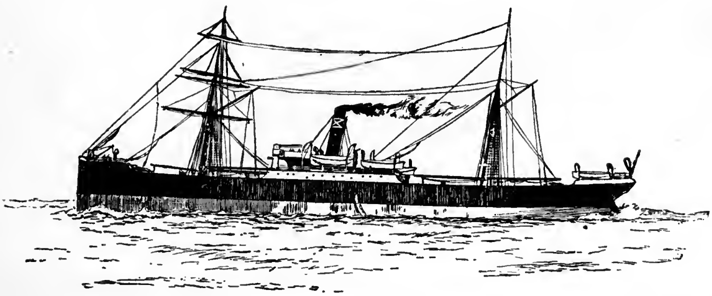
At the present time petroleum only comes to England from America, and from Batoum, in the Black Sea. Formerly there were a number of oil companies in the United States, but they have nearly all now been absorbed by one great corporation, the Standard Oil Company of North America, which has large works both at Philadelphia and New York. This company principally supplies Great Britain and the northern ports of the continent of Europe, but they also send some oil to the Mediterranean, and some to South America. The Batoum works are to a large extent owned by the Rothschilds, and their oil goes mostly to Mediterranean ports; but some goes through the Canal, to India, China, and Japan, Messrs. Samuels and Co., of London, running a line of petroleum steamers to the East, carrying oil out from Batoum, and bringing a general cargo home.

The petroleum steamers carrying the American oil are for the most part owned by the Standard Oil Company themselves, they having bought up very many of the steamers specially built for the trade by private firms, so that now it is only if they are temporarily short of a ship that an outsider is ever

* Because it comes from the River Plate.



A MODERN FRUIT STEAMER, THE "BAVARIAN."



A GRAIN STEAMER, S.S. "BANDA."

[*To face page* 206.

wanted at all, and numbers of the privately owned oil-tank steamers are at the present time out of employment, practically the whole of the trade from North America being carried on by the Standard Oil Company, which is one of the wealthiest and strongest monopolies in the United States.

The petroleum-tank steamer is divided longitudinally by a water-tight bulkhead running fore and aft down the centre of the ship, and again by thwart-ship bulkheads, so dividing her up into a series of separate tanks. These are usually numbered from forward, thus: No. 1 Port Tank, and No. 1 Starboard Tank; then No. 2 Port Tank, and No. 2 Starboard Tank, and so on. Along the bottom of the ship, on each side of the longitudinal bulkhead, runs the "pump-line," as it is called, or the filling-pipe, with a valve in each tank worked from the deck with a wheel which screws the valve up or down, the valve being on the lower side of the pipe, close to the bottom of the ship, thus admitting of the tanks being pumped out perfectly dry.

For taking in the oil the steamer is provided with a circular hole with a flange to it, usually in the side of a ship. These inlets or outlets are all made of a uniform size and pattern, so that when the ship goes alongside the refinery to load, a pipe is screwed on, and the pumping is at once commenced at the works. The ship also has a large pump-room aboard, with powerful pumps in it; but these are chiefly used for pumping out the oil; the charter-party usually providing that the shippers shall pump the oil in, and the ship pump it out when discharging.

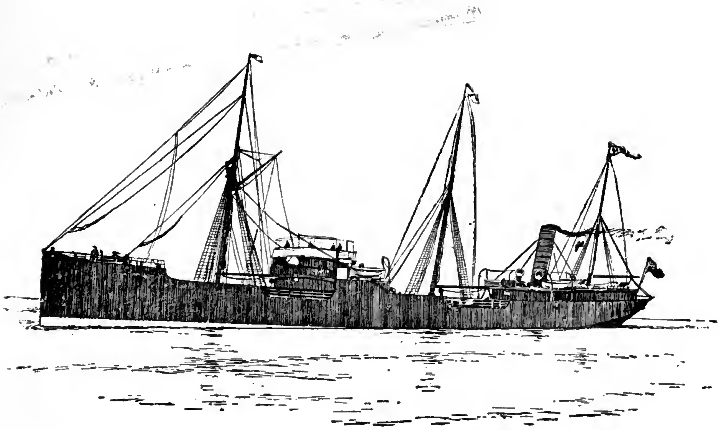
At the refinery, where the ships load, the oil is stored in large tanks not unlike the gas-holders at a gas works. Before the loading commences the distance from the top of the tank to the oil is carefully measured, and the same when the loading is completed; the amount put on board is then calculated by sworn gaugers, and their decision is final. This is the only way by which the quantity of oil put on board the ship is arrived at.

The oil coming in, as we have seen, at the side of the ship, flows down pipes at once to the bottom of the tanks, when by an adjustment of the valves any one tank may be filled separately, or the whole series of tanks may be filled simultaneously, at option; and the trim of the ship may be regulated as required by turning the valves on or off to the different tanks.

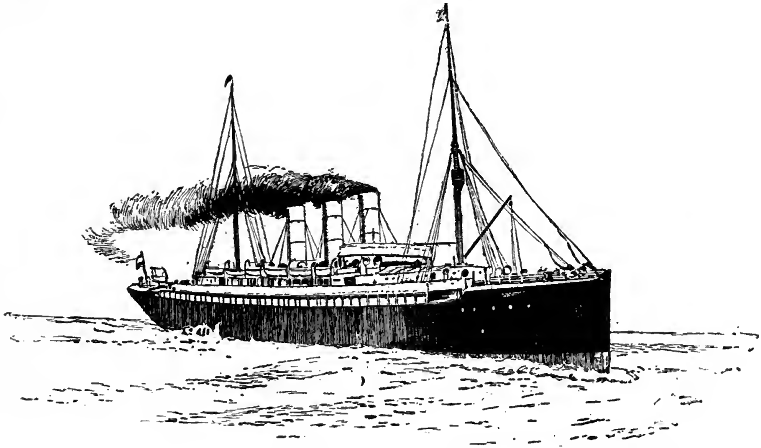
The ship usually has a 'tween-deck running the whole way fore and aft, but not extending entirely athwart the ship, a narrow space being left throughout the whole length along the centre line, so that the oil tanks, now narrowed to about three feet in width, come right up to the deck line. This central narrow space connected with the tanks is technically called "the expansion;" and at the top of the expansion, at the deck-level, are screwed the tank-lids. The object of this contrivance is to enable the oil, which expands with heat, to rise or fall accordingly to the temperature; and consequently the main body of the tank is always entirely full of oil, and there is no wash as the ship rolls. Without these narrow spaces for the expansion of the oil, if the tanks were filled entirely full, when the weather got warmer and the oil swelled it would burst the deck up; and if the tanks were not entirely full, there would be such a wash as would probably burst the bulkheads and wreck the ship. But, having these "expansions," the oil is filled up to within about eighteen inches of the top, which allows space for it to swell, but the space is not wide enough for much of a wash to get up. The oil as it expands loses its specific gravity, so that in hot weather, although there would be more gallons of oil on board the ship than were originally put on board, yet the number of tons of oil remains the same. In coming from Philadelphia in the winter, as soon as the ship runs into the warm water of the Gulf Stream, up comes the oil. It will rise sometimes in "the expansion" as much as four inches in a single night.*

On board an oil-tank steamer the men are never allowed to smoke on deck, and it is made a special stipulation when they sign on that they are not to do so, under a penalty of a fine of one month's wages for every time they are caught

* Although with heat the oil increases in volume, yet the ship also increases somewhat in size too. There is a difference in the length of an iron ship 500 feet long of rather over 7 inches (to speak accurately, 0·60 feet) between 32° and 212° Fahrenheit.



OIL-TANK STEAMER, S.S. "BEAR CREEK."



A COTTON-LADEN STEAMER.

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smoking; they, however, know the danger, and very seldom infringe the rule. All lamps used on board an oil-tank steamer, including the mast-head and the side lights, are usually electric; and the engine-room and the stoke-hold, which are right aft, are separated from the aftermost tanks by a four-foot space called the "coffer-dam," so that should there be any leakage from the tanks, the oil would run into the coffer-dam, and could be easily pumped out.

By means of these precautions, and by using ordinary care, mineral oil carried in bulk, is not necessarily more dangerous than many other cargoes. An oil-tank steamer is more dangerous empty than full, and for this reason:—petroleum gives off explosive vapour in proportion to the surface exposed. A full tank, where the top is narrowed by the "expansion," has but little exposed surface, and so gives off but a small quantity of vapour; but an empty tank, after carrying oil, and before it has been steamed out and washed, has a certain amount of oil still adhering to the sides, top, and bottom, and from all these exposed surfaces a large amount of vapour is given off. The vapour is of greater specific gravity than atmospheric air, and consequently sinks to the bottom of the tank; the upper part of the tank may therefore be perfectly free from gas, whilst a lighted match inadvertently thrown to the bottom of an empty tank might cause an explosion fatal to the ship.

Not long ago an oil-tank steamer was discharging at Rouen, and when one of the tanks was pumped out all but a few feet, something went wrong with the valve, and the chief engineer, without thinking, went down the ladder into the tank. When he got near to the bottom of the ladder the fumes of the oil, or the vapour, overcame him, and he fell off the ladder and was drowned in the oil. No one could go down to his assistance—indeed, it was night, and there were but few people about—and before they could recover his body a diver had to be engaged, who went down in his diving-dress.

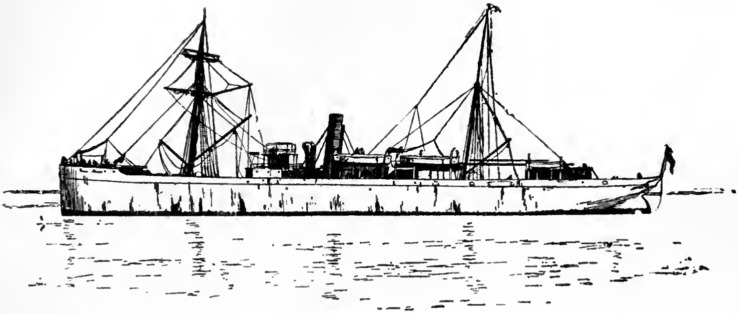
Last December a Russian oil-tank steamer went ashore on the Bolt Tail, between Plymouth and the Start; the oil got out of the tanks, and although a stiff gale was blowing in the

Channel at the time, for miles round the Start the sea was perfectly smooth.

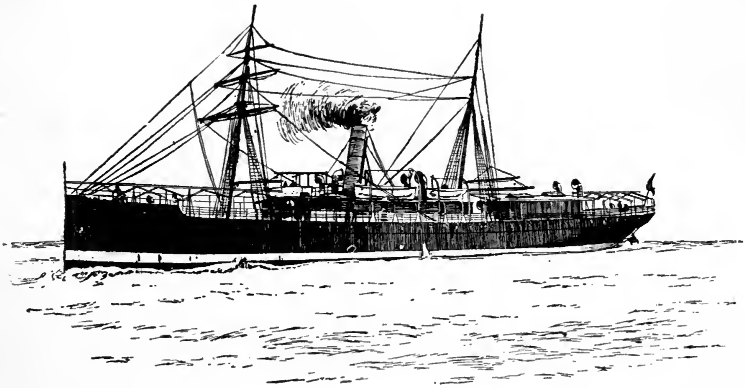
The total destruction by fire of a petroleum steamer (although not a tank steamer), occurred in November, 1897, under rather curious circumstances. The *Edenmoor*, a steel-built steamer, of Newcastle-on-Tyne, left Batoum on the 6th of November, with a cargo of refined petroleum, for Kurrachee. The petroleum was in tin cases of four gallons each, which were again packed in wooden cases. There were 112,480 such cases, so that there were about 450,000 gallons of petroleum on board. In addition to this there were 70 gallons of the petroleum in a tank in the engine-room, for use in the engine-room lamps.

All seems to have gone well until November 24, on which date the *Edenmoor* was in the Red Sea, about six miles S.S.E. of the Island of Jabel Tir. On that day the chief engineer, on going into the engine-room, noticed that the cock of the petroleum tank was leaking; and as the part of the engine-room where the tank stood was dark, he took a naked lamp in his hand, and proceeded to tighten the cock to prevent the leakage. In doing this the cock broke, and the oil rushed out, and almost immediately the whole engine-room was in flames, the oil having caught the naked light which he had placed on the floor about three feet from the tank.

All that could be done was to stop the ship by shutting off the steam from the stoke-hold, and this they managed to do. H.M.S. *Edgar*, which happened to be passing, endeavoured to render assistance, but the sea was too high to enable her to get alongside in order to use her own pumps in checking the fire; she therefore took the crew off, and took the *Edenmoor* in tow, with the intention of taking her to the nearest harbour. During the night, however, the fire spread, the *Edenmoor* being then in flames from the bow to the stern, and the hawser soon after parted. Seeing that there was no possibility of saving the ship, and thinking it not unlikely that an explosion would occur, Admiral FitzGerald withdrew the *Edgar* to a little distance, and then opened fire on the *Edenmoor* to sink her. Seventy-two shots were fired at



A "WELL-DECKED" STEAMER.



A "SPAR-DECKED" STEAMER.

[*To face page* 210.

her before she ultimately went to the bottom, still burning furiously.

A dangerous type of cargo steamer is that technically known as the "well-decked" steamer. She has a long poop and a top-gallant forecastle, and the solid bulwarks being continuous between the forecastle and the poop, an open well is formed amidships; or if she have a deck-house under the bridge, then practically two such wells. So long as a steamer of this kind is freighted in moderation there is, perhaps, no very particular danger; but should she be very deep in the water, so that the actual free-board is not more than a couple of feet or so, then if she meet with bad weather and ships two or three heavy seas, it will probably be all over with her. Supposing a ship of this kind to have a beam of 30 feet, and the "well" to extend fore and aft for a hundred feet, then with bulwarks six feet high it would be quite possible for her suddenly to take four or five hundred tons of water on board at an awkward moment, and in an exceedingly awkward place.

Fifteen years ago a vessel of this type, called the *Muriel*, was lost under precisely these circumstances, and at the court of inquiry held at Middlesborough a rider was attached to the finding of the court, to the effect that "well-decked steamers are not adapted for voyages across the Atlantic during the winter months."

At a similar court of inquiry, held in the case of the loss of the Tyne-built iron screw steamer *Egypt*, which occurred while crossing from New York to Lisbon in March, 1887, the court found

"that the ship was lost because large bodies of water came into, and remained in the well, and that there was no other contributing cause to the loss; the vessel herself being thoroughly seaworthy, her cargo properly stowed, and the navigation in all respects quite efficient."

Mr. Herbert Russell, writing on cargo steamships, says—

"Of quite an opposite type, yet nearly as unpopular, too, in her way amongst sailors, is the 'spar-decked' steamer. She is a craft rendered already horribly crank by the modern theories of 'wall-sides' and 'box-beam;' but when her slender hull is additionally built up with a long cumbrous deck-house, the top-weight reduces her to a chronic condition of threatening to turn turtle at a moment's notice. The chief danger of this type of vessel lies in her disastrous tendency to shift her cargo, owing to excessive labouring in a seaway.

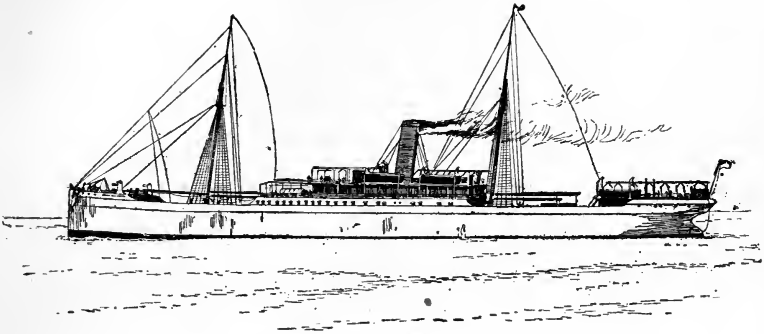
Numbers of these unstable ships have been lost simply by the displacement of their freight throwing them over on to their beam ends, from which posture their narrow proportions and excessive top-weight effectually prevent their recovering buoyancy."

Mercantile Jack has frequently to choose between dangerous ships employed in carrrying perfectly harmless cargoes, and thoroughly good and well-found ships laden with cargoes which in themselves are highly dangerous. Few things are, perhaps, more risky to carry on board ship than cotton, which has always been believed to have a dangerous tendency to spontaneously ignite, although now there are some experts who deny that it ever does ignite spontaneously; they, however, go so far as to admit that it will frequently arrive at such a state as to ignite upon the very slightest provocation, a single spark being sufficient to ignite a whole cargo: so that, which ever way it be, the ultimate result to Mercantile Jack is pretty much the same.

In August, 1887, the Inman Line steamer *City of Montreal* was totally destroyed by fire, she having at the time on board, as part of her cargo, over two thousand bales of raw American cotton. At the Board of Trade inquiry as to the loss of this ship it was stated that no less than seventy-three vessels laden with cotton had recently been either wholly or partially burnt within the short space of five months.

The Government then determined thoroughly to investigate the question of the spontaneous ignition of cargoes of cotton, and Dr. Dupré, Chemical Adviser to the Explosives Department of the Home Office, was instructed to make certain experiments both with Indian and American cotton. As the result of these experiments, Dr. Dupré reported

"that it was not until a heat of 250° Fahrenheit had been attained that the cotton began to char, and not until it was subjected to the enormous temperature of 1000° Fahrenheit did it burst into flames. He believed spontaneous combustion in cotton cargoes to be almost impossible; but, on the other hand, the material was so easily ignited as to leave no difficulty in accounting for the extraordinary number of conflagrations among cotton-laden ships. A match accidentally dropped into a bale whilst packing, and ignited by friction, might set the stuff smouldering; a live ember from the funnel might be wafted into a ventilating shaft, and so find its way down into the hold, to say nothing of the obvious danger from tobacco-smoking among the stevedores and lumpers."



A CLAN LINE STEAMER.

A BIBBY LINE STEAMER.

[To face page 212.

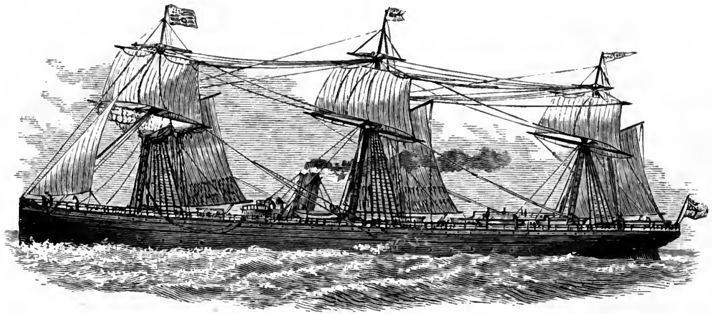
Thus far Dr. Dupré. Whether all will agree with him is another question; and until haystacks cease to heat and to take fire, ordinary folk will be disposed to suspect that the same kind of thing may possibly occur in the hold of a cotton-ship.

On board a cotton-laden steamer great care has to be exercised in such matters even as the painting of the holds; and if the holds have been recently painted, before taking in the cotton it is most desirable to see that the paint is thoroughly dry and hardened, as any contact of cotton with oily substances is exceedingly dangerous, and likely to lead to fire breaking out if the temperature be at all high.

Ships regularly employed in the cotton trade are usually fitted with steam-pipes leading from the boilers to the holds, so that in the event of a fire breaking out, the hatches being battened down and all the ventilators and other apertures closed, the steam can be turned into the hold; there being no doubt but that steam will hold the fire in check, and, indeed, hitherto, in numberless cases it has enabled vessels with serious fires on board to arrive safely at their port of destination, both in the United Kingdom and the Continent.

Coals, especially certain sorts of coal, are apt to be exceedingly dangerous, and many coal-carrying vessels are destroyed every year. Large quantities of gas are generated in the hold, and unless the hatches are frequently taken off, it so accumulates that a light inadvertently taken below may in a moment be the cause of an explosion and a fire. Gunpowder and dynamite are equally unpleasant companions to have on board, although gunpowder is so far safe that it does not spontaneously ignite.

Perhaps, when one comes to consider the number of dangerous things that have of necessity to be carried about in ships, it is wonderful, not that there are so many vessels burnt every year, but that there are not more. Passenger steamers, even the great liners, are always subjected to the risk of what may be hidden away in the recesses of the ship's hold. Many passengers are singularly thoughtless and careless, and despite the special notices issued by the P. and O. and other well-known lines, doubtless many things get below among the passengers' baggage that ought not to be there. A fine of £50 and costs was recently imposed by the magistrate at Bow Street upon a person who had sent for shipment on board a P. and O. steamer a package of wearing-apparel, etc., among which were two boxes of lucifer matches, without declaring the same—a perfectly just decision, inasmuch as an act of carelessness of this sort might jeopardize the lives of hundreds of human beings, to say nothing of the loss of a fine ship and a valuable cargo.



ANCHOR LINE S.S. "VICTORIA."

[*To face page* 214.

CHAPTER XVI.

The Transatlantic "Record"—1838, the *Sirius*—the *Great Western*—1840, the *Britannia*—1851, the *Baltic* (Collins Line)—1863, the *Scotia*—1869, the *City of Brussels*—1873, the *Baltic* (White Star)—1879, the *Arizona*—1882, the *Alaska*—1884, the *Oregon*—1885, the *Etruria*—1889, the *City of Paris*—1891, the *Majestic*—1891, the *Teutonic*—1895, the *Campania*—The future.

It so frequently happens that a paragraph appears in the daily papers to the effect that such or such a steamship has *broken the record* in the matter of the trans-Atlantic passage, that it may be worth while, even at the expense of repeating one or two facts already stated elsewhere, to give in a concise form some account of what actually has been done since the first employment of steam in crossing the Atlantic Ocean.

The year 1838, may be taken as the starting-point of the Atlantic "record," for on the 5th of April, 1838, the *Sirius* left Cork, making the passage across from Cork to New York in 18 days. On the 8th of April, in the same year, three days after the *Sirius*, the *Great Western* left Bristol, also for New York, which port she reached on the same day as the *Sirius*, and only about two hours after her, making the passage in 14½ days, thus being the first steamer to "break the record."

In 1840, one of the first Cunarders, the paddle-wheel steamer *Britannia*, crossed from Liverpool to Halifax in fourteen days and eight hours. In the following year, 1841, a great improvement was made in the speed, the *Britannia* making the homeward passage from Halifax to Liverpool in ten days; and this remained the actual record until the year 1851.

In 1851, this record was reduced to nine days eighteen hours, westward, by the *Baltic*, one of the now extinct Collins Line; and to nine days twenty hours, eastward, by her sister ship, the *Pacific*. The *Scotia*, the last paddle-wheel ship of the Cunard Line, was the first vessel to succeed in making the passage in less than nine days, she crossing eastwards in 1863, in eight days and three hours; and in the following year, 1864, accomplishing the outward passage in eight days and sixteen hours.

In 1869, the *City of Brussels* made the run between New York and Queenstown under eight days, making the passage in seven days twenty-two hours, thus beating the record up to that time, and accomplishing a feat which stood unrivalled for four years.

In 1873, the *Baltic,* of the White Star Line, came across from New York to Queenstown in two hours less than the *City of Brussels,* namely in seven days twenty hours. In 1879, the *Arizona,* of the now extinct Guion Line, one of the first of the ships since known as the "greyhounds of the Atlantic," made the passage from Sandy Hook Lightship to Queenstown in seven days and eight hours, and in the November of the same year went back from Queenstown to New York in seven days and nine hours. At that time these two passages were the "fastest on record"—a record, however, to be broken three years later by the *Alaska,* of the same Company, which made the homeward passage from New York to Queenstown, in July, 1882, in six days twenty-two hours; and in September of the same year in six days nineteen hours, the *Alaska* thus being the first ship to cross the Atlantic in less than seven days.

In 1884, the *Oregon* made the homeward passage in six days eleven hours; and in the following year, 1885, the Cunarder *Etruria* crossed from Queenstown to New York in six days two hours. In 1889, the *City of Paris,* of the then Inman Line, still further reduced the time, making the run from Queenstown to New York in five days twenty hours, and from New York to Queenstown in five days twenty-two hours. This was the "record" until it was broken by the magnificent ships of the White Star Line, the *Majestic,* and the *Teutonic.*

In July, 1891, the *Majestic* crossed from Queenstown to New York in five days eighteen hours and eight minutes, the fastest passage on record up to that date; and in the following month the *Teutonic* still further lowered the record by making the passage in five days sixteen hours and thirty minutes. In 1892, the *City of Paris* again came to the front, making the outward passage from Queenstown to New York in five days fourteen hours and thirty minutes.

In 1893, the latest additions to the Cunard fleet appeared in the *Campania* and the *Lucania*, which hold the record up to the present time, the *Campania's* fastest passage out being from Queenstown, on the 18th of August, 1895, to New York, a distance of 2898 knots, in five days nine hours and five minutes; and the *Lucania's* fastest being in October, 1894, in five days seven hours and twenty-three minutes. Up to the present, therefore, the *Lucania* is the fastest ship that ever crossed the Atlantic; her average speed for a whole passage being 22·1 knots an hour; and her fastest for a single hour 23·3 knots, or very nearly twenty-seven miles in the hour.

The above particulars of record passages are, for the most part, limited to the route between Queenstown and New York, but other fast passages have been made between other ports, as for instance that of the *Labrador*, of the Dominion Line, which left Moville (Ireland) at 2.15 p.m. on the 9th of August, 1895, and reached Belle Isle, Newfoundland, at 7.5 a.m. on August the 14th, thus making the run from land to land across the Atlantic (allowing for the difference of longitude) in four days twenty hours, the fastest on record in that direction.

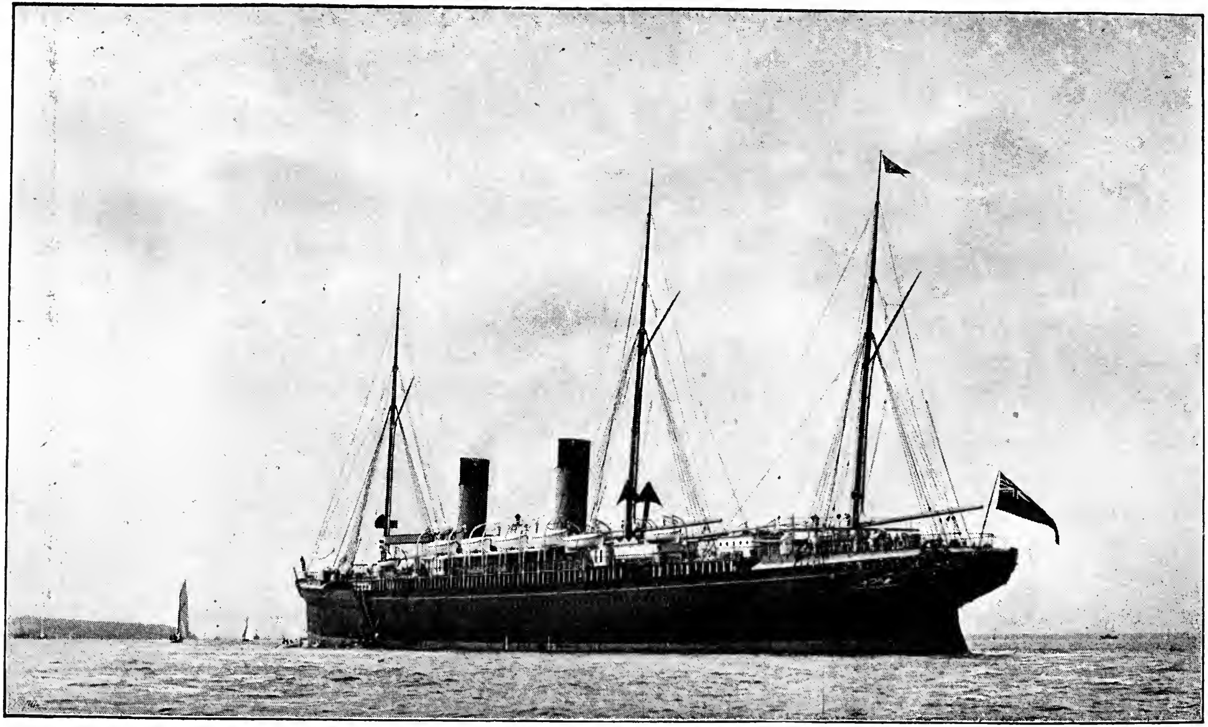
During 1896, the highest average rate of speed throughout the whole of an Atlantic trip was made by the *Campania*, with 21·86 knots to her credit. But the *Lucania* was close behind her with 21·80 knots. The latter ship made the best day's run that year, viz. 562 knots. When running to the westward her day would be equal to 24 hours 50 minutes, and consequently the average for the day was 22·63 knots per hour. Coming home she made 523 knots, and the day being then only 23 hours 10 minutes long, the average would be 22·57 knots.

Of the White Star liners, the fastest average speed for a whole passage was in 1896, 20·17 knots per hour, by the *Teutonic* on her homeward passage in June; whilst the *Majestic* came very close in her outward passage in August, her average speed then being 20·15 knots.

The *St. Paul* and the *St. Louis*, the American-built steamers of the American Line, which were designed to beat all previous records, have so far failed to do this that their best average speed remains appreciably below that of either the *Campania* or the *Lucania*. The *St. Paul's* best average for a whole trip was her westward passage from Southampton to New York, 3046 knots, in August, 1896, the time being six days and thirty minutes, or at the average speed of 21·08 knots per hour. The *St. Louis'* best whole trip was also her westward passage, 3055 knots, during the same month of August, 1896, her time being six days two hours thirty minutes, or an average speed of 20·87 knots per hour.

It is curious to note that nearly all the record-breakers have been built in pairs. In 1875, the *Britannic* and the *Germanic*, of the White Star Line, were considered the swiftest steamers in the world, and at that time it was extremely difficult to say which of them was the faster. In 1881, the *Servia*, of the Cunard Company, and the *City of Rome*, of the Anchor Line, made their appearance, and put the *Britannic* and the *Germanic* into the shade. In 1884, the two Cunard boats, the *Etruria* and the *Umbria*, were built, and were then considered to be the best-matched, as well as the fastest pair of steamers afloat; yet their brilliant performances were completely eclipsed by the Atlantic passages of the Inman ships, the *City of Paris* and the *City of New York*, which were launched in 1888. These in turn had to give place to those magnificent steamships of the White Star Line, the *Majestic* and the *Teutonic*, which are almost identical in appearance, tonnage, and speed; and now these fine ships have had to yield the palm to the Cunarders, the *Campania* and the *Lucania*, which, like all the rest, will probably themselves be superseded before long by still faster ships, and one of their successors will doubtless be the White Star's new *Oceanic;* although, unless some very striking revolution takes place either in shipbuilding or in the means of propulsion, it seems difficult to conceive that any very material advance still remains to be made.

But although the *Campania* and the *Lucania* as yet hold the premier position for speed and size, it would be wrong



WHITE STAR LINE R.M.S. "TEUTONIC" AT SPITHEAD.

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to suppose that those interested in the transit of passengers and mails across the Atlantic have not been casting about with a view of surpassing the greyhounds of the Cunard Company. Expert opinion seems unanimous as to the direction which the most probable development of the North Atlantic passenger and mail traffic must take; and the future, and probably the near future, will see a still more decided line of demarcation between passenger and freight services than obtains at the present time. In all existing railway services passenger traffic and goods traffic are relegated to totally distinct departments, each provided with its own special locomotives, and with its own particular rolling stock. It will not, probably, be long before a similarly sharp division will have to be made between the passenger and the goods traffic on the Atlantic, and prompt action in this direction will probably result very favourably to the first company which has the courage to break through established traditions.

A passenger boat, pure and simple, need not be of the same dimensions as the *Campania* and the *Lucania*. A vessel of from 400 to 420 feet in length would be amply large enough to give the requisite stability in a seaway, and as she would probably require less power to drive her, a material saving would be effected. Her decks, too, unobstructed by hatches and winches, would afford superior attractions to the ocean traveller, and passengers would soon learn to discriminate between the passenger steamer, and the passenger and cargo boat. But one of the most material points in favour of these suggested vessels is the fact that they would be able to make considerably more trips in the course of a year than a steamer that has a cargo to load and discharge. In the case of the *Campania* and the *Lucania* a month elapses between their sailing dates from Liverpool; in other words, a return voyage occupies a month, these boats being in port for a week at Liverpool and a week at New York on each trip. If they were simply passenger boats much of this delay would be avoided. Assuming the cost of one of these vessels to be half a million sterling, every week that she is lying idle—considering the matter as one of interest on idle capital—means a loss of something like £500. If she were simply a passenger boat these twenty-four weeks of the year spent in port would certainly be reduced by one-half, which seems to point to a saving of something like £6000 a year. But there would be another effect—the twelve trips across in the year would probably be increased to eighteen, so that the gain would be at both ends.

With such a boat the point of departure would probably be Holyhead, and not Liverpool, and the inducement to call in at Queenstown would then disappear, the record passage being for the future New York to Holyhead and Holyhead to New York.

Engineering experts are perhaps a little undecided as to how long a boat could keep up such a service without requiring overhauling; but when the continuous runs of the large fast steamers engaged in the Australian and New Zealand trade are considered, it is evident that marine engines are capable of running much more than six or seven days at a stretch. Thus there should be no real difficulty in a ship which crosses the Atlantic at a speed of from 22 to 24 knots an hour being turned round in a couple of days, and making at least eighteen trips in the year as against the *Campania's* or the *Lucania's* twelve; so that the passenger boat, as distinct from the cargo boat, will without doubt be soon as much recognized as an institution between Holyhead and New York as it now is between Dover and Calais, or between Folkestone and Boulogne.

CHAPTER XVII.

Sailing ships—The "Baltimore clippers"—Boston and New York clippers—The *Sea Witch*—The American tea clippers—British clippers—The China tea race in 1853—Donald McKay's ships—The *Flying Cloud*—The White Star Liners—The *Great Republic*—The *Blue Jacket*—Loss of the *Blue Jacket*—The *Marco Polo*—The *Red Jacket*—The *Lightning*—The *James Baines*—The *Donald McKay*—The Scotch clippers—The China tea race of 1866—The *Ariel* and the *Taeping*—*Bombay* clippers—The *Tweed*—The *Sir Lancelot*—The tea race of 1867—The *Thermopylæ*—The *Cutty-Sark*—British ships—Four-masters.

A CURIOUS similarity manifested itself towards the middle of this century between the way in which steam was gradually superseding horses on the land, and the way in which it was equally superseding sails upon the sea. Stage-coach travelling had never been brought to such a pitch of perfection as it attained just before its final extinction by the railroad. Such handsome, well-appointed, fast, and punctual coaches as then appeared had been entirely unknown until the railway engineer was slowly, but surely, throwing up his embankments, and boring his tunnels, for the new mode of locomotion that was so soon to take their place. In the same way on the water, although steam was making rapid progress, and was steadily threatening the sailing ship with extinction, yet never had the world seen such perfect specimens of sailing ships as appeared between the years 1840 and 1870, or perhaps a little later.

Like many other useful arts, that of building fast-sailing clipper ships came to this country from America, the shipbuilders of Baltimore claiming the honour of being the first to turn out these swift and handsome vessels. From the Potomac issued the particular kind of craft that soon became famous throughout the world, under the name of "Baltimore clippers," not only for their astonishing speed, but also for the exceeding beauty of their model. The vessels built at Baltimore, however, were seldom larger than brigs, the number of barques and ships constructed there being but small, owing to the want of water-room; two of the first vessels of the larger type, however, were the *Greyhound* and the *Grey Eagle*, both of which proved to be exceedingly fast sailers.

Soon after this New York and Boston turned their attention to the building of an improved type of ship, and it was not long before a fleet of handsome clippers hailed from these two ports also. The first of the famous American clippers built at New York was the *Sea Witch*, of 907 tons register, which was launched in 1844. The *Sea Witch* soon became famous, and although repeatedly beaten afterwards by the larger ships which succeeded her, she is believed to have had more influence on the form of deep-sea vessels than any other merchant ship ever built in the United States. With her the full bow and the long sharp run aft went out of fashion, and the long sharp bow with a fuller stern came into permanent use the world over for fast ships of the mercantile marine. The *Sea Witch* was 170 feet 3 inches in length, 33 feet 11 inches beam, and 19 feet in depth. Owing to the sharp rise of her floor (16°), she was, however, unstable without a good deal of ballast, and she rolled considerably in a seaway; but her speed was surprising, she being at that time undoubtedly the fastest sailing ship afloat.

The *Sea Witch* was soon followed by larger and swifter clippers, many being specially built for the China tea trade, among them being the *Oriental* and the *Celestial*, and after these the *Challenge* and the *Surprise*, and many others. Among the many splendid trips made by these American clippers those of the *Oriental* and the *Celestial*, belonging to New York, perhaps stand pre-eminent. The *Oriental* accomplished the distance from New York to Hong Kong—14,521 miles by log, and 14,160 by observation—in less than 71 days, her average rate of sailing per day being 200 miles. The *Celestial* made a trip from New York to San Francisco in 95 days, which was two days quicker than the *Sea Witch* had done, which until that time had been the shortest passage on record.

These American ships were now beginning to appear in the Thames and in the Mersey, and were already competing for British trade against British ships. It was in the year 1850, however, that Mr. Richard Green, of the famous Blackwall Line, determined to construct some vessels that should beat the American clippers, and at a dinner given by one of the city companies he announced his intention as follows: "We have heard," said he, "a great deal this night about the dismal prospects of British shipping, and we have heard, too, from other quarters a great deal about the British lion and the American eagle, and the way in which the two are going to lie down together. Now, I don't know anything about all that, but this I do know—that we, the British shipowners, have at last sat down to play at a fair and open game with the Americans, and, by Jove! we'll trump them." Soon after this an English clipper ship was laid down by Mr. Green, which when she was launched was called the *Challenger*, in answer to the Baltimore clipper *Challenge*.

By 1850, the annual race home from China of the tea ships was an established institution, and in 1852, was attracting so much attention that the American Navigation Club of Boston offered £10,000 to the vessel which should win the next race, an American clipper against a British one, of 1200 tons register, the ships to run from London to China and back, under certain regulations. After the offer had been published for a month in England, it was raised to £20,000, and the British ship was promised fourteen days' start. The challenge, however, was never accepted.

By this time, however, other British shipbuilders besides Mr. Green were constructing vessels designed to equal, if not to surpass, the American clippers, and in 1853, Messrs. Jardine, Matheson, and Co. sent out the *Chrysolite* and the *Stornoway* to take part in the race, which, however, still resulted in favour of the American clippers, as follows:—

American-built clipper	... *Challenge*	...	Canton to Deal, 105 days,
" "	... *Surprise*	...	" " 106 "
Aberdeen-built clipper	... *Stornoway*	...	" " 109 "
" "	... *Chrysolite*	...	Canton to Liverpool, 106 days,
American-built ship	... *Nightingale*	...	Shanghai to Deal, 110 days,
British-built ship	... *Challenger*	...	" " 113 "

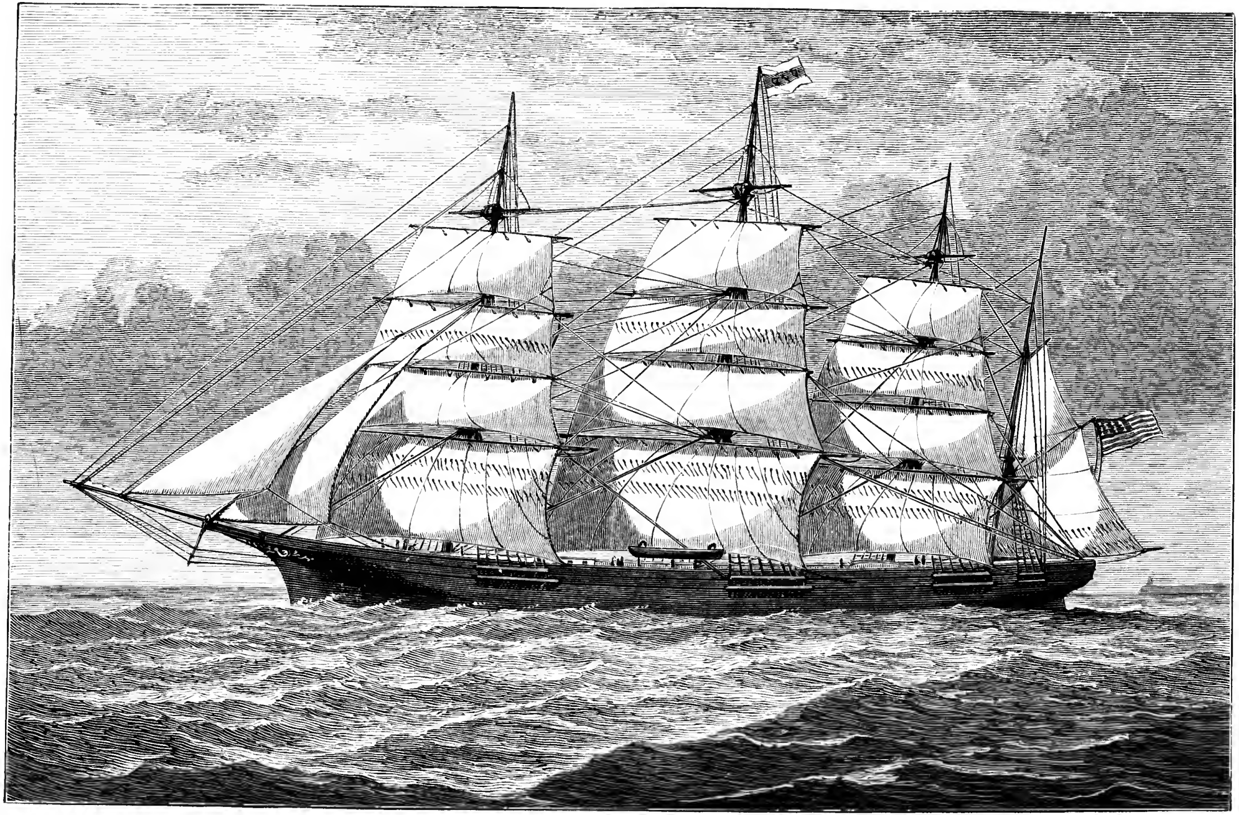
the Americans thus winning both races.

The years from 1850, to 1855, were noted for the number of fast clippers turned out from the building-yards of the United States, and the demand for such vessels became so great that they were frequently very hastily constructed. As a case in point, the *John Bertram*, 1100 tons register, a clipper well known for a few years, was launched in sixty days from the laying down of her keel, and in thirty days more she was speeding on her way from Boston to San Francisco with a full cargo of goods, at forty dollars per ton freight. This reckless mode of construction soon told its tale, more particularly in the case of the China tea-clippers of American build, which, in spite of the fact that they were exceedingly beautiful vessels, and admirable in point of speed, were notoriously so slightly built that on arrival their cargoes were frequently found to be very materially damaged.

In 1851, the clipper *Nightingale*, mentioned above as in the race from Shanghai to Deal, was built at Portsmouth, New Hampshire. She was 178 feet long, 36 feet beam, and 20 feet deep, and was 1066 tons register. She was an exceedingly sharp ship. In the race from Shanghai upon one occasion she ran 336 nautical miles in the twenty-four hours, or at the rate of rather more than 16 statute miles an hour. The next year, 1854, she ran from New York to Melbourne in 76 days.

In 1851, Donald McKay, of East Boston, a name destined to become famous in connection with fast-sailing ships, built the *Flying Cloud*, a clipper, measuring 208 feet on keel, 41 feet beam, and 21 feet 6 inches depth of hold, 1782 tons register. She made her first voyage from New York to San Francisco, doing the passage out in 90 days. On one day she ran 427 nautical miles, then the very fastest time on record.

Mr. Donald McKay, in 1852, built the clipper *Sovereign of the Seas*. She was 245 feet long on the keel, 44 feet 6 inches beam, and 25 feet 6 inches depth of hold, and was 2421 tons



THE AMERICAN CLIPPER "GREAT REPUBLIC."

[To face page 224.

register. She was the largest, sharpest, and longest sailing-vessel in the world at the time of her construction. Upon one occasion she ran 1367 miles in four days, thus keeping up a continuous rate of over 14 miles an hour. Once she made 436 miles in twenty-four hours, or over 18 miles an hour. This ship earned 200,000 dollars gross during the first eleven months of her existence.

The original "White Star" Line was composed of a fleet of these fast-sailing American clippers, and among their ships were the *Champion of the Seas*, 2470 tons; the *Blue Jacket*, 1790 tons; * the *Sardinian*, 1150 tons; the *White Star*, the *Shalinar*,

* This celebrated clipper was, unfortunately, burned at sea. The following account is that given by the Master, Captain J. White, upon the arrival of the survivors at Queenstown, on May 17, 1869:—"The *Blue Jacket*, 1790 tons register, left Lyttelton, New Zealand, on the 13th of February, 1869, with a cargo of wool, flax, and colonial produce, and 15 boxes of gold, containing £48,000. She had 17 saloon passengers, 13 second-class, and a crew of 39, with a surgeon and a stewardess. On the 5th of March, at 11 a.m., the *Blue Jacket* passed Cape Horn, and on the 7th of March, the Falkland Islands. At 1.30 p.m. on that day, being in latitude 50·26 S. and longitude 47 W., a fine breeze blowing from W.N.W., smoke was observed to issue from the fore hatch. Immediately the hatch was removed to ascertain the cause, when a volume of smoke rushed up. Both fire-engines were immediately started to work by the crew and passengers, the fire-buckets being also put into requisition. After two hours' incessant labour by all hands the fire seemed to decrease, and an attempt was made to break out the cargo, and to throw overboard the bales in the fore-hatch so as to get at the fire, but the attempt was unsuccessful, the flames rushing from the starboard wing. The hatch was immediately closed, and covered with tarpaulins, wet sails, etc., and the engines were played into the holes where the deck-lights had been, and through which the flames could be distinctly seen coming from the flax. The flames were put out as far as the hose-pipes would reach, when these holes were closed up and others opened, until it was discovered that the coals in the fore-peak were on fire, when all hope of saving the ship was abandoned.

"The boats were at once got ready, provisions, water, etc., being put into them. The heat now compelled those working the engines to desist, the most perfect order and discipline being maintained by the crew and passengers. The first boat lowered was the cutter, into which the ladies, children, and the rest of the passengers, and some of the crew were put. The remainder of the crew took to the lifeboats, of which there were two. At 10 p.m. the flames were observed to be breaking out of the top-gallant forecastle, rushing up the fore-sail and the fore-stays. At 10.30 p.m. the foremast went over the side, the flames having by this time reached the mainsail. Before leaving the ship she was hove-to on the starboard tack, drifting to the S.E.

"I now regulated the boats, dividing the crew equally in the lifeboats, the *Salamis*, the *Patriarch*, and many others, sailing to Australia. Of these, perhaps, the *Patriarch* was the fastest ship, making, in 1868, the run home from Sydney to the West India Docks in sixty-eight days. To this line Messrs. Ismay, Imrie, and Co. succeeded, and they then supplemented the fleet with a number

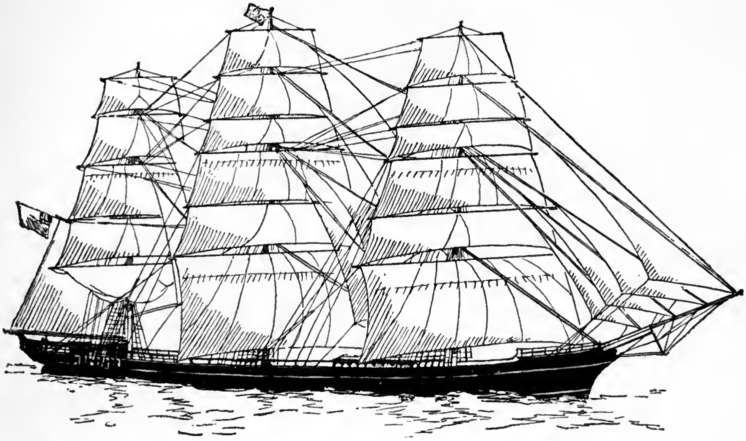
putting Mr. R. J. Bell, the second officer, in charge of one, and Mr. A. Webber, the third officer, and the bo'sun, in charge of the other. The cutter was taken charge of by myself and the first officer, Mr. F. Williams, there being in her the fourth officer, two seamen, three stewards, one boy, and all the passengers (thirty-nine in all), the two lifeboats having thirty-two persons, all the boats being in company.

"On the 11th of March smoke was still visible from the burning hull of the ship; the boats were in company, wind fresh from the westward, and the sea rising. Both the lifeboats were lost sight of during the day, though they had strict orders to keep in company. Before sunset we ran down to see if the boats could be made out. I kept a man at the mast-head, sent up a rocket at 8 p.m., and kept on dodging about till midnight when another rocket was sent off without any response. We then proceeded on our course for five days, experiencing strong westerly gales, the sea washing over the boat continually, drenching every one to the skin.

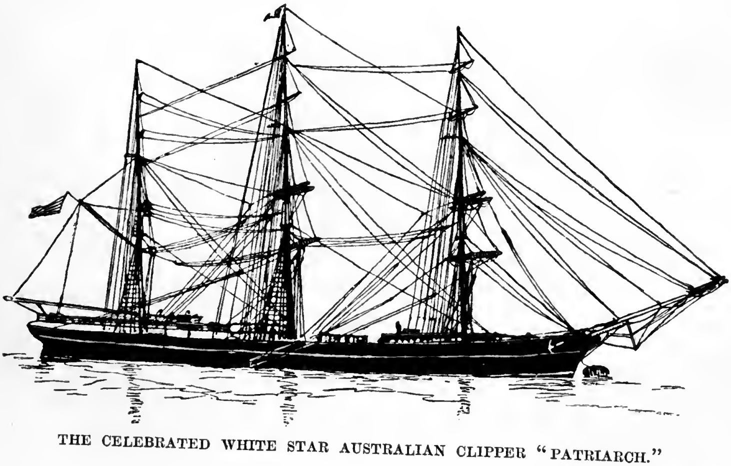
"On the 16th of March, at 5.30 a.m., lat. 50·55 S., long. 53·51 W., all being in a very exhausted state from hunger, thirst, wet, and cramp, the rations having been reduced to a mouthful of water, and one table-spoonful of preserved meat every twenty-four hours (all the biscuit having been destroyed by the salt water), a sail hove in sight, running down towards the boat. She proved to be the barque *Pyrmont*, of Hamburg, from Iquique, bound to Falmouth for orders, Capt. R. Neemeyer, master. Capt. Neemeyer at once took all on board, the boat being abandoned. Unremitting attention was paid to the rescued by all on board the barque, the weak being attended to first, their wet clothes being removed, and all supplied with fresh dry things. The captain being told that two more boats had left the burning ship, ran the *Pyrmont* an hour N. by W. and two hours E.N.E., but, unfortunately, nothing could be seen of them. Thomas Apsey, third steward, died immediately on being brought on board the *Pyrmont*, and Mr. Farrington, the fourth officer, lost his reason and gradually sank, dying on the 21st of March.

"On the 28th of March, lat. 28·5 S., and long. 29 W., one of the passengers died, and soon after the ship *Carricks*, from Liverpool to Calcutta, hove in sight, and was boarded, her captain supplying the *Pyrmont* with what provisions he could spare. On April 1st, in lat. 25 S., long. 29 W., the clipper ship *Yorkshire* was spoken, bound for Melbourne. Her captain most generously supplied the *Pyrmont* freely with every necessary, and took off two of the passengers who were desirous of proceeding to Melbourne.

"On the 17th of May the *Pyrmont* landed the survivors, comprising the whole of the passengers, with the exception of the one who had died and the two who had gone back to Melbourne, at Queenstown, there having been no further casualty among those from the cutter of the ill-fated *Blue Jacket*."



WHITE STAR LINE CLIPPER "SALAMIS."



THE CELEBRATED WHITE STAR AUSTRALIAN CLIPPER "PATRIARCH."

[*To face page* 226.

of iron clippers such as the *British Commerce*, the *Belfast*, the *Knight Commander*, the *Houghton Tower*, the *Glengarry*, the *Knowsley Hall*, and other magnificent ships.

In the same way that the stage-coach proprietors vainly tried their utmost still to beat the railways; so the Yankees tried their very hardest with these fast-sailing and handsome clippers to beat the steamers across the Atlantic. One of these American clippers, the *Dreadnought*, under the command of Captain Samuels, actually came across from New York to Queenstown in 9 days 17 hours, which is probably the fastest sailing time on record, being at the rate of at least twelve knots an hour the whole distance.* The *Ashburton* crossed from New York to Liverpool in 12 days; the *Princeton* in 16 days; and the *Virginia*, the *Waterloo*, and the *Queen of the West* in 17 days; whilst the *Waterloo*, the *Liverpool*, and the *Tornado* crossed the other way, from Liverpool to New York, in 18 days. A little later the *Gleniffer* made four voyages to Quebec and back, thus crossing the Atlantic eight times during eight months, her fastest passage being from Quebec to Greenock in 15 days. One of the finest, as well as one of the largest of these famous vessels—indeed, at that time she was the largest sailing-vessel in the world—was the *Great Republic*, belonging to Messrs. A. A. Law and Co., of New York, When launched she was of 4000 tons; but having soon afterwards been partially destroyed by fire, her upper deck was removed, and her size was consequently reduced to 3400 tons. She was 305 feet long, 53 feet beam, and 30 feet depth of hold. She was fitted with double topsails, being one of the earliest ships to be so treated. On her first trip she brought 3000 tons of Peruvian guano from New York to London as ballast. She made the passage from New York to Scilly in thirteen days; and beat up the Channel from thence to the Downs, in the teeth of a strong easterly gale, in three days more, making in all sixteen days from New York to the Downs. But the days of the Transatlantic passenger trade were over for sailing ships, and they had, at last, to haul

* This famous American clipper—the *Dreadnought*—for some years was employed in the Californian trade, the steamers having driven sailing vessels like her off the Atlantic. She was totally lost in 1869, at Point Penas, near San Francisco.

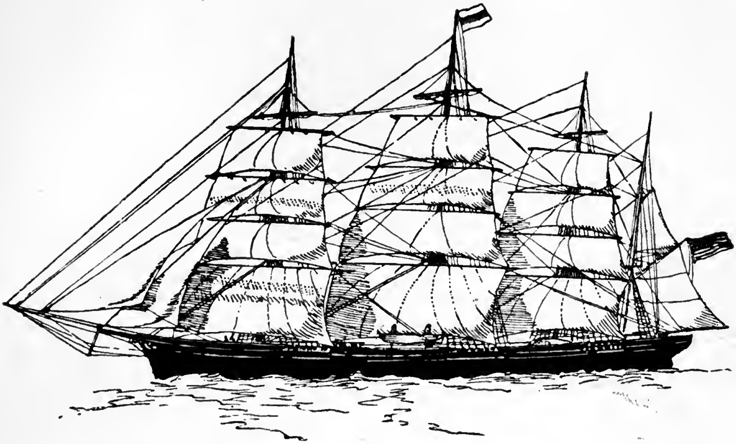
down their colours to the steamers; and lines like the *White Star*, the *Guion*, and others, had to give up sails, and take to steam.

Between the years 1850 and 1860, when the Australian gold fever was at its height, every available vessel was put into the Australian trade, and a keen competition was waged between the English and the American ships. Large firms like Devitt and Moore, after putting on the large ships previously used in the East Indian trade, were sending out quite small vessels as passenger ships to Geelong, Adelaide, and Sydney, vessels ranging from 350 to 500 tons; indeed, the great majority of the ships leaving London at that time rarely exceeded six hundred tons.

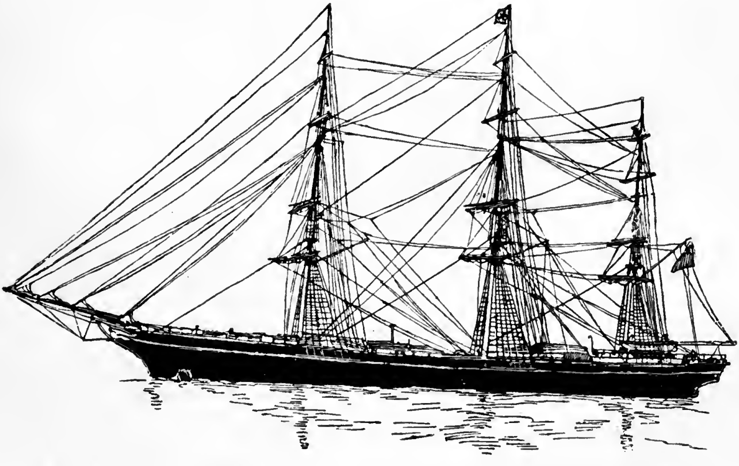
During the whole of the "sixties," the average Australian passage of the regular English frigate-built ships—such ships as Green's, or Money Wigram's, which were the very finest vessels out of the port of London, was usually from eighty-five to a hundred days. The following may be taken as fair examples: The *Blackwall*, 1000 tons, belonging to Messrs. Green, arrived in the Downs on November 1, 1867, one hundred days from Melbourne. She left Melbourne on the 23rd of July, rounded the Horn on the 3rd of September, having experienced very heavy easterly and south-easterly gales all the way from New Zealand to the Horn. She crossed the Line on the 30th of September, and anchored in Plymouth Sound on the 30th of October.

The same day the ship *Sussex*, 1100 tons, belonging to Money, Wigram and Co., arrived at Plymouth, 85 days from Melbourne, which port she left on the 6th of August. She rounded the Horn on the 13th of September, crossed the Equator on the 6th of October, arriving at Plymouth on the 30th of October. This, then, was about the usual length of the passage in the best ships, so that no small sensation was created in Liverpool by the American-built clipper, the *Marco Polo*, making the passage from Melbourne in the then unprecedentedly short time of 75 days.* In 1854, Messrs Baines and Co., of the Black Ball

* The Black Ball clipper *Marco Polo* was not always so fortunate. Upon one occasion she was 183 days from Melbourne. The *Marco Polo* sailed from Melbourne for Liverpool on the 19th of February, 1861, passing Port Philip Heads on the 20th, with 242 passengers, and a general cargo including 6570 oz. of gold. On the 4th of March, in the South Pacific Ocean, she came into violent collision with an iceberg. Her bowsprit was carried away, her



AMERICAN FOUR-MASTED CLIPPER.



HON. EAST INDIA COMPANY'S SHIP "PUNJAUB," AFTERWARDS THE "TWEED."

[*To face page* 228.

Line, put on two splendid ships, the *Lightning* and the *Red Jacket*, followed shortly after by the equally celebrated clipper, the *James Baines*.

The famous clipper, the *Red Jacket*, 2464 tons register, designed by Mr. S. M. Pook, was built by Donald McKay specially for the Australian trade. She came across from New York to Liverpool in 13 days 11 hours in an attempt to beat the Dreadnought; but the *Dreadnought* beat her by three hours. The *Red Jacket* made her first run out to Melbourne from Liverpool in 69 days. Upon another occasion she made the passage from Liverpool to Melbourne in 69½ days, and the passage home in 73½ days; the whole voyage, out and home, including the detention in Australia, occupying only 5 months and 10 days.

The *Lightning*, also built by Donald McKay, in 1854, was one of his very smartest clippers. She was 227 feet 6 inches long on the load-line, 44 feet 6 inches beam, and drew 17 feet of water. Her register tonnage was 2090 tons. She came across from Boston to Liverpool in 13 days 20 hours. She did Liverpool to Melbourne in 77 days, 65 days, and once in 63 days—the shortest passage on record—and made the return passage in 64 days.

The *James Baines*, another of the famous Black Ball liners, of 2515 tons, was equally celebrated for her uniformly rapid passages, so much so that upon one occasion when she and the *Lightning* left Melbourne the same month, and when the former ship was over a hundred days coming home, instead of her usual time of from sixty to seventy days, there was something like a panic in Liverpool. The *James Baines* left Melbourne on the 7th of August, 1856, having on board 174,000 oz. of gold dust, worth about £700,000. Not having arrived at Liverpool on the 14th of November, being then 99 days out, insurances were effected upon her at £8 per cent. (her usual

bows stove in, and the foremast sprung. Such was the extent of the damage that for a time all hopes of saving the vessel were given up; but owing to the intrepidity of the captain, and the brave conduct of all on board, the *Marco Polo* was successfully taken into Valparaiso on the 2nd of April. Here she underwent a thorough overhaul, and was enabled to continue her voyage, arriving in Liverpool on the 21st of August, being 183 days out from Australia.

terms for specie being from 35*s.* to 40*s.* per cent.); and being still unheard of on the 20th of November, then 105 days out, £15 per cent. was paid. On the next day, the 21st, she towed up the Mersey.

The *Lightning* left Hobson's Bay on the 27th of August, three weeks after the *James Baines*, with 140,000 oz. of gold-dust on board. The following morning she passed the Heads, and on the 1st of September was off New Zealand. She rounded the Horn on the 19th of September (21 days 16 hours from the Heads); crossed the Line on the 8th of October; on the 18th of November was off Cork; rounded Holyhead on the 19th; and arrived in the Mersey on November 20, 1856—one day before the *James Baines*.

Another very celebrated "Black Ball" liner was the *Donald McKay*—2604 tons register (the largest clipper in the world). She was built at Boston, her length being 266 feet, her beam 46 feet, and her depth of hold 29 feet. She was one of the fastest sailers in the world; upon one occasion taking a thousand troops from Portsmouth to Mauritius in 70 days. Her average time for six consecutive voyages from Liverpool to Melbourne was 83 days; and only once it exceeded 85 days.

Another very fast clipper ship, belonging to the Liverpool White Star Line, was the *Lillies*, 1665 tons register. She took a number of troops from Dublin to Gibraltar in 4 days. She made the passage from Liverpool to Melbourne in 79 days, on which occasion she made 365 miles a day for several days in succession.

Some Aberdeen clippers, however, were by this time making their appearance, whose performances quite equalled those of the American ships. The *Maid of Judah*, 1200 tons register, made the passage from London to Sydney, in 1860, in 78 days; whilst the *Star of Peace*, of 2000 tons, made four consecutive passages from London to Sydney, respectively, in 77, 77, 79, 79 days. The British clipper ship *Hurricane*, of the Thames and Mersey Line of Australian Packets, was also an exceedingly fast sailer. She came home from Melbourne in 74 days. Upon one occasion she ran 270 nautical miles in sixteen hours and a half, thus keeping up a speed exceeding sixteen knots an hour.

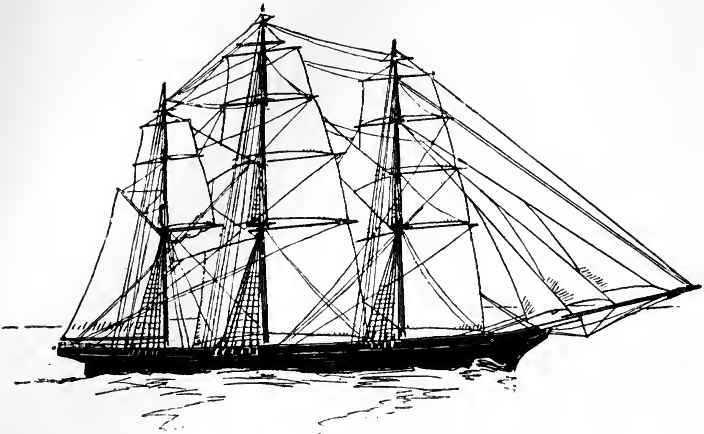
The building of clipper ships had now reached the far East, and ships on the lines of the American and the Aberdeen clippers were being turned out of the shipbuilding yards of Bombay. In 1857, such a vessel, named the *Punjaub*, was built for the East Indian Government as a steam war-ship. She continued in the East Indian Navy until the Government of India was transferred to the Imperial Crown, when she was sold, converted into a sailing ship, and re-christened the *Tweed*. The East India Company always used to pay dearly for their ships, and a more costly ship of her class was probably never built than the *Tweed*, she being constructed entirely of the finest Malabar teak.

Under the red ensign of the Merchant Service she made some remarkable passages. Her first voyage was from London to Bombay, with the Persian Gulf telegraph cable on board, which she was afterwards employed in laying, when she made the run out to Bombay, of course by way of the Cape, in 77 days. She then went to Vingorla, at which place she took on board the Seaforth Highlanders, and brought them home in 78 days. And others of her trips were equally rapid.

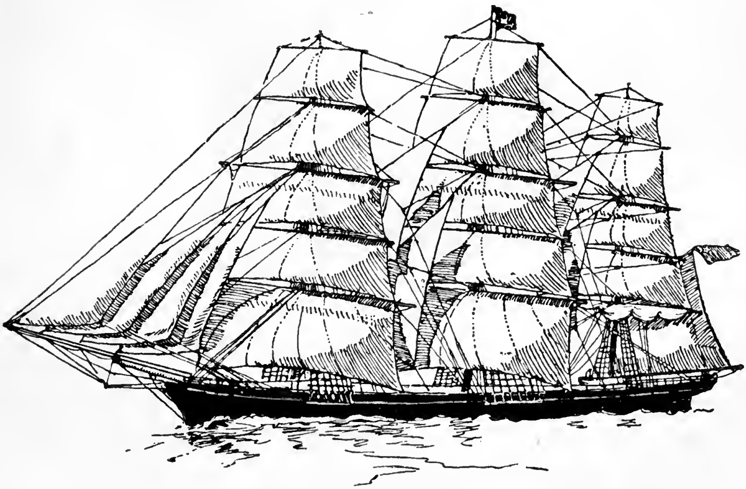
In 1856, Messrs. Scott and Co., of Greenock, built the *Lord of the Isles*, to compete with the American tea clippers, and in the next race home from China she beat the Americans in point of speed, besides possessing the additional quality of being better built than they were, and in consequence, bringing her cargo home uninjured. For some years the honours of this race were divided, the palm of victory falling sometimes to the British ships, sometimes to the American; but before the "sixties" were out the blue ribbon of the China tea race was wrested from the Americans altogether, and carried off by British ships, some very smart sailing constantly taking place between the competitors. In the race of 1866, the *Ariel*, the *Taeping*, and the *Serica*, with two other famous clippers, left Foo-chow-foo together, and at nightfall on the first day out lost sight of each other, and during the entire distance from China to England they never met again until off the mouth of the Channel. The *Ariel* and the *Taeping* then came up the Channel neck and neck; but the *Ariel* got in advance of the *Taeping* in coming up the river, and was the first to arrive off Blackwall. In consequence, however, of there not being sufficient depth of water at the dock entrance of the West India Docks, she could not be hauled into the docks that day, and had to let go her anchor and wait till the next tide; meanwhile the *Taeping* passed her, and succeeded in getting into the London Docks the moment she came up, and thus claimed the prize. Both ships were built at Greenock in the same year. They were both built on the composite principle—that is to say, with iron frames and teak planking, the *Ariel* being 750 tons register. She was 197 feet 4 inches in length, 33 feet 9 inches beam, and 21 feet depth of hold; the *Taeping* being 183 feet 7 inches in length, 31 feet beam, and 19 feet 9 inches depth of hold.

A very characteristic anecdote of American 'cuteness is told in connection with one of these races home. The celebrated Baltimore clipper *Sea Serpent* sailed from Shanghai for London in company with the British clipper *Crest of the Wave.* A premium of thirty shillings a ton, over and above the amount of the freight, had been offered to the vessel first in, and this was sufficient inducement for both skippers to crack on. The two ships were fairly near to each other all the way home, and they actually hove to for pilots off the Isle of Wight within an hour of each other. The American captain determined that he would not be outdone by the Britisher, so he came ashore in the boat that brought out his pilot, took the steamer from Cowes to Southampton, and the train up to Waterloo. From here he took a cab to the Custom House, and reported the *Sea Serpent* as "arrived," while each ship was carrying on in order to get into the Thames before the other.

The depression of freights to the owners, and the flatness of the tea-market, led in the next year, 1867, to the withdrawal of the premium awarded to the first ship in. This, however, did not detract from the extreme interest manifested in the race of that year, there being no less than fourteen competitors as against nine in 1866, and all of them crack ships. All were built under special survey, and were constructed on the composite principle, similar to that adopted in the case of the *Ariel* and the *Taeping.* Of the fourteen ships, one, the *Taewan,* with 780,500 lbs. of tea for her cargo, was totally lost close to Foo-chow-foo on the very day of her sailing. Two new ships, the *Titania* and the *Sir Lancelot,* which had been built



THE SCOTCH CLIPPER "SIR LANCELOT."



THE ABERDEEN CLIPPER "THERMOPYLÆ."

[*To face page* 232.

by Robert Steele and Co., of Greenock, expressly to take part in this race, and both of whom afterwards greatly distinguished themselves, got dismasted on the passage out to China, and could not be repaired in time for the race.

The names of the fourteen ships that did actually start were as follows: the *Taewan* (lost, as above stated); the *Maitland*, 799 tons; the *Serica*, 708 tons (Greenock); the *Taeping*, 767 tons (Glasgow); the *Fiery Cross*, 880 tons (Liverpool); the *Yangtsze*, 688 tons (Aberdeen); the *White Adder*, 915 tons (London); the *Ziba*, 670 tons (Aberdeen); the *Taitsing*, 815 tons (Glasgow); the *Black Prince*, 750 tons (Aberdeen); the *Ariel*, 750 tons (London); the *Flying Spur*, 735 tons (London); the *Chinaman*, 688 tons (Greenock); and the *Golden Spur*, 657 tons (Guernsey).

The following were the dates of sailing from Foo-chow-foo for London:—

Taewan	May 30	*Flying Spur*	June 9
Maitland	„ 31	*Taitsing*	„ 10
Serica	June 2	*Black Prince*	„ 10
Taeping	„ 4	*Yangtsze*	„ 13
Fiery Cross	„ 5	*Ariel*	„ 13
White Adder	„ 7	*Chinaman*	„ 15
Ziba	„ 8	*Golden Spur*	„ 18

It was not the first ship in that was to be considered the winner, as the competitors for the most part started on different days; but the ship that made the passage in the shortest amount of time. The fastest ship up to Anjer was the *Ariel*, which had left Foo-chow-foo twelve days after the departure of the first ship, she having done the distance from Foo-chow-foo to Anjer in 21 days. The next was the *Taeping*, in 23 days, these being the two ships that ran the dead-heat in the race of the previous year.

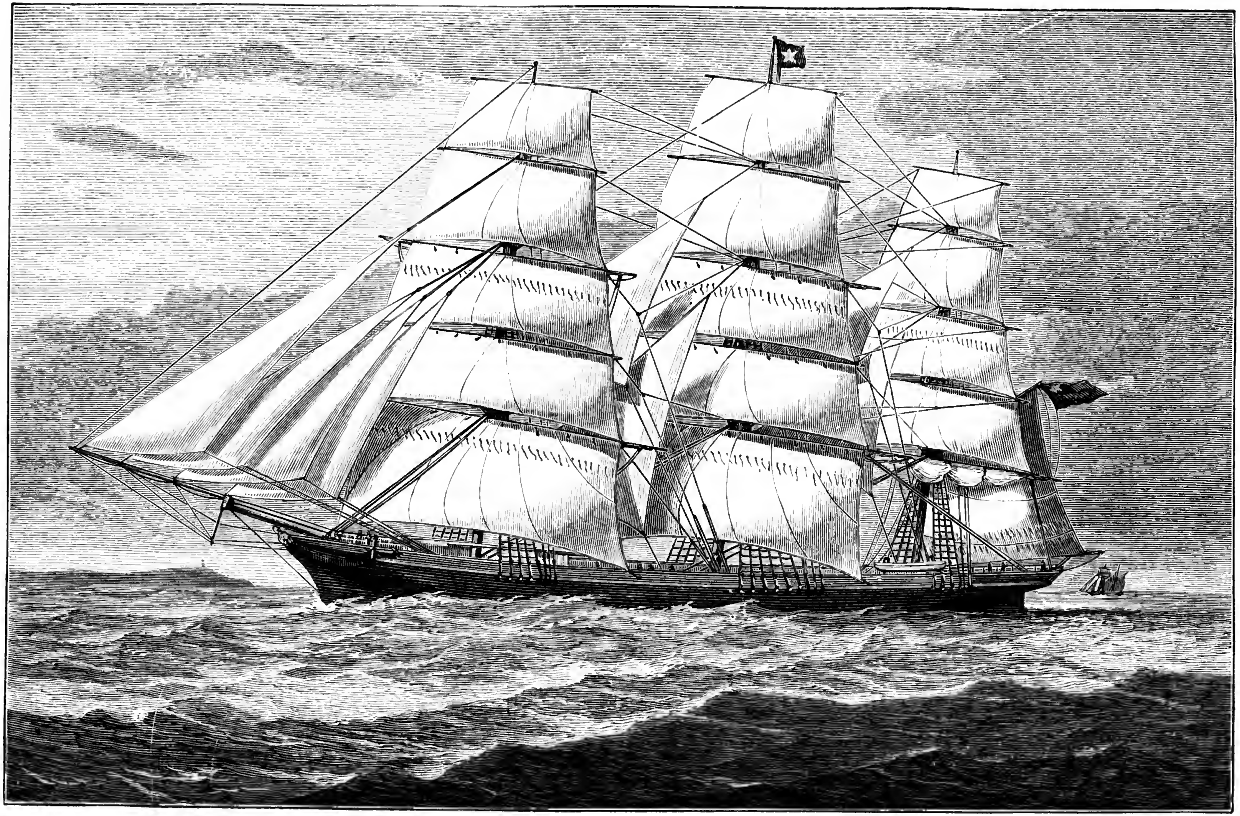
The *Taeping* was the first ship to reach the London Docks, which she did on the 14th of September, 1867; but she was not adjudged the winner, that honour being reserved for her old adversary, the *Ariel*, which had made the passage from Foo-chow-foo to London in *five hours* less time, accomplishing the distance in 102 days, the *Taeping* being 102 days and 5 hours.

Great as was the excitement caused by the foregoing race, another arrival from China completely put the *Ariel* and the

Taeping in the shade as regarded speed. This ship, however, was not in the race. She sailed from Shanghai on the 16th of June, 1867, after the departure of all the racers but one, and took what is termed the eastern passage, arriving, nevertheless, in the Downs a few hours previous to the *Ariel*. The eastern passage is considerably longer than the route taken by the ships in the race; yet she accomplished this longer passage in 99 days. This ship was the *Sir Lancelot*, mentioned above, belonging to Mr. John McGunn, of Greenock, her tonnage and measurements being precisely the same as those of the *Ariel*.

She also was a composite-built ship; her framework being of iron, and her sheathing of wood. The one idea in the construction of this vessel was speed, and every pains was taken to achieve that result. Before the copper was put on to her bottom her planks from the water-line downwards were planed off, and the hard teak rendered as smooth as a ball-room floor. In order to give the vessel greater stability, and to enable her to carry her immensely long masts, which exceeded two hundred feet in height, nearly one hundred tons of iron pigs were fitted into the open spaces along the keelson between her frames. That she needed some such deadweight as this to keep her steady may well be supposed when it is stated that, in racing trim and under all sail, the *Sir Lancelot* spread upwards of 46,000 square feet of canvas—that is to say, rather over an acre, her mainmast being just over 200 feet in height.

This ship made some exceedingly fast passages, of which, perhaps, the fastest was the run home from Foo-chow-foo, in 1869. Upon that occasion she left Foo-chow-foo on the 17th of July; on the 7th of August she made Anjer Light, on the 28th of the same month she sighted the African coast near East London, on the 11th of September she passed St. Helena, on the 10th of October was signalled off the Lizard, and on the 14th was berthed in the West India Docks, making the passage of 14,000 miles in 89 days against the prevailing monsoon. Her best day's run was made whilst crossing the Indian Ocean, when on one occasion she did by observation 354 statute miles in twenty-four hours; whilst for one whole week she kept up an average daily run of 300 miles.



THE CHINA TEA CLIPPER "THERMOPYLÆ."

[To face page 234.

In the race of 1869, the first ship home was the *Thermopylæ*, a very handsome clipper, built by Hood, of Aberdeen, from the designs of Mr. Bernard Waymouth, the late secretary of Lloyd's Register, for Messrs. George Thompson and Sons, which ship made the passage home in ninety-one days. She was followed by the *Sir Lancelot*, which, although she started a few days after the *Thermopylæ*, came home in two days less time, namely in eighty-nine days.

The *Thermopylæ* was of 948 tons burthen; her dimensions were 210 feet long, 36 feet beam, and 21 feet deep. Her first voyage was from London to Melbourne, when she made one of the fastest, if not the very fastest, passage on record, accomplishing the distance from port to port in 60 days. She left Gravesend on the 5th of November, 1868, and down to the date of crossing the Line, which she did on the 28th of November, her average daily runs amounted to 178 miles. It was, however, in running down her easting that she displayed her wonderful capabilities. On January 3, 1870, with the wind strong abeam, she ran by the log, confirmed afterwards by observation, 330 knots, or 380 statute miles; that is to say, at the rate of 15·8 miles an hour.

Another very fast clipper that came out in 1870, was the *Cutty-Sark*; but, somehow or other, she never was a particularly fortunate ship. In 1872, she left Shanghai with seven other clippers, among them being the *Thermopylæ*, which ship and and the *Cutty-Sark* sailed in consort down the whole length of the China Sea. When off Anjer, in the Strait of Sunda, the *Thermopylæ* was only leading by about four hours. Off the Cape, however, the *Cutty-Sark* lost her rudder, and with it all chance of making a rapid passage, she taking 122 days to get home, and having the honour of being the last ship in the race. She, however, made some very good passages afterwards to Australia, and for eight successive voyages made the trip between London and Sydney in an average of seventy-five days, her quickest passage being in 1885, when she made her number off the Lizard exactly sixty-seven days after leaving the Heads.

At the end of the year 1869, the Suez Canal was opened, and this ultimately made great alterations as far as the

China tea trade was concerned, the steamers superseding the sailing-ships, so that after a few more years the days of the China tea-clippers were ended. For a time, however, the sailing-ships did still continue to maintain their own in the tea trade, as the China merchants had an idea that the delicate flavour of the tea might be injured in the hold of a steamer, and, moreover, that the excessive heat of the Red Sea would prove injurious to it; so that for a few years, even after the opening of the Canal, the annual race continued; but the number of ships was sensibly falling off, and by 1873, it had practically ended.*

Perhaps the fastest passage on record between England and China was that made in 1857, by the celebrated American clipper *Pride of the Ocean*, which did the run out from the Lizards to Hong-Kong in sixty-nine days.

In 1875, a ship appeared, which, when she first came out, was said by all seafaring men to be "the finest sailing-ship afloat." The *Loch Garry* may be accepted as a fair representative example of the modern iron clipper, for although a ship of more than twenty years ago, yet there are plenty like her at the present day. She was 1500 tons register, her length over all being 268 feet.

In 1880, the four-masted iron clipper barque *Loch Torridon* was built on the Clyde. At that time there were but exceedingly few four-masted sailing-ships afloat, and not many sailing ships at all that exceeded 2000 tons, so that

* The following were the results of the last races:—

1870. 14 ships competed. The first three home were—

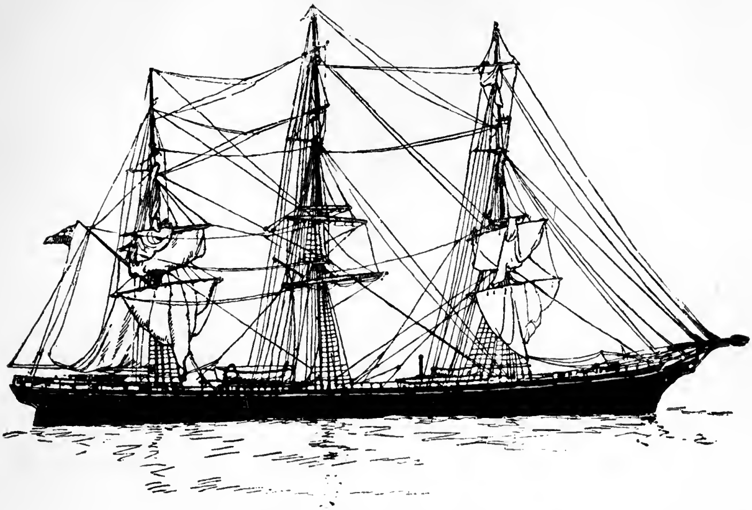
1. *Lahloo*	from Foo-chow-foo	97 days.
2. *Windhover*	" "	100 "
3. *Sir Lancelot*	" "	102 "
Last ship in, *Taitsing*	" "	121 "

1871. 8 ships competed.

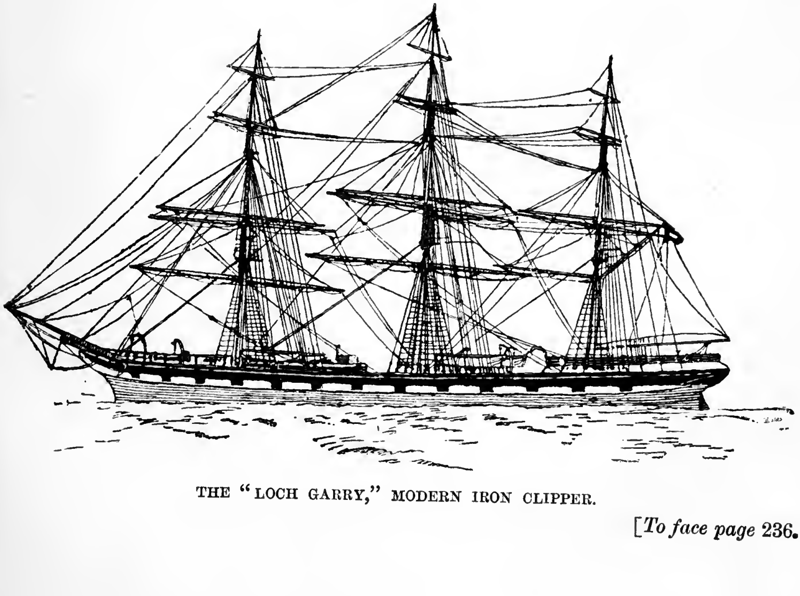
1. *Titania*	from Foo-chow-foo	93 "
2. *Thermopylæ*	" Shanghai	106 "
3. *Cutty-Sark*	" "	110 "
Last ship in, *Forward Ho*	" "	118 "

1872. 8 ships competed.

1. *Falcon*	from Whampoa	111 "
2. *Taitsing*	" Shanghai	114 "
3. *Thermopylæ*	" "	118 "
Last ships in { *Sir Lancelot* / *Cutty-Sark*	" / "	122 "



THE CHINA TEA CLIPPER "CUTTY SARK."



THE "LOCH GARRY," MODERN IRON CLIPPER.

[*To face page* 236.

the *Loch Torridon* was looked upon as quite exceptional. At the present day four-masters are common enough, and the only wonder about them is that, with so much canvas as they carry, they can be handled by the very small crews that they go to sea with. As regards speed, these large ships cannot beat, nor, indeed, can they favourably compete with, the smaller clippers of the *Ariel* and the *Taeping* type, a result, doubtless, due to the fact that the height of the masts of these large ships does not, and necessarily cannot, bear the same relation to the length of their hulls as was the case in the earlier vessels.

Another large four-master, the *Liverpool,* was launched at Port Glasgow in 1889, specially for employment in the jute trade between this country and Calcutta. Her register tonnage is 3330 tons, and she is capable of carrying 26,000 bales of jute, very nearly 6000 tons deadweight. Her extreme length is 330 feet, her beam 47 feet 6 inches, and the depth of her hold 26 feet 6 inches.

That in many directions steam is taking, and, indeed, in many directions has already taken, the place of sails is, of course, an indisputable fact. That the days are practically over for the conveyance of passengers in sailing-ships is obvious, yet there would appear to be still some avenues of trade where a tearing hurry is not an absolute necessity; and in these days of South Wales coal strikes it is a pleasant thing to be able to contemplate the fact that it is sometimes possible to do without coals altogether, and that there are still many branches of commerce in which sailing-ships may yet be more profitably employed than steamers.

CHAPTER XVIII.

Tonnage—Origin of tonnage—Early Acts of Parliament relating to tonnage—Builders' Old Measurement—New Measurement—Gross tonnage—Register tonnage—Displacement tonnage—Board of Trade deductions—Accommodation for the crew—Freight tonnage—Horse-power—Nominal horse-power—Indicated, or effective horse-power—Speed in steamships—Paddle-wheel steamers—Paddle-wheels—Screw propeller—Slip—Negative slip—Twin screws—Crank-shafts—Speed.

From very early times in the history of shipping a scale of some sort must have been employed to determine the relative capacity or carrying-power of different vessels, and in point of fact the term "tonnage" in this connection can be traced back for at least five hundred years. It appears to have originated from the *tun* cask of wine, the earliest system of measuring vessels being simply to count the number of casks, or *tuns,* of wine which could be carried, and thus obtaining a measure of the internal capacity of the ship. In Britain the first Act of Parliament dealing with the subject was passed in the reign of Henry V., in 1422. This Act required "Keels that carry coals at Newcastle to be measured and marked," but it is not known how the measurement and the marking were at that time carried out. In the year 1679, an Act of Parliament extended the above regulation to the Wear, and prescribed that always in measuring these river craft "should be used the Bowle Tub of Newcastle, containing 22¾ gallons Winchester measure," and "allowing twenty-one bowls of coals to be measured by such Bowle Tub by heap measure, and no more." The "keels" were marked by nails upon the bulkheads at each end of the cargo-space, or by driving nails into the stem and stern post to indicate the corresponding load-draught.

Another Act was passed in the reign of William III. in 1694, also for the measurement of "keels," and a *weight* was then fixed upon as the standard instead of a measure. This Act required the "keels" to be measured by putting into them dead-weights of iron or lead, allowing 53 hundredweights to every chaldron of coals, and a maximum load of ten chaldrons. The load-line was then marked on the stem, stern, and each side amidships.

By an Act passed in 1775, the foregoing regulations for the Tyne and Wear were extended to all vessels loading coal at all other ports of Great Britain, but the ton of twenty hundredweight avoirdupois was then made the standard weight instead of the chaldron weight. The application of all these earlier Acts, however, was thus limited to particular classes of vessels, or to those vessels employed in a particular trade.

Tonnage, as concerning ships, is the measure of capacity of the ship, the ton not being one of weight, but of cubic contents. The ton is now reckoned as 100 cubic feet, and it is the unit upon which is based the assessment of all dues and charges upon shipping. The first tonnage rule embodied in an Act of Parliament in England was that given in the Act of 1694, which levied certain duties upon sea-going and coasting ships, and was as follows: "The tonnage equals the length of the keel taken within board (so much as she treads the ground) multiplied by the breadth within board, by the midship beam from plank to plank, multiplied by the depth of hold from plank below keelson to the under part of the upper deck plank, divided by 94."

In 1720, a rule for the measurement of vessels, which was ultimately known as Builders' Tonnage, was first legalized in an Act intended to prevent smuggling, by prohibiting small vessels of "thirty tons burden and under from carrying spirits." This rule differed from that given in the Act of 1694, in half the breadth being substituted for the depth, thus making the rule the same as that which had for some time obtained among shipbuilders on the Thames. The present system, or at least a modification of the present system, dates from the year 1835, previous to which time the system obtained which, as has been stated, was first established in 1773, and which has since been called "Builders' Old Measurement," but it was a system that was clearly extremely erroneous, and which had a most evil effect upon naval architecture.

The tonnage was then obtained by measuring together the length of the ship, the breadth, and a certain assumed depth, and then by dividing the product by 94. The actual depth of the ship was not measured, but for the purposes of the calculation it was assumed that the depth was equal to the beam. As harbour and other dues were regulated by the tonnage, it naturally followed that shipowners and shipbuilders, with the view of reducing these dues to a minimum, made their ships as narrow as possible, and with as great a depth as possible. The ships thus built were thoroughly unseaworthy, and were highly dangerous in bad weather, whilst every correct principle of shipbuilding was sacrificed in order to produce deep and narrow wooden vessels, capable of carrying the maximum of cargo with the minimum of beam. The absurdity of a law by which, in consequence of an inch or so more beam, a two-decked vessel might be reckoned as of greater capacity than a ship of like length with three decks, was so palpable that many efforts were made to obtain some improvement of the system, although without success until the year 1835, when a "New Measurement" law, embodied in the Act 5 and 6 William IV., was introduced to take its place.

The Act of that year very properly established the depth of the hold as a necessary factor in the calculation of the tonnage; but as the cross-section of a ship varies very considerably at different points of her length, it was not often that more than a mere approximation of her cubical contents was attained.

This "New Measurement" system gave place in 1854, to "Register Tonnage," a system to a certain extent resembling it in principle, but much more perfect in its details, and which, with certain minor modifications, is the system still in force as the legal basis of measurement upon which dock, harbour, light, and other dues are assessed; this system, as far as register tonnage is concerned, being known as the "Moorsom System."

There are several terms used in respect of the tonnage of ships —namely, gross tonnage; tonnage under decks; and register tonnage; also displacement tonnage; and freight tonnage.

First, of "gross tonnage." As stated above, a ton is a hundred cubic feet of the internal capacity of the ship, and therefore a vessel having 50,000 cubic feet of internal space within the points of measurement prescribed by law is reckoned to be of 500 tons gross.

The Merchant Shipping Act, 1894, section 77, provides that the tonnage of every British ship shall be registered, and in the Schedule attached to the Act is laid down the mode by which such tonnage is to be computed. For the purposes of the computation of tonnage, the second deck from below in all vessels of more than two decks is called the "tonnage deck," and the upper deck is so called in all vessels which have less than three decks.

The Act minutely prescribes the mode of measurement, but, without going into all the intricacies of the operation as there defined, the method to be adopted is broadly as follows: The length of the ship is to be measured in a straight line along the upper side of the tonnage-deck from the stem to the stern-post. The length so taken is then divided into a certain number of equal parts. For ships of 50 feet long and under, it is divided into four equal parts; for ships exceeding 50 feet, and under 120 feet, into six equal parts; for ships exceeding 120 feet in length, but under 180 feet, into eight equal parts; for ships over 180 feet in length, but under 225 feet, into ten equal parts; and for all ships over 225 feet in length, into twelve equal parts. At each point of division of the length-line, the breadth and the depth of the ship are to be taken; but, as the section of a ship is not a rectangle, each depth is subdivided into a certain number of equal parts, and the breadth is measured at each point of subdivision of the depth line. From all these measurements of breadths and depths the areas of the ship's section at all the points of division of the length-line are ascertained, and by multiplying each sectional area by the length of the longitudinal division adjacent to that section, the cubic contents of the whole ship is arrived at.

If the ship have a third deck, commonly called a spar deck, the tonnage of the space between that deck and the "tonnage deck" is ascertained in a similar manner, and also the space occupied by the poop, if there be one, or of any enclosed deck-houses; and when the sum-total of the cubic contents of all these spaces is ascertained, then that sum-total divided by 100, is reckoned to be the gross tonnage of the ship.

From this gross tonnage many deductions are allowed by the Board of Trade, and when all the legal deductions have been made, then the residue is the "register tonnage" of the ship. Speaking broadly, and as a general rule, all the parts of a ship used for her propulsion and navigation are exempt from being reckoned for tonnage, whilst all the parts of the ship from which profit is derived—all the earning parts of the ship—are liable to be reckoned for tonnage. The first instance of any such deduction made in the case of steamships, was in the year 1819, when the Act, 59 George III., provided that in steam-vessels the length of the engine-room should be deducted from the length as previously described, in order to obtain "the just length of the keel for tonnage."

The deductions now allowed by the Board of Trade embrace the spaces respectively occupied by the master, the seamen,*

* This space must be fit for the proper occupation of the men who are to use it, and it must conform to the requirements of the Merchant Shipping Act, to entitle it to be so deducted. This enactment has led to a great improvement in the seamen's quarters, although something is still left to be desired. The law is not particularly exacting, and does not stipulate for very luxurious accommodation for Mercantile Jack. Section 210 of the Act prescribes that "every place in any British ship occupied by seamen and apprentices, and appropriated to their use, shall have for each of those seamen or apprentices a space of not less than seventy-two cubic feet, and of not less than twelve superficial feet, measured on the deck or floor of that place."

As affording a means of instituting a comparison between this floor area and cubic space to which Jack is thus legally entitled on board ship, and what is considered to be necessary for a soldier on shore, it may be noted that the War Office lays it down as a rule for all barracks, in temperate climates, that each man is to have 60 feet of superficial floor area, and 600 cubic feet of space. That is to say, the soldier has five times as much floor space as the sailor, and more than eight times as much cubic space. As another means of comparing what is considered sufficient for the sailor on the and the apprentices; any space used exclusively for the working of the helm, the capstan, and the anchor-gear, including the chain-lockers; any space used for the keeping of the charts, signals, and other instruments of navigation, and the boatswain's stores; the space occupied by the donkey-engine and boiler; and, in the case of a ship wholly propelled by sails, any space set apart and used exclusively for the storage of sails. In the case of steamers, the engine-room, under certain conditions, is to be deducted, and the stoke-hold, the tunnel for the shaft of the propeller, and the coal-bunkers; and in view of these very extensive deductions in the case of steam-vessels, there are steamers—tugs, for the most part—which are actually registered as being of no tonnage: that is to say, after deducting the spaces occupied by the engines and boilers, the coal-bunkers, and the mens' quarters, there is nothing left, and consequently there is no tonnage to be recorded. Indeed, the whole subject of registered tonnage, and the allowed deductions from gross tonnage to constitute registered tonnage, can scarcely be regarded as in an entirely satisfactory condition even yet. On the 19th of February, 1898, the screw steamer *Paris*, built for the trade between Cardiff and Continental ports, left the Tyne fully laden on her official trial trip. This vessel is of the following dimensions, viz. length, 230 feet; breadth, 32 feet; and depth, 16 feet 6 inches;—a special feature in connection with her being her very small register tonnage, compared with the dead weight carried. The register tonnage of the *Paris* is only 507 tons, and she carries 1500 tons, or nearly three times the amount of her registered tonnage.

The above British system of tonnage has now come to be generally adopted by most civilized countries, the following being the dates of its adoption by other nations: United States, 1865; Denmark, 1867; Austria-Hungary, 1871; Germany, 1873; France, 1873; Italy, 1873; Spain, 1874;

sea, with similar requirements on land, let us take a moderately small bedroom in a suburban villa. Say that it is twelve feet by ten, and eight feet high. It might possibly be considered large enough for a bachelor, or perhaps for one of the boys. Into this room the Merchant Shipping Act, 1894, puts *thirteen* Mercantile Jacks!

Sweden, 1875; Norway, 1876; Netherlands, 1876; Finland, 1877; Greece, 1878; Russia, 1879; Hayti, 1882; Belgium, 1884; Japan, 1885. The British system was mainly adopted by the International Commission assembled at Constantinople in 1873, the rules of which Commission formed the basis of the dues levied on the ships of all countries passing through the Suez Canal.

"Displacement tonnage" is the weight of the water actually displaced by the ship as she floats, and is, of course, the absolute weight of the ship, as though she were placed in a pair of scales, and weighed. The weight of any floating body is equal to the weight of the fluid displaced, and in order, therefore, to ascertain the weight of a vessel and her contents at any given draught, it is only necessary to calculate the weight of the volume of fluid displaced. The displacement of a vessel is calculated from the drawings, and the method of calculation is similar in principle to that adopted for the measurement of the internal capacity; but the naval architect is not fettered by any definite number of sub-divisions as laid down in the tonnage laws, and is free to determine the number of transverse sections and ordinates deemed necessary according to the size of the vessel.

Thirty-five cubic feet of salt water weigh a ton, and if, therefore, the volume in cubic feet be divided by 35, the result will be the displacement of the vessel in tons. Displacement tonnage is by general consent regarded as the fairest measure of tonnage for naval ships, since they are designed to carry certain maximum weights, and to float at certain load-lines which are fixed with reference to the character of the service. It has for many years been the official tonnage for the warships of France and other European nations; and since 1872—prior to which date the system of 1773, known as "Builders' Old Measurement," was the only one employed—the tonnage of British naval ships has been based on the displacement system.

"Freight tonnage" is a system of measurement commonly employed in connection with stowage by merchants and shipowners, although it has no legal authority. It is simply a measure of cubic capacity. A freight ton, or "unit of cargo measurement," simply means 40 cubic feet of space available for cargo, and is therefore two-fifths of a register ton. Thus a packing-case measuring 5 feet by 4 feet, and 2 feet high (40 cubic feet), sent on board for shipment, would be reckoned as a "freight ton." It is purely an arbitrary measure, based upon the assumption that 40 cubic feet of space are required in which to stow a ton weight.

Horse-power is the name given to the unit, in terms of which engineers measure the power of steam-engines, etc. It is the development of 33,000 foot-pounds of work per minute, a foot-pound being the amount of work necessary to raise a pound weight a foot high.

When the steam-engine was first invented it was chiefly used to drive mills, pumps, and other machinery, which had previously been driven by horses, and it seemed natural to express the working power of the steam-engine in terms of the number of horses it had superseded. This led to experiments being made in order to obtain an estimate of what was the exact working power of a horse. Several such estimates have been given, all differing considerably from each other, a result which is not to be wondered at, considering that all horses are not of the same power. The estimate, however, ultimately adopted whereby to express horse-power was that obtained by Boulton and Watt from observations made on the strong dray-horses at the London breweries, working eight hours a day. They found that such a horse was able to go at the rate of two and a half miles an hour, and at the same time to continuously raise a weight of 150 lbs. by means of a rope led over a pulley. This is easily seen to be equivalent to 33,000 pounds raised one foot per minute, and hence the number given above, which has since been generally adopted as "horse-power."

For calculating the power of marine engines a commercial unit was originally employed, termed "nominal horse-power." A certain number of square inches of cylinder area, and a velocity of piston in feet per minute were given, 7 lbs. per square inch being the recognized pressure, and, as stated above, to raise 33,000 lbs. one foot high was the duty of one horse-power per minute.

Nominal horse-power, however, means very little, the term being arbitrary and varying. It is scarcely ever used at the present day by engineers for these reasons; but although practically obsolete, it is still retained in Board of Trade and other Government official documents, for the simple reason that it always has been so used, and in matters of reform Government moves but slowly; yet, in describing their own vessels of the Royal Navy, even Government does not use the term "nominal" horse-power, but adopts the more modern and the more intelligible designation of "indicated," or "effective," horse-power; the actual or indicated horse-power varying in marine engines from 3 or 4 times the nominal horse-power to sometimes as much as 6 or 7 times. As a matter of fact, the "indicated" horse-power of an engine has nothing whatever to do with the nominal horse-power, and can only be found by means of an indicator diagram taken off the engine itself, from which the mean pressure on the piston is found, the indicated horse-power being simply the actual power given off by the piston.

As examples of the uselessness of the term "nominal horse-power," the following examples out of thousands may be cited: in the Board of Trade official description of the P. and O. steamer *Australia*, her horse-power (nominal) is given as 2500, her effective horse-power is really 10,000; the Union Company's steamer *Moor* is given as 470, her effective horse-power is 2800; the Orient liner *Orient* is given by the Board of Trade as 1000, her effective horse-power is 3231; and this list might be increased to any length. It will thus be seen that the nominal horse-power, and consequently the official description, affords no index whatever of the actual or the effective horse-power of the engines of any given vessel, and that no comparison whatever based on these figures can be instituted between one vessel and another.

In the Mercantile Marine, for vessels of about 2000 tons and upwards, the proportion of horse-power of the engines to the tonnage of the ship varies according to the service for which she is intended; it usually ranges from one horse-power to every 5½ tons to one horse-power to every 3½ tons. This is only the "nominal" horse-power, referred to above; the actual, or indicated, horse-power will, of course, very greatly exceed this, and will depend upon the lines of the vessel, the draught of water, and a variety of other points. In the two great Cunarders, the *Campania* and *Lucania*, where the element of speed enters very largely into the question, there is one horse-power (indicated) to every 0·43 tons, or one horse-power to less than half a ton.

Long vessels are the most economical in carrying-power, a higher rate of speed being attained in a long ship than in a short one, for the same indicated horse-power, while, of course, more cargo can be carried in the former than in the latter. For these reasons many steamships, after having been running for years, have been sent into dock, and have been lengthened with a view to gaining these important advantages, whilst still retaining their original engines and boilers.*

It has been proved, both theoretically and in practice, that a moderate rate of speed for steamships is, under all circumstances, the most economical. A high rate of speed is always expensive, not only as far as the engines themselves are concerned, and the greater wear and tear to the ship, but from the largely increased amount of coal consumed, and which has to be carried, thus proportionately diminishing the space available for cargo. When a ship is engined to attain a certain speed, to only very moderately increase that speed involves a large increase of horse-power, with a correspondingly large increase in the amount of coal burnt, the horse-power varying approximately as the cube of the speed. Thus a steamer of 500 horse-power has a speed, say of 12 knots per hour. Now, if we wish to increase that speed to 15 knots per hour, 976 horse-power will be required, or practically double the horse-power will be required to give the additional three knots; and although the time will be diminished, yet more coal must be burnt, and, what is worse, must be carried. For example, the steamer of 500 horse-power, steaming at the rate of 12 knots per hour, will do the passage from Plymouth to Gibraltar, 1056 miles, in 88 hours. At 976 horse-power, steaming at 15 knots per hour, she will do it in 70 hours; but although she will thus save eighteen

* The *Scot*, of the Union Company, is a case in point; see page 176.

hours in time, yet she will have to burn 27 tons more coal to do it.

Given equal size of the ships and equal power of the engines, more work is to be obtained from the propeller than from paddle-wheels, and there is a saving in bulk and in weight of the engines and boilers, by which the ship is enabled to carry more cargo, while greater coal-stowage is possible in the case of long voyages. The propeller is, when the ship is in trim, always immersed, so that the whole propelling power of the screw is exerted against the water; whilst in the paddle-wheel, during a great part of the time, the floats are exerting themselves simply against the air—are, in fact, doing only useless work. In rough weather, also, if the ship be rolling much one paddle-wheel will be entirely out of water, whilst the other will be almost totally immersed, the entire paddle-box being full of green water; so that the power is exerted very unequally, and a great deal of it is lost altogether.

Paddle-wheels still hold their own, however, for short-voyaged passenger steamers, notably in certain of the boats employed in the Channel service, and in many pleasure steamers. This is partly from fashion, but partly also from the fact that the additional width obtained from the sponsons and the paddle-boxes renders the vessel steadier, and less liable to roll in a sea-way than a screw boat of a similar size would be. Another reason is that for rapidly leaving or getting alongside piers and wharves the projecting sponson greatly facilitates the throwing off or the bringing in of the bow or the stern of the vessel. These reasons are of little account, however, in ocean-going steamships, whilst the advantages of the screw-propeller are so obvious that in all ocean-going steamers paddle-wheels are perfectly obsolete.

At first all paddle-wheels were constructed with fixed floats, but these are now nearly universally superseded by feathering floats. In the case of the fixed floats, the float entered the water obliquely, depressing the water as it entered, and the full power was only exerted at the moment when the arms to which the float was bolted were vertical. The tendency of the float as it left the water was to lift it, so that much of the power was uselessly expended. With the feathering float, by means of a mechanism, to a certain extent complicated, and so to a certain extent liable to get out of order, these evils are obviated, and the floats from the moment of entering the water until the moment of leaving it are practically vertical. Three floats immersed at the same time is usually considered by engineers as sufficient, because if the floats are closer together than that, so that more than three are in the water together, they only tend to disturb the water, and to clog the action of the paddle-wheel.

In a paper recently read before the Institute of Naval Architects, it was pointed out that among other losses of power in paddle-wheel steamers, two sources of loss arise—one from the energy absorbed in creating and maintaining waves, and the other from the effect of this wave-formation upon the paddle-wheels. All vessels forced at a speed beyond what their size and form fit them for, tend to produce waves, commencing at the bow and passing aft; and whether the hollow or the crest of the wave occurs at the precise spot occupied by the paddle-wheels makes a considerable difference in the propelling power of the wheels. Short bluff vessels exert power in raising a series of short waves—three or even four in the length of the vessel—whilst narrower and sharper vessels are more or less free from this defect, not raising more than two, or two and a half, waves in the length, so that in their case the paddles will work at about their normal level.

The above is a disadvantage from which, of course, the screw-propeller is free. For the benefit of the lay reader it may be well just to give a very rough outline of the principle of the propeller. The form and construction of the screw-propeller is thus: the boss of the propeller may be said, as in an ordinary screw-bolt, to form the bottom of the thread, and the blade of the propeller forms the thread itself. The principle of the propeller may be illustrated by applying a right-angled triangle of paper to an ordinary round ruler. Let the base of the paper triangle be made of the same length as the circumference of the round ruler. The perpendicular of the triangle will be the pitch, and the hypothenuse will be the thread of the screw. If the paper triangle be wound round the ruler (the pitch being placed parallel to the length of the ruler), and the ruler be turned once round, then any given point on the thread, when working in a nut with a corresponding thread, will move forward exactly the extent of the pitch.

In this way the screw-propeller is practically an endless screw, and the endless nut it works in is the water. Supposing the pitch of the screw to be 24 feet, then in 50 revolutions of the screw the vessel will move forward 1200 feet; in 100 revolutions 2400 feet, and so on. The action of the screw-propeller is precisely that of the corkscrew. At each turn of the corkscrew certain progress is made through the cork; at each revolution of the propeller the ship is advanced a certain space. As to the exact shape that is best for the blade of the propeller, opinions and practice differ, but it will, reverting to the example given above, be some portion—perhaps even a very small portion—of the area of the paper triangle as wound round the ruler. As the water in which the propeller revolves, unlike the solid cork in which the corkscrew works, is a yielding substance, sometimes the action ceases for a while, and the propeller revolves without imparting any forward motion to the vessel. This is termed the "slip" of the screw, and it varies from 10 to 20 per cent., so that if the engines be of such a power as should give a speed of ten knots, the actual speed of the ship may possibly be not more than nine.

There is in some ships what is called "negative slip," the screw moving through less space than the speed of the vessel—the vessel, as it were, outstripping the screw, and dragging it through the water. Thus, it is sometimes found that in the case of a vessel engined to only 10 knots, her actual speed may sometimes be as much as 11 knots.

Screw-propellers are either right-handed or left-handed, and although one is practically as good as the other, yet a difference is usually experienced in the behaviour of the ship, more particularly when going astern. When a steamship is fitted with twin screws, one of them is usually right-handed, and the other left-handed, and the two propellers are not usually fixed side by side, but one rather in advance of the other.

When a pilot comes on board an ordinary screw steamer fitted with a single propeller, one of his first questions usually is, "Are you right or left-handed?"

There are some facts connected with the screw-propeller that at the present time are not satisfactorily accounted for; for instance, if a ship be fitted with a propeller that the engines work to a speed of, say eight knots, and this propeller be taken off and replaced with another cast in the very same mould, and so far as can be seen the exact counterpart of the former one, yet the speed of the ship may be altered by the change—either increased or diminished to a sensible degree.

The propeller of a first-class ocean liner is of very considerable dimensions; that of the Cunard steamer *Servia,* for instance, measures 24 feet across. The immense power of the engines in large ocean-going steamships necessitates correspondingly heavy and strong machinery. The crank-shaft of the *Servia,* as also that of the Anchor Line steamer *City of Rome,* and the shaft of the *Alaska,* are each 25 inches in diameter, those of the *Servia* and the *Alaska* being of solid metal, whilst that of the *City of Rome,* which is of steel, is hollow. The crank-shaft of the *Arizona* is built up of five pieces. Of these four are of hammered and rolled scrap-iron, the fifth being of steel. The diameter is 22½ inches.

Every year ships increase in size;—every year engines increase in power; and the speed of our ocean liners is correspondingly increased. Of course, the higher the rate of speed at which the vessel is driven, the greater must be the attendant risk in case of anything going wrong; but so long as the public insist upon going from port to port with the least possible delay, so long will the keenest competition prevail, each company vying with the others as to who shall perform the distance from port to port in the shortest space of time. Whether any solid advantage results from this insane desire for travelling at the highest possible rate of speed, or whether the human race generally are permanently the happier because it is possible to go from Liverpool to New York in six days instead of in seven, are points which would seem to be open to a very considerable amount of doubt.

CHAPTER XIX.

Present state of the British Mercantile Marine—Merchant shipping owned by every country of the world—Progress of British shipping during the reign of the Queen—Increase in British shipping since the time of Queen Elizabeth—Shipping in 1897 and in 1898—Additions and losses—Merchant ships subsidized as "armed cruisers."

EXCLUDING all vessels of less than one hundred tons burden, the entire merchant shipping owned by every country of the world, at the present time, numbers 28,052 vessels, with an aggregate tonnage of 26,561,250 tons. The number of such merchant vessels belonging to the United Kingdom, and to the British Colonies, is 11,143, with a united tonnage of 13,665,312 tons. Thus more than one-half of the merchant tonnage of the entire world sails under the British flag.

In considering the present state of the British Mercantile Marine, it may be well to note the progress that has been made in British shipping during the long and happy reign of her Majesty, Queen Victoria. In the year 1837, when the Queen came to the throne, the shipping on the Register consisted of 19,269 sailing-vessels, many being under a hundred tons, and 554 steamships, with a total tonnage of 2,312,000 tons. During the first three years, even, of the Queen's reign considerable progress was being made, and the total tonnage of British merchant vessels registered in the year 1840, was 3,311,538 tons. This included 28,138 sailing-vessels, and 824 steamers, of which 1904 sailing-vessels and 77 steamers had been built during that year.* At the close of the Jubilee year, 1897, there were, of vessels of a hundred tons and upwards, and excluding all the vessels under a hundred tons, 2,452 sailing-ships, with

* Lloyd's Calendar.

a tonnage of 2,189,840 tons; and 6655 steamships, with a gross tonnage of 10,213,569 tons, or a total united tonnage for both steamers and sailing-ships of 12,403,409 tons. In addition to this, 2130 steamers and sailing-ships, with a tonnage of 1,079,467 tons, are owned by the British Colonies.

Although, however, the amount of tonnage steadily increases with each successive year, the actual number of the vessels does not increase in anything like a corresponding ratio; this being, of course, due to the fact that every year ships increase in size. In 1837, the largest British sailing-ship—indeed, the largest British ship of any kind—was of 1488 tons, the largest steamer being of only 1320 tons. At the present time we have many great steamers of four and five thousand tons; and two steamships—the *Campania* and the *Lucania*—each of 13,000 tons, or ten times the size of the largest steamer of 1837. But, immense as these two steamships are, a far larger vessel than either of them—the *Oceanic*—now building for the White Star Line—will shortly be added to the list of British merchant steamers.

At the commencement of the Queen's reign the finest wooden vessels were practically similar in design and construction to those in which our countrymen had sailed round the world in the middle of the last century, and they did not differ materially from the still earlier vessels of the Dutch navy. The vessels of the merchant navy were rarely larger than 500 tons, only a few ships of the East India Company exceeding 1000 tons, and these were practically men-of-war; while scarcely any ship exceeded 100 feet in length.

Sailing-vessels built within the last few years are generally of large size when compared with those built even as recently as twenty years ago. The *Somali*, a four-masted steel barque, is of 3537 gross tons, and 330 feet long. This is the largest sailing-ship owned in the United Kingdom; but the Germans own a still larger sailing-vessel, named the *Potosi*. She is a five-masted steel barque of 4027 tons gross, and is 366 feet long.

Of the wooden vessels of 100 tons and upwards now built in the United Kingdom, by far the greater number are under 200 tons, and are for the most part engaged in the coasting trade. Of iron vessels, eighteen steamers are over 5000 tons each, and upwards of two thousand iron steamers and sailing-vessels are between 1000 and 2000 tons. Of steel vessels, two hundred are over 5000 tons, and 1502 steel steamers and sailing-vessels are between 2000 and 3000 tons. Thus the tendency is distinctly to lessen the number of vessels, but at the same time vastly to increase their size.

These facts, although, doubtless, sufficiently gratifying to the patriotic Englishman, who sees in them an evidence of the growing prosperity of his country, can only be contemplated with positive dismay by the officers of the Mercantile Marine, who, whilst they are being poured into the service by hundreds every year, find each successive year, in consequence of a few great ships taking the place of many little ships, that only a single master and a couple or so of mates are now wanted, where the previous year half a dozen masters, and a dozen or more mates were able to find employment, so that every year, while ships increase in size, employment for officers in the Merchant Service seriously diminishes. The following table shows the steady increase of British Shipping from the time of Queen Elizabeth to the present day :—

BRITISH TONNAGE.

In the year	1588	...	12,500	tons	(exclusive of fishing-boats).
„	1770	...	682,811	„	(England and Scotland).
„	1791	...	1,511,401	„	(including the Colonies).
„	1830	...	2,199,959	„	(exclusive of the Colonies).
„	1837	...	2,312,000	„	(including sailing-ships and steamers).
„	1840	...	3,311,538	„	„ „
„	1855	...	5,250,553	„	„ „
„	1870	...	5,690,789	„	„ „
„	1880	...	6,574,513	„	„ „
„	1891	...	10,585,747	„	„ „
„	1898	...	12,587,904	„	„ „
			or 13,665,408	„	(including the Colonies).

As to entrances and clearances in British and foreign shipping in the United Kingdom, the figures show that while in 1837 there were 42,700 vessels, with a tonnage of 7,000,000 tons,—that is, an average of 164 tons a vessel—in 1897 the number of vessels was 121,400, with a united tonnage of

80,500,000 tons, or an average of 664 tons a vessel. In point of fact, the figures prove that since the Queen's Accession not only has the carrying-power of the country increased tenfold, but the entrances and clearances have increased at a like rate.

The vastness of the shipping business of this country will be appreciated when we consider that there are at the present time on the register, exclusive of the Colonies, no less than twelve and a half millions of tons of shipping, employing a quarter of a million of men, and involving an investment of capital which it is quite impossible to estimate.

During the five years ending in 1897, the tonnage of the United Kingdom had increased by two millions of tons, yet at the close of 1897, there were absolutely forty-two fewer ships belonging to the United Kingdom than there were in 1892, in consequence of the size of the ships every year increasing. In 1892, the total number of sailing-ships of a hundred tons and upwards belonging to the United Kingdom was 3342, with a united tonnage of 2,417,985 tons. The total number of such sailing-ships at the close of 1897 was 2452, with a united tonnage of 2,189,840 tons; thus showing that whilst what sailing-ships there are are increasing in size, yet at the same time that the actual sailing tonnage has decreased during the past five years, and that the actual number of sailing-ships has very materially diminished during the same period. And as pointing to the same fact, namely, the rapid manner in which steam is superseding sails, it may be noted that whilst, during the year 1897, 462 steamers were built in the United Kingdom, with a gross tonnage of 670,201 tons, only 219 sailing-ships were built, with a tonnage of 37,030 tons; that is to say, the steam tonnage built in the United Kingdom in 1897 was eighteen times the amount of the sailing tonnage. Of these 462 steamers, 366 are of steel, 63 are of iron, and 33 were of wood and composite.

The most recent authentic information as to the state of the British Mercantile Marine at the present time will be found in the following Return for the year 1898, kindly furnished for this work by Lloyd's Register, as follows:—

TABLE No. 1.—Showing Number, Tonnage, and Description of the Steamers, of 100 Tons Gross and upwards, belonging to each of the Several Countries of the World, as recorded in the Register Book.

Flag.	Wood.			Composite.			Iron.			Steel.			Total.		
	No.	Net tonnage.	Gross tonnage.	No.	Net tonnage.	Gross tonnage.	No.	Net tonnage.	Gross tonnage.	No.	Net tonnage.	Gross tonnage.	No.	Net tonnage.	Gross tonnage.
British: United Kingdom	116	10,125	18,692	7	650	2,380	3,116	1,813,560	3,023,951	3,544	4,654,393	7,502,332	6,783	6,478,728	10,547,355
British: Colonies	268	47,511	76,534	20	4,157	7,066	350	141,826	231,417	281	181,763	305,817	919	375,257	620,834
British: Total	384	57,636	95,226	27	4,807	9,446	3,466	1.955,386	3,255,368	3,825	4,836,156	7,808,149	7,702	6,853,985	11,168,189
American (United States)	219	97,507	141,358	17	16,558	21,568	263	277,151	394,097	281	445,384	618,739	780	836,600	1,175,762
Argentine	3	422	783	1	94	132	43	15,490	24,198	46	15,765	25,497	93	31,771	50,610
Austro-Hungarian ..	3	171	375	..	..	..	91	83,614	130,990	101	105,965	174,118	195	189,750	305,483
Belgian	2	300	454	..	..	..	56	42,165	58,844	45	54,142	77,411	103	96,607	136,709
Bolivian	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Brazilian	8	2,160	3,294	..	..	..	68	27,704	43,284	141	58,734	90,764	217	88,598	137,342
Chilian	..	..	..	..	..	..	27	16,335	26,509	20	15,649	24,929	47	31,984	51,438
Chinese	2	164	246	1	1,468	2,336	16	13,747	21,150	27	23,896	38,447	46	39,275	62,179
Columbian	..	..	..	..	..	..	1	555	877	..	..	..	1	555	877
Costa Rican	..	..	..	..	..	..	..	..	..	1	358	592	1	358	592
Danish	6	952	1,617	1	160	234	142	63,236	103,394	156	123,705	203,165	305	188,053	308,410
Dutch	2	143	280	1	423	507	112	96,027	140,078	129	146,190	214,834	244	242,783	355,699
Egyptian	1	678	1,017	..	..	..	6	3,253	4,047	6	3,021	6,783	13	6,952	11,847
French	8	685	1,267	1	375	566	374	270,174	538,108	234	215,781	432,676	617	487,015	972,617
German	1	105	203	3	416	673	422	231,767	371,970	640	790,031	1,271,491	1,066	1,022,319	1,644,337
Greek	7	493	915	..	..	..	66	39,279	62,248	54	56,312	88,053	127	96,084	151,216
Hawaiian	13	3,098	4,847	..	..	..	2	2,544	3,477	8	9,374	15,671	23	15,016	23,995
Haytian	2	481	832	..	..	..	1	103	167	4	663	1,505	7	1,247	2,504
Italian	6	376	720	..	..	..	211	198,583	325,013	55	73,395	115,852	272	272,354	441,585
Japanese	226	31,261	51,602	9	2,798	4,172	138	118,713	188,629	89	130,566	209,760	462	283,338	454,163
Mexican	2	502	613	..	..	..	4	680	1,056	14	3,915	6,859	20	5,097	8,528
Montenegrin	..	..	..	..	..	..	1	1,090	1,857	..	..	..	1	1,090	1,857
Norwegian	77	17,913	29,860	23	3,996	6,178	339	164,493	265,861	271	201,434	316,718	710	387,836	618,617
Persian	1	107	133	..	..	..	1	579	838	..	..	..	2	686	971
Peruvian	..	..	..	..	..	..	1	1,400	2,100	2	1,804	2,769	3	3,204	4,869
Portuguese	3	216	382	..	..	..	22	11,971	19,298	14	20,045	33,613	39	32,232	53,293
Roumanian	..	..	..	..	..	..	7	808	1,615	11	9,843	16,153	18	10,651	17,768
Russian	13	1,507	2,388	6	992	1,430	168	63,024	117,493	203	141,400	229,056	390	206,923	350,367
Sarawak	..	..	..	..	..	..	3	650	1,084	..	..	..	3	650	1,084
Siamese	..	..	..	..	..	..	2	305	557	1	1,232	2,229	3	1,537	2,786
Spanish	36	7,968	11,998	3	718	1,356	261	166,225	257,897	136	178,387	273,524	436	353,298	544,775
Swedish	33	4,414	6,766	87	12,075	18,743	324	129,801	203,665	150	61,537	99,381	594	207,827	328,555
Turkish	22	2,287	4,153	..	..	..	65	45,705	71,606	22	4,193	7,440	109	52,185	83,199
Uruguayan	1	206	374	..	..	..	5	4,016	6,193	12	5,787	9,013	18	10,009	15,580
Venezuelan	..	..	..	..	..	..	10	2,169	3,717	2	234	445	12	2,403	4,162
Zanzibar	..	..	..	..	..	..	3	1,871	3,168	..	..	..	3	1,871	3,168
Other Countries:— Arabia, Salvador, Oman, Ecuador, Liberia, Samos, Nicaragua, Bulgaria, etc.	3	453	684	..	..	..	14	9,274	13,830	2	1,204	1,645	19	10,931	16,159
Total	1,084	232,205	362,387	180	44,880	67,341	6,735	4,059,887	6,664,283	6,702	7,736,102	12,417,281	14,701	12,073.074	19,511,292

THE WORLD, AS RECORDED IN THE REGISTER

Flag.	Wood.		Composite.		Iron.		Steel.		Total.	
	No.	Net tonnage.	No.	Net tonnage.	No.	Net tonnage.	No.	Net tonnage.	No.	Net tonnage.
British { United Kingdom	863	161,528	17	8,884	878	1,040,695	503	829,442	2,261	2,040,549
British { Colonies	1,093	403,269	17	9,292	58	32,353	12	11,660	1,180	456,574
British { Total	1,956	564,797	34	18,176	936	1,073,048	515	841,102	3,441	2,497,123
American (United States)	2,287	1,123,307	..	..	24	27,815	59	121,793	2,370	1,272,915
Argentine	67	18,364	..	..	19	6,497	17	3,300	103	28,161
Austro-Hungarian ..	79	35,186	2	1,563	6	6,157	2	1,425	89	44,331
Belgian	2	420	..	..	..	..	..	..	2	420
Bolivian	..	..	..	..	..	..	..	..	..	..
Brazilian	114	27,339	..	..	6	3,435	..	..	120	30,765
Chilian	85	50,124	2	1,494	8	7,479	..	..	95	59,097
Chinese	1	587	..	..	..	..	..	..	1	587
Columbian	6	2,355	..	..	..	..	..	..	6	2,355
Costa Rican	..	..	..	..	..	..	..	..	..	..
Danish	389	72,293	..	..	50	31,977	16	10,176	455	114,446
*Dutch	76	30,464	5	4,736	13	19,212	45	34,339	139	88,751
Egyptian	1	303	..	..	..	..	..	..	1	303
French	424	77,962	2	1,014	57	48,366	51	79,556	534	206,898
German	246	99,206	4	4,007	171	187,893	117	178,538	538	469,644
*Greek	307	99,479	1	498	3	1,170	..	..	311	101,147
Hawaiian	..	..	1	779	4	3,808	8	10,987	13	15,574
Haytian	2	361	..	..	..	..	..	..	2	361
Italian	807	331,743	6	5,096	45	42,264	32	34,790	890	413,893
Japanese	69	17,391	..	..	1	499	..	..	70	17,890
Mexican	14	2,888	..	..	1	493	..	..	15	3,381
Montenegrin	14	3,027	..	..	..	..	..	..	14	3,027
Norwegian	1,794	870,371	12	10,889	107	98,712	40	44,628	1,953	1,024,600
Persian	1	608	1	624	..	..	..	..	2	1,232
Peruvian	35	9,832	..	..	1	761	..	..	36	10,593
Portuguese	117	32,419	6	4,897	9	8,726	..	..	132	46,042
Roumanian	4	1,216	..	..	..	..	..	..	4	1,216
*Russian	741	216,600	6	2,961	19	20,715	3	3,788	769	244,067
Sarawak	..	..	..	..	..	..	..	..	..	..
Siamese	1	294	..	..	..	..	..	..	1	294
Spanish	272	74,117	1	543	1	451	2	1,257	276	76,368
Swedish	748	204,262	9	4,691	18	12,097	4	3,180	779	224,230
*Turkish	138	37,971	..	..	..	..	..	..	138	37,971
Uruguayan	15	2,873	..	..	1	102	2	259	18	3,234
Venezuelan	8	1,111	..	..	..	..	..	..	8	1,111
Zanzibar	..	..	..	..	..	..	..	..	..	..
Other Countries :— Arabia, Salvador, Oman, Ecuador, Liberia, Samos, Nicaragua, Bulgaria, &c.	23	5,135	3	2,796	..	..	..	..	26	7,931
Total	10,843	4,014,396	95	64,767	1,500	1,601,677	913	1,369,118	13,351	7,049,958

Flag.	Total No. of steam & sailing-vessels.	Total tonnage of steam and sailing-vessels (net tonnage of sailing-vessels and gross of steamers).
British { United Kingdom	9,044	12,587,904
British { Colonies	2,099	1,077,408
British { Total	11,143	13,665,312
American (United States)	3,150	2,448,677
Argentine	196	78,771
Austro-Hungarian ..	284	349,814
Belgian	105	137,129
Bolivian	..	..
Brazilian	337	168,107
Chilian	142	110,535
Chinese	47	62,766
Columbian	7	3,232
Costa Rican	1	592
Danish	760	422,856
Dutch	383	444,450
Egyptian	14	12,150
French	1,151	1,179,515
German	1,604	2,113,981
Greek	438	252,363
Hawaiian	36	39,569
Haytian	9	2,865
Italian	1,162	855,478
Japanese	532	472,053
Mexican	35	11,909
Montenegrin	15	4,884
Norwegian	2,663	1,643,217
Persian	4	2,203
Peruvian	39	15,462
Portuguese	171	99,335
Roumanian	22	18,984
Russian	1,159	594,434
Sarawak	3	1,084
Siamese	4	3,080
Spanish	712	621,143
Swedish	1,373	552,785
Turkish	247	121,170
Uruguayan	36	18,814
Venezuelan	20	5,273
Zanzibar	3	3,168
Other Countries	45	24,090
Total	28,052	26,561,250

* Note.—In the absence of satisfactory information, the records of numerous small sailing-vessels (belonging chiefly to Greece, Turkey, Southern Russia, and the Dutch East Indies) have been omitted from the current edition of the Register Book.

TABLE No. 3.—SHOWING THE NUMBER, TONNAGE, AND DESCRIPTION OF VESSELS ADDED TO THE REGISTER OF THE UNITED KINGDOM DURING THE YEAR 1897.

(Prepared from information supplied by the Registrar-General of Shipping.)

NEW VESSELS BUILT IN THE UNITED KINGDOM.

1897.	Steam.								Sail.								Grand Totals.	
Month in which registered.	Steel.		Iron.		Wood and Composite.		Totals.		Steel.		Iron.		Wood and Composite.		Totals.			
	No.	Tons (gross).	No.	Tons (gross).	No.	Tons (gross).	No.	Tons (gross).	No.	Tons (gross).	No.	Tons (gross)	No.	Tons (gross).	No.	Tons (gross).	No.	Tons (gross).
January ...	20	41,482	6	817	3	141	29	42,440	6	3,209	...	...	7	379	13	3,588	42	46,028
February ...	33	66,836	7	1,103	2	139	42	68,078	4	3,726	...	...	11	579	15	4,305	57	72,383
March ...	30	40,680	7	1,159	1	4	38	41,843	4	3,773	...	...	10	623	14	4,396	52	46,239
April... ...	21	51,039	6	917	...	...	27	51,956	2	2,144	...	...	15	698	17	2,842	44	54,798
May	38	57,702	7	1,104	6	380	51	59,186	4	4,675	...	...	19	567	23	5,242	74	64,428
June... ...	49	74,669	7	1,150	4	217	60	76,036	1	301	...	...	24	1,178	25	1,479	85	77,515
July	38	62,282	6	1,024	5	105	49	63,411	3	4,503	...	...	21	777	24	5,280	73	68,691
August ...	35	72,275	4	630	8	381	47	73,286	2	2,198	...	...	17	895	19	3,093	66	76,379
September	29	40,155	3	437	2	96	34	40,688	...	...	...	...	18	833	18	833	52	41,521
October ...	19	47,678	6	960	...	...	25	48,638	3	501	1	95	15	619	19	1,215	44	49,853
November	30	54,087	3	528	1	17	34	54,632	3	1,577	...	...	9	291	12	1,868	46	56,500
December...	24	49,761	1	145	1	101	26	50,007	2	1,874	1	137	17	878	20	2,889	46	52,896
Total ...	366	658,646	63	9,974	33	1,581	462	670,201	34	28,481	2	232	183	8,317	219	37,030	681	707,231

TABLE No. 4.—Showing the Number, Tonnage, and Description of Vessels removed from the Register of the United Kingdom during the year 1897.

(*Prepared from information supplied by the Registrar-General of Shipping.*)

Vessels lost, broken up, etc.

1897.	Steam.								Sail.								Grand Totals.	
Month in which removed from Register.	Steel.		Iron.		Wood and Composite.		Totals.		Steel.		Iron.		Wood and Composite.		Totals.			
	No.	Tons (gross).	No.	Tons (gross).	No.	Tons (gross).	No.	Tons (gross).	No.	Tons (gross).	No.	Tons (gross).	No.	Tons (gross).	No.	Tons (gross).	No.	Tons (gross).
January ...	1	2,527	13	8,822	1	73	**15**	**11,422**	1	1,332	3	4,199	26	1,711	**30**	**7,242**	**45**	**18,664**
February	5	8,757	7	11,385	1	28	**13**	**20,170**	1	1,241	4	4,441	28	2,392	**33**	**8,074**	**46**	**28,244**
March ...	9	22,000	13	13,065	1	49	**23**	**35,114**	2	2,467	2	2,655	29	2,836	**33**	**7,958**	**56**	**43,072**
April ...	4	2,338	11	9,128	2	143	**17**	**11,609**	1	906	3	3,968	22	1,524	**26**	**6,398**	**43**	**18,007**
May ...	2	388	2	7,021	2	169	**6**	**7,578**	1	2,269	5	5,129	24	2,995	**30**	**10,393**	**36**	**17,971**
June ...	4	6,494	15	14,895	5	272	**24**	**21,661**	1	1,239	2	3,149	43	2,989	**46**	**7,377**	**70**	**29,038**
July ...	5	13,432	7	11,365	3	176	**15**	**24,973**	1	2,297	2	2,830	48	5,895	**51**	**11,022**	**66**	**35,995**
August ...	4	7,442	10	16,593	2	98	**16**	**24,133**	1	1,662	1	1,830	20	1,846	**22**	**5,338**	**38**	**29,471**
September	1	2,191	9	13,343	2	52	**12**	**15,586**	...	...	4	3,678	19	1,211	**23**	**4,889**	**35**	**20,475**
October ...	3	9,668	7	8,729	1	57	**11**	**8,454**	1	1,374	...	...	28	2,292	**29**	**3,666**	**40**	**22,120**
November	5	4,458	10	12,970	1	15	**16**	**17,443**	...	...	2	1,910	59	4,318	**61**	**6,228**	**77**	**23,671**
December	8	12,065	15	13,779	2	62	**25**	**25,906**	2	3,114	5	5,402	61	6,055	**68**	**14,571**	**93**	**40,477**
Total ...	**51**	**91,760**	**119**	**141,095**	**23**	**1,194**	**193**	**234,049**	**12**	**17,901**	**33**	**39,191**	**407**	**36,064**	**452**	**93,156**	**645**	**327,205**

The two preceding tables, also kindly furnished by Lloyd's Register, show the number of vessels that were added to the British Merchant Service during the year 1897; and also the number of vessels that have to be deducted through loss and other causes during the same year.

LIST OF MERCHANT STEAMERS HELD AT THE DISPOSAL OF H.M. ADMIRALTY FOR USE AS ARMED CRUISERS IN CASE OF NEED.*

SHIP.	OWNERS.	Gross tonnage.	Indicated H.P.	Speed (knots).
†*Campania*	Cunard	12,950	30,000	22
†*Lucania*	”	12,952	30,000	22
Etruria	”	8,120	14,500	20
Umbria	”	8,128	14,500	19½
Aurania	”	7,269	9,500	16
Servia	”	7,392	10,000	16½
†*Victoria*	P. & O.	6,527	7,000	17
†*Himalaya*	”	6,898	10,000	18
†*Australia*	”	6,901	10,000	18
†*Arcadia*	”	6,188	7,000	17
Oceana	”	6,188	6,000	17
Britannia	”	6,525	7,000	17
Rome	”	5,545	5,500	16
Peninsular	”	5,287	5,000	15½
Oriental	”	5,284	5,000	15½
Valetta	”	4,904	5,000	15½
Massilia	”	4,902	5,000	15½
Carthage	”	4,879	5,000	15
Ballarat	”	4,778	4,500	14½
Parramatta	”	4,756	4,500	14½
†*Majestic*	White Star	9,965	16,000	20¼
†*Teutonic*	”	9,984	16,000	20¼
Germanic	”	5,066	5,200	17
Britannic	”	5,004	5,200	16
Adriatic	”	3,888	3,600	14
†*Empress of India* ...	Canadian Pacific Railway.	5,905	10,000	18
†*Empress of China* ...		5,905	10,000	18
†*Empress of Japan* ...		5,905	10,000	18

* These vessels are permitted to wear the blue ensign of Her Majesty's fleet.

† These ships receive an annual subsidy.

CHAPTER XX.

The *Personnel*—Number of mariners in the British Merchant Service—Masters and Mates—The men—Able seamen—Ordinary seamen—Undermanning—Better regulations needed—The Board of Trade scale of food—Fines for offences—Foreign seamen in British ships—Decline in the numbers of British seamen—Relative merits of British seamen and foreigners — The Quartermasters — The Boatswain — Carpenter—Sailmaker—Cook—The Engineers and the Firemen.

About 250,000 persons are at the present time employed in the service of the British Mercantile Marine. This very large number of mariners may broadly be divided into two classes—the officers, and the men—both of which classes it may be well to consider somewhat in detail.

In the Royal Navy, as in the Army, between the officers and the men is drawn an absolute, and a perfectly defined line. The man-o'-war's-man is one thing, the naval officer is quite another;—but the Merchant Service is far more democratic. On board the merchant ship the line of demarcation is not nearly so strictly defined;—the great gulf fixed is not so impassable. Tom Smith, the foremast hand of to-day, may in the course of a year or two have a handle to his name, and blossom into Mr. Smith, the second officer; whilst a hard-up mate who cannot get a ship may make a voyage or so to Australia or to New Zealand "before the stick," as Jack has it, as an A.B. The two classes, the officers and the men, more overlap each other in the Merchant Service than could for a moment be thought of in the Royal Navy.

With regard to the former class—the officers in the Merchant Service—the law does, however, lay down certain very definite conditions. All officers in the Merchant Service, for instance, must possess proper certificates of competency granted by the Board of Trade, after due examination had, both in seamanship and in navigation, by the Examiners of the Board;

and no foreign-going British ship can legally proceed to sea from any port in the United Kingdom without being in charge of such a duly certificated master, who must be not less than twenty-one years of age, and must have served for six years at sea, one year of which must have been passed as mate in charge of a watch, whilst in possession of a first mate's certificate. In like manner no vessel employed in the home trade, *if she carry passengers*, can legally leave any British port without a similarly competent master; and if any person proceeds to sea as master of a vessel without a master's certificate, both he, and the owner of the vessel, are each liable to a penalty of fifty pounds.

Then, besides the master, the law requires that every vessel of 100 tons or upwards, shall carry one or more mates, also holding Board of Trade certificates of competency. A foreign-going British ship of more than 100 tons, is therefore obliged by the law to have a master and one mate. If, however, she be a large vessel she will probably carry, instead of only one mate, two or three; and in the case of the large ocean mail steamers, four, five, or even six mates are carried; but the actual requirements of the law would appear to be fulfilled if she had simply one master and one mate.

With regard to the latter class—the men—the law has but little to say, and what little it does say scarcely seems to be enforced. The men are divided, or are supposed to be divided, into two classes—A.B.'s (able-bodied seamen), and O.S. (ordinary seamen). An able seaman should be able to "hand," "reef," and "steer;" that is to say, to set, take in, and secure the sails, and to reef them; and also should be able to steer. Besides these things, he should be capable of performing all the handicraft work connected with the ship's sails, and with the standing and running rigging; he should know how to use the lead, and should understand every other part of the ordinary duty of a seaman.

The Merchant Shipping Act of 1894, enacts that "a seaman shall not be *entitled* to the rating of A.B., that is to say, to the rating of an able-bodied seaman, unless he has served at sea for four years before the mast" . . . "and the service may be proved by certificates of discharge, or by a certificate of service from the Registrar-General of Shipping and Seamen." This clause of the Act has always, however, been very much neglected, and has now become practically a dead letter, with the result that numbers of men now call themselves A.B.'s, and ship as such, who are in every respect totally unqualified.

From figures supplied by the Chamber of Shipping, the total number of seamen employed at the present time in the British Merchant Service is, in round numbers, 235,000. Of this number 80,000 are, or are supposed to be, A.B.'s; but no less than 27,000 of these A.B.'s are foreigners, leaving the total number of British A.B.'s as 53,000, a very large proportion of whom are untrained, and more or less incompetent. Of A.B.'s with four years' service at sea there are at present certainly not more than 26,000.

An Ordinary Seaman is simply a man who earns his living on the sea. He may have been at sea for a year or two, or he may have been afloat merely for a month, or even less. Anybody, in fact, who takes a fancy to go to sea may call himself an "ordinary seaman." There is nothing, so far as the law is concerned, to prevent any landsman—the gardener, say, or the milkman, if he can get any mate to take him—turning sailor and shipping as an ordinary seaman; and after a voyage or so to the Colonies it is quite possible, the Merchant Shipping Act notwithstanding, that without further preliminaries, he may proceed to the degree of A.B.

A man, however, who has shipped as A.B., and who is afterwards found to be thoroughly incompetent to perform the duties he contracted for, may be reduced at any time to the rating of "ordinary seaman"; and in addition he would lay himself open to further punishment for fraud—and very justly so, for supposing that a ship should be entitled to, say, six A.B.'s, and after she gets to sea finds herself one hand short, clearly more work will devolve upon the other five, and they will have just reason to complain.

Competition is now so keen that owners send ships to sea with the very minimum of hands capable of carrying on the work; many tramp steamers, even of as much as 4000 tons, at the present time cross the Atlantic with only half a dozen deck hands, three in a watch—not sufficient for a relief to the wheel and look-out. In spite of all that is said by shipowners about British ships not being under-manned, it is an undoubted fact that large numbers of ships do go to sea exceedingly short-handed. No allowance whatever is made for casualties or for sickness, and with matters cut as fine as they are at present, if a man gets hurt, or becomes ill, the number of the crew at once falls below the proper factor of safety, or, in other words, the ship is distinctly under-manned. A large four-master of over 2000 tons will leave the port of London for the Colonies with a crew of only eighteen—nine in a watch. Here, of course it is "all hands" every time she goes about; and if that be not under-manning it is something very near akin to it.*

In 1835, an Act was passed,† one of the main features of which was a declaration that a British ship should be considered duly navigated if she had one seaman for every twenty tons of her registered tonnage; but since the repeal of the Navigation Laws, in 1849, it has been left entirely with the shipowner to say what number of hands shall be carried, with only this one restriction, that it shall be stated on the articles what number are to be carried upon the voyage about to be entered upon, and then that number must be maintained as a minimum during the entire voyage.

A shipowner, like most other possessors of property, thinks that he has a perfect right to do as he likes with his own; but

* In February, 1898, the following official notice was issued by the Board of Trade: "Foreign-going steamships of over 200 feet in length, or not less than 700 tons gross, when proceeding to sea, should have, independently of the master and two mates, a sufficient number of deck-hands available for division into two watches, so as to provide a minimum effective watch, viz. a competent hand at the wheel, a look-out man, and an additional hand on deck available for any purpose." It will be remarked in the above "Official Notice" how exceedingly apologetic a public department like the Board of Trade can contrive to be. It does not lay down the law that such or such things *must* be done; but it mildly suggests that certain vessels "*should* have," etc. Something stronger than this is wanted before under-manning is put a stop to.

The charge of under-manning in no wise applies to the great lines of ocean mail steamers, which, universally, are most efficiently manned, and admirably officered. The accompanying illustration will afford a good idea of the crew of a first-class mail steamer. It is from a photograph of the crew of the R.M.S. *Briton*, of the Union Company.

† 5 and 6 William IV., c. 19.

CREW OF A LINER, THE UNION COMPANY'S R.M.S. "BRITON."

[*To face page* 264.

that is not a view entirely in accord with the fact, more realized every day, that the possession of property carries with it its own special responsibilities; nor is it at all in accordance with the whole tenor of modern legislation; and in these days of factory acts and measures affecting the well-being of workers ashore, it is high time that the law stepped in between the interests of the shipowner on the one hand, and the interests of the seaman on the other; and the sooner Parliament takes steps by judicious legislation to remedy the evils attaching to, and the present decadent state of, our Mercantile Marine, the better.

Apart from the vexed question of manning, there are many directions in which a little judicious legislation might very considerably benefit Mercantile Jack without injuring the shipowner, and so by rendering the service more popular, induce a better class of men to join it. There is nothing to be more deprecated than grandmotherly legislation, yet leaving alone large questions, there are still many smaller matters that might with advantage, in some manner, be dealt with, and out of many points which will readily suggest themselves to those interested in such things, the following are one or two:—

On signing-on day at the Shipping Office—that is, upon the day on which the crew for the forthcoming voyage are finally selected, and when the absolute contract between the shipowner and the men is entered into—the men agreeing to serve under certain conditions, and the shipowner agreeing, also subject to certain conditions, to pay,—there ought distinctly to be a medical inspection. Men now sign on, apparently, as far as can be seen, in good health; but the ship may have scarcely got outside before certain diseases will manifest themselves; some of the men go to their bunks for a time, and the ship, sparingly manned at the best, is short handed at once. It is true that under the Merchant Shipping Act a medical inspection is authorized "on application by the owner or master;" but it ought to be in every case *compulsory,* whether applied for by the owner or master or not.

When the men sign on the ship's articles are read over to them; but often, and more particularly such parts as the master is not specially anxious that the men should hear, in such a rapid and indistinct manner as to be perfectly unintelligible to them. At the time Jack does not care—he is only too thankful to get a ship at all; but he is no sooner at sea than petty disputes begin. Of course, the ship's articles are supposed to be posted up in the forecastle; but why not give every man when he signs on a printed copy, with the special stipulations as to food, work, fines, and so on, plainly set forth, that he may have a better knowledge of what he is expected to do, and what he ought to receive, without either having to ask the master or to remain in doubt.

These articles of agreement are upon a proper printed form issued by the Marine Department of the Board of Trade, and should, when properly filled up, be placed on board in such a manner as to be accessible to the crew, in default of which a penalty not exceeding five pounds may be enforced. Among other things, the articles prescribe the amount and kind of food to be supplied to the crew daily during the voyage.

Scale of Provisions to be allowed and served out to the Crew during the Voyage, in addition to the Daily Issue of Lime and Lemon Juice, and Sugar, or other Antiscorbutics, in any case required by 30th and 31st Vict. c. 124.

	Bread.	Beef.	Pork.	Tinned meats.	Soup and bouilli.	Preserved potatoes.	Compressed or preserved vegetables.	Flour.	Peas.	Rice.	Tea.	Coffee.	Sugar.	Molasses.	Water.
	lb.	lb.	lb.	lb.	pint.	lb.	lb.	lb.	pint	lb.	oz.	oz.	oz.	oz.	qts.
Sunday ...	1	1½	—	—	—	½	—	½	—	—	½	½	2	—	3*
Monday ...	1	—	1¼	—	—	—	½	—	⅓	—	½	½	2	—	3
Tuesday ...	1	1½	—	—	—	½	—	½	—	—	½	½	2	—	3
Wednesday	1	—	1¼	—	—	—	½	—	⅓	—	½	½	2	—	3
Thursday	1	1½	—	—	—	½	—	½	—	—	½	½	2	—	3
Friday ...	1	—	1¼	—	—	—	½	—	⅓	—	½	½	2	—	3
Saturday...	1	1½	—	—	—	½	—	—	—	1	½	½	2	—	3

Note.—In any case an equal quantity of fresh meat, or fresh vegetables may, at the option of the master, be served out in lieu of the salted or tinned meats, or preserved or compressed vegetables named in the above scale.

Substitutes.—At the master's option.

* This, it must be remembered, is for all purposes, washing as well as drinking.

The preceding is a copy of a recent agreement as concerns the food on board a Glasgow barque bound from the London Docks to the Colonies; and it may be taken as a fair sample of the amount of food supplied to the crew of an ordinary British sailing-ship at the present time; and it is so far plain and intelligible; although the last line, "Substitutes," etc., rather gives the whole of it away.

Although a bill of fare may look well enough on paper, the actual articles of food will naturally differ much in quality on board different ships; and while a liberal owner will send on board his ships good and wholesome beef and pork, and excellent biscuit, there are plenty of ships sent to sea with casks of salt horse, and the very vilest, and commonest of bread.

The following is the bill of fare recommended by the Merchant Shipping Victualling Scale Committee, 1892.

Bill of Fare.

	Breakfast.	Dinner.	Supper.
Sunday ...	Dry hash, soft bread.	Sea-pie and plum duff.	Cold beef and pickles.
Monday ...	Irish stew.	Pea-soup, pork, calavances.	Dry hash.
Tuesday ...	Rice and molasses.	Salt beef, potatoes, plum duff.	Cold meat and pickles.
Wednesday	Porridge and molasses.	Sea-pie.	Potato stew.
Thursday	Bread scowse.	Pea-soup, pork, calavances.	Cold pork and pickles.
Friday ...	Dry hash.	Preserved meat or salt fish and potatoes.	Twice laid of fish.
Saturday ...	Porridge and molasses.	Salt beef, rice, and molasses.	Cold meat and pickles.
	Coffee, biscuit, butter, and marmalade daily.	Biscuits and switchell daily.	Tea, biscuits, butter, and marmalade daily.

One would be inclined to think that if this Bill of Fare were really adhered to, Mercantile Jack need not absolutely starve.

The amount of fines for various offences is also set forth in the Articles of Agreement, as follows:—

No.	Offence.	Amount of fine or punishment.	Signature of superintendent.
1	Striking or assaulting any person on board, or belonging to the ship (if not otherwise prosecuted)	Five shillings	
2	Bringing or having on board spirituous liquors	Five shillings	
3	Drunkenness. First offence	Five shillings	
	Ditto. Second and for each subsequent offence	Ten shillings	
4	Taking on board and keeping possession of any fire-arms, knuckle-duster, loaded cane, slung shot, bowie-knife, sword-stick, dagger, or any other offensive weapon, or offensive instrument, without the concurrence of the master, for every day during which a seaman retains such weapon or instrument	Five shillings	

The fines are deducted from the amount of wages paid to the men at the Shipping Office when the ship is paid off at the conclusion of the voyage.

There ought to be distinct rules laid down as to the power of compelling men to work in exposed places when the temperature is beyond a certain point. At present it is an everyday occurrence to see men in foreign ports, on stages over the ship's side, chipping rust or painting, with an almost vertical sun pouring down upon them, and the thermometer, if it were placed against the iron side of the ship, showing something considerably over a hundred. The same with the men at the wheel—totally unprotected, although the deck may be so hot that it would be painful to walk about upon it barefoot.

It is a stipulation on some of the great liners that the men—that is to say, the deck-hands—are to assist during the passage in trimming the coal in the bunkers. As a case in point, this year on board one of the largest of the New Zealand liners the men were so engaged all through the tropics. The heat in the coal-bunkers was so insufferable that the men used to get faint and giddy on going down, and yet they had the greatest possible difficulty in getting an extra ventilator rigged up. There was no law compelling the ship to have it done, therefore it was not done, until the men absolutely refused to go below until it was done.

Then in cold wet weather there ought to be some definite rules as to the mode of carrying on the work during rain. No one advocates making feather-bed sailors, but why should a man who earns his bread upon the sea be placed in a worse position than a similar man on the land? A man would not be likely to keep a worse helm if the wheel were placed under shelter than he now does, exposed for two hours at a stretch to a bitterly cold driving rain or drifting sleet, or with a vertical sun threatening him every moment with sunstroke.

Then, again, there ought to be some fixed rule as to knocking off work on a Saturday afternoon. The men want a little time for washing and mending their clothes without having to do it after 6 p.m.; and on some ships—for the practice varies very considerably on different ships—work is kept up on Saturdays until five, and frequently up to six o'clock, the mate often being at considerable pains to invent work merely in order to keep the men employed.

Another point that requires looking to, is the keeping the forecastle, or the men's house, regularly cleaned out and tidy, a matter in some ships almost totally neglected, with the worst possible results from a sanitary point of view.

These are merely one or two points out of many; but if some kind of legislation were directed to matters like these, small and insignificant as they may seem, ship-owners and ship-masters would find themselves none the worse, and the men would be considerably benefited; work would be done more cheerfully than is often the case now, a good many sources of wrangling and grumbling would be removed, and life "before the stick" would be made considerably less irksome than it is at present.

The very large extent to which foreign sailors are now taking the place of British sailors in the British Mercantile Marine is becoming, year by year, a more and more serious matter, the percentage of foreign seamen in our Mercantile Marine having increased from 4 per cent. in 1851, to 17 per cent. in 1895; and it is still increasing. The number of British merchant seaman, considered relatively to the largely increased and increasing population of the country, is undoubtedly steadily declining. In 1855, the total United Kingdom registered tonnage was 3,800,000, and the number of British persons employed in the Merchant Service was 155,610. In 1895—that is to say, after an interval of 40 years, the total United Kingdom registered tonnage was 8,861,848, and the number of British subjects so employed (not counting lascars) was 170,074.

Of course, due allowance must be made for the more general adoption of steam as the motive-power, and for the substitution of large ships for little ones, yet still, taking as a basis the population of the United Kingdom in 1855, we find that one British person was employed in the British Merchant Service to every 175 persons ashore. Now, if we take one person to every 175 of the population of the United Kingdom in 1895, it would give us about 220,000 as the number of British Merchant sailors that there ought to have been. The actual number of British merchant seamen was, therefore, in 1895, very considerably below what it should have been; and this decrease is going on still. The Royal Navy naturally looks to the merchant navy for its reserves in time of war. In past times, when our Mercantile Marine was manned solely by British seamen, they fought side by side with their brethren in the Navy, and largely contributed to the naval supremacy of Great Britain; but if the foreign element in our Merchant Service continues to increase in the future in the same ratio that it has increased in the recent past, the Navy will have to look elsewhere for its reserves.

There are many reasons that conduce to this gradual decline in the numbers of British merchant seamen, and unquestionably one reason is the steadily falling rate of wages. The pay of an A.B. on board ships out of the port of London is now exceedingly low,—£2 15*s.* a month being about what Jack gets at the present time. This, to a great extent, is the result of this foreign competition. Scarcely a ship leaves London or any of our great ports without a very considerable percentage of her crew being "Dutchmen"—the sailor's term for foreigners, of whatever nationality they may be. Swedes, Norwegians, Fins, Danes, Frenchmen, Spaniards, are all Dutchmen to Jack. England is a free-trade country, and so long as there are Dutchmen to be found who are willing to work for lower wages than English Mercantile Jack, so long will shipowners employ them, with the inevitable result of still further lowering the wages of the English A.B.

Low as the present rate of pay is on board British ships, it is higher than the foreign sailor can get on board ships of his own country, and so he comes to us; and besides that, most British ships are better victualled than foreign ships, so that the foreign sailor gets a double advantage, from his point of view, by shipping on board British vessels—he gets better wages than he would get on board his own ships, and he is better fed into the bargain. There is a standing joke among English sailors, that if a Norwegian vessel is signalling, ten to one it is "two days out, and short of provisions."

There is one reason, however, that weighs considerably with skippers and mates in favour of employing Dutchmen in the place of Englishmen, and it is a reason that British sailors would do well to bear in mind; and that is, that without any doubt the foreign sailor does not get drunk to anything like the same extent that the British sailor does. It is not that the mate looks upon drunkenness from any particularly moral point of view; but if a man who has signed on goes away and gets drunk he may very possibly not turn up when the ship is about to sail, and that would lead to difficulties, probably to delay;—and even if he does come aboard, the chances are that he would be so drunk that he can't do his work. The Dutchman is pretty sure to turn up on sailing day, and to turn up sober, so that he is certainly in this respect more to be depended upon than the Englishman.

There is a good deal of nonsense talked and written about the "British Tar;" but he is not the only seaman in the world; and it is a fact that all the Scandinavian nations produce very excellent seamen. The sailors of Norway, Sweden, and Denmark, were famous in old times, as Britons found out to their cost; and although Englishmen would naturally prefer to see English ships manned by English sailors, yet such a result is one of the things that can never be brought about by any amount of legislation; it is simply a question of the survival of the fittest; and if British sailors want to hold their own on board British ships they must take care to be not only equal to, but in all respects superior to the foreigner. When this is undoubtedly the case, we shall cease to hear of British shipowners employing foreigners in the place of Englishmen.*

* At last the Government appear to have recognised this growing evil, and have proposed as one means of increasing the number of British seamen employed in the British Mercantile Marine, to remit a certain proportion of the Light Dues now paid by shipowners, to such ships as shall carry a certain proportion of British boys; and during the debate in the House of Commons, on July 27, 1898, on the Bill which the Government have brought in—the Merchant Shipping (Light Dues) Bill—Mr. Ritchie, President of the Board of Trade, spoke as follows:—"The decline of British Sailors in the Mercantile Marine has been a matter of considerable anxiety to all those who have the interest of the country at heart, and many suggestions have from time to time been made with a view of endeavouring by some means or other to check that decline. In the year 1891, there were 41,590 British sailors on board British ships, and in 1896, the number had decreased to 35,020, showing a falling off of 6570.

"In 1891, there were 13,432 foreigners on board British ships, and in 1896, the number had increased to 14,469. He did not dispute that a great many of these foreigners made good seamen, but the country would prefer that its ships were manned by British sailors. It was a disquieting fact that the decrease in the number of British sailors was most marked among the younger men; in 1896, there being of men under twenty-five years of age 3,981 fewer than there were in 1891. If at the present moment the Naval Reserves were called out, it would leave our Mercantile Marine almost entirely in the hands of foreign sailors. This was a very real danger, and he thought that the House would support the Government in an endeavour to remedy it.

"The great difficulty in the matter is the reluctance of both shipowners and masters to carry boys, as they find them, at any rate for the first year, of but very little service, while they cost as much for maintenance as full-grown sailors. It appeared to him that the Bill now before the House afforded an avenue by which at least something—and, he believed, a good deal—could be done to remedy the existing state of things.

"The Government proposed to give an allowance of twenty per cent. on the Light Dues in respect of any one vessel at the end of each year, during which the vessel must have been not less than nine months under articles of agreement, provided the owner carried boy sailors under the following scale:—Under 500 tons, one boy; between 500 tons and 1000 tons, two boys, this being net tonnage; between 1000 tons and 2000 tons, three boys; and an additional boy for every 1000 tons, or portion of 1000 tons.

"Each boy must be a British subject, not being a lascar; he must be a

After the able and the ordinary seamen there are four other classes of personages with whom we must make acquaintance. They are the quartermasters, and the boatswain, the carpenter and the sail-maker, with their mates. On the larger ships, and on the great liners these rank as petty officers, but in the eye of the law they are all simply "seamen."

The quartermasters in sailing-ships are for the most part merely picked out from the A.B.'s, getting a slight increase of pay for the additional service rendered. For the Australian voyage, for example, they would get, perhaps, an extra two pounds—a pound for the passage out, and another pound for the passage home; their special business being to attend to the steering. In the mail lines the quartermasters hold a more defined position than is the case in the ordinary sailing ship. Here, as above stated, they rank as petty officers, and are frequently old A.B.'s in the Company's service. They steer, and attend to all matters connected with the steering-gear; clean and brighten up the binnacles, telegraphs, and wheels, and keep the wheel-house clean and tidy, both aft and on the bridge. They hoist, or superintend the hoisting of the flags and signals,* and keep the colours in order, mending

deck-hand; he must be medically examined, and certified to be sound, and likely to grow into an efficient volunteer for the seaman class of the Naval Reserve. He must be enrolled in the Royal Naval Reserve, and he must enter into an agreement to present himself for service when called upon in accordance with the rules issued by the Admiralty. He must be over 15 and under 18 years when first enrolled, and under 19 years at the time of signing an agreement for any voyage in respect of which the allowance was claimed."

This somewhat cumbrous proposal on the part of the Government met with but very qualified support at the hands of members interested in the shipping world, as clearly the remission of the percentage of the Light Dues would in reality be paid for by the shipowner, who would, in order to obtain the remission, be compelled to carry a certain number of boys at a considerable pecuniary loss to himself. The Bill, however, was, nevertheless, read a third time; but that anything satisfactory will eventually result from it, seems to be extremely problematical, shipowners maintaining, and justly maintaining, that the Lights should be paid for altogether out of the National Exchequer, and not by the British shipowner.

* I remember once seeing a lad incur the wrath of an old quartermaster for hoisting colours in an improper manner. Ordinary flags when hoisted are usually sent up in a ball, and a jerk of the flag halliards sets the colour free—

them, and so forth; they keep the account of the temperatures of the air and the water; take soundings, heave the log, and note down the readings of the patent log, writing everything down before they go off duty, for the day's work; and in port they usually attend at the gangway.

The bo'sun is, or ought to be, the smartest foremast hand in the ship. He superintends the men in the day's work on board, and there is, or ought to be, nothing in a sailor's work that he cannot show them how to do. He has charge of the bo'sun's locker, which includes ropes, tar, paint, and ship's stores in general. He is answerable, under the chief officer, for all gear, the running and the standing rigging, and all the working parts of the ship. He usually is berthed in a house on deck, the carpenter and he often sharing the same house; but in some sailing-ships, although it is a plan much to be deprecated, he occupies the same house as the apprentices. In large vessels he has, under him, several mates.

The carpenter ("chips," on board ship), as his name implies, is responsible for all the carpentering jobs that may be required to be done on board, from putting a new lock on the cabin door to turning out a new spar in the case of an existing one being carried away. He looks after the pumps, and sounds the well every day, making his report to the officer of the watch; so that what with one thing and another, the carpenter's time is always pretty fully occupied.

The sail-maker has charge of all the canvas on board the ship, making new sails if required, and at other times repairing the old ones; and in an ordinary ship he is always busy, as sails are not only always chafing and wearing out, but very frequently are carrying away altogether.

These three last members of the crew usually keep no watches, but work all day, and sleep in all night, unless "all hands" are called, when they turn out with the rest. The cook, as a rule, does the same. He is engaged in his galley

"breaks it," as it is called. The lad had to hoist the blue ensign at the peak (it was a naval reserve ship), and he hoisted it in this way. The quartermaster was furious with him—"Sure, and don't ye know better," said he, "than to break the national flag of the country, just like you would a common house-flag?"

all day, either preparing the meals for the cabin, or cooking the food for the men, or cleaning up his saucepans and utensils. Of course this is on board the ordinary sailing-ship, or ocean tramp; on board the great liners the steward's and cook's department is simply the Hôtel Metropole afloat, with its untold array of stewards, under-stewards, waiters, chef, assistant cooks, pantrymen, vegetable-washers, butchers, bakers, and the rest. In the ordinary merchantman the cook is rather of the rough-and-ready description. He can turn out good plain food, but he does not profess to be an artist.

Upon steamers, and therefore on the majority of ships afloat, besides the navigating crew of seamen, there is another large body of men in the engineers, and firemen, or stokers, the duty of the former being to attend to the machinery, and the boilers, and that of the latter the furnaces. Until the year 1862, the position of the engineers was the same as that of any ordinary member of the crew, and their appointment and position was entirely dependent upon the will of the shipowner, who simply formed his own judgment of their fitness for the duties required of them. Now they are obliged to pass a Board of Trade Examination, in precisely the same way as Masters and Mates, and certificates are given for First-class Engineer, or Second-class Engineer, as the case may be, no one being allowed to fill these posts without holding such certificates of competency under a similar penalty to that incurred by the deck officers.

The stokers and the coal-trimmers are for the most part bred from shore labourers, and are usually drawn from a still lower class in the social scale than the deck hands; there being but very little community of feeling between the two sets of men. In the great liners the forecastle is usually divided longitudinally, the starboard side being occupied by the seaman and the port side by the firemen, or *vice versâ*, and neither class think of entering the others' berth uninvited.

CHAPTER XXI.

Apprentices—Their numbers formerly, and at present—Sea-time—The best way of a boy's going to sea—Importance of being apprenticed to a good firm—Premium and expenses—Apprentice's indentures—A contract—Duties of the apprentice, and duties of the shipowner—Treatment of apprentices—Training-ships—Suggestions—Apprentices sixty years ago.

HAVING seen something of the men, we now come to the apprentices, and as from the apprentices of to-day will be drawn the skippers of the sailing-ships and of the crack ocean liners of the future, their position is one well worthy of careful consideration.

Previous to the repeal of the Navigation Laws in 1849, it was compulsory * for every vessel to carry a certain number of apprentices according to her tonnage, for instance—

All vessels of	80 tons	and under	200 tons	were bound to carry	one apprentice.
"	200 "	"	400 "	"	two apprentices.
"	400 "	"	500 "	"	three "
"	500 "	"	700 "	"	four "
"	700 "	"	and upwards	"	five "

And for every apprentice deficient a fine of ten pounds was to be imposed. Since the repeal of the Navigation Laws, when the carrying of apprentices ceased to be compulsory, the number of apprentices has steadily diminished, as may be seen from the following table taken from the Board of Trade Returns :—

NUMBER OF APPRENTICES ENROLLED.

1845	15,704
1850†	5,055
1860	5,616
1870	4,241
1880	3,501
1890	2,167
1894	2,164

and the number continues now at about 2000.

* By Act of Parliament, 5 and 6 William IV. c. 19.

† The first year after the Repeal of the Navigation Laws.

When a father apprentices his son to a trade, or articles him to a profession, the presumption is that the father wishes the son to become, or the son himself wishes to become, a master in that particular calling in life. The primary object, therefore, of the sea apprentice may reasonably be assumed to be, that in due course of time he should become a master-mariner; and a necessary step towards this end is that he should be so trained during his apprenticeship, as that he may be able to pass the Board of Trade Examinations, first for Second Mate, after that for First Mate, and then for Master; and after that, if he chooses, for Extra Master—a master in the Mercantile Marine having to pass through the preliminary grades of Second Mate and Mate before he can obtain his Master's certificate.

The Board of Trade requires that every candidate for Second Mate shall have served for four years at sea, out of which time twelve months must have been passed in a foreign-going square-rigged sailing-ship. So long, therefore, as the candidate can show his four years at sea, including his year in the square-rigged foreign-going sailing-ship, it does not matter one pin, so far as the Board of Trade is concerned, whether he has ever been apprenticed or not. If he can show his four years' service at sea by his discharges as A.B., or even as ordinary "boy," he entirely fulfils the Board of Trade requirements, just as much as though he had been duly apprenticed. Therefore to be apprenticed is not an absolute necessity imposed by the Board; yet, to encourage apprenticeship the Board of Trade agrees to accept the whole of the time served under Indentures of Apprenticeship as actual sea service, provided the applicant has really served at sea, or at least out of the United Kingdom, four-fifths of the time claimed as apprentice (that is to say, that he has not spent more than one-fifth of the time claimed, in home ports); in other words, if he has been actually at sea, or out of the United Kingdom, with his ship for three years and three months, although he may have had in addition to this, nine months holidays, the Board will reckon these three years and three months, in the case of an apprentice, as four years' sea-service; but in the case of a boy not apprenticed, or of an A.B., he must put in sufficient discharges to make up four entire years. Here, therefore, is a clear inducement to apprenticeship, and it is intended as such by the Board of Trade.

We may take it, then, that the boy is to be apprenticed. The question now arises how should he, or his father, set about it? It is unquestionably best that a boy should, if possible, be apprenticed to a good firm owning many ships, rather than to a small firm owning but few ships, or to the owner of one single ship, and for this reason—competition is now so keen, and for any berth in any occupation whatever, there are now so many applicants, that when the apprentice has served his time, and has passed the Board, and has obtained his certificate, he experiences the greatest possible difficulty in obtaining employment; and naturally the first people to whom he would look would be the firm with whom he had served his apprenticeship.

All the best firms select their officers, as far as possible, from their former apprentices; and here, then, is his opportunity. If the firm owns but one or two ships they will probably have no vacancy; or their ship will be on her way out to Sydney, or going from Rio to Rangoon, or be otherwise equally inaccessible, and the lad, not getting a berth under his old firm, will find it next to impossible to get a berth at all; and if he has not influential friends to give him an introduction to some other and better firm, he will have to do what a very large number of passed apprentices are now obliged to do, ship as A.B. until some better opportunity presents itself.

It is, of course, not always within the power of the boy's friends to apprentice him to one of the larger firms. A considerable premium has to be paid, varying from £50 to £150; and nothing at all is coming in for the four years of his apprenticeship, whilst the boy will have to be found in outfit and in pocket-money.

Say that the apprentice's premium is £100; his first year's outfit will certainly cost £20 at the least, and for each of the other three years £15; then for pocket-money and travelling expenses to and from his ship, which, although she may have sailed from London, may possibly come home to Glasgow, or Cardiff, or Liverpool, or some other port, £10 a year will not leave a very large margin. This will bring the sum-total up to £205, or, say, £50 a year for the four years. To a great number of parents—perhaps professional men, retired army men, or clergymen, with several sons to bring up—after all the expenses of the boy's education to have to pay £50 a year for four more years is a very serious matter, and one which ought to carry with it some very distinct advantages.

The small firms will often take an apprentice for £30 (some few for nothing), and will pay the amount back as wages—£6 the first year, £7 the second, £8 the third, and £9 the last year; which may be a present good, but which is often terribly at the expense of the boy's future, for the reasons given above.

Now, an apprenticeship indenture is an absolute contract between two parties, each with his own special responsibilities: the boy undertakes, on his part, to properly serve his master; the ship-owner, on the other hand, undertakes to perform his part of the bargain, which in ninety-nine cases out of a hundred, he never does, and never even thinks of doing. He undertakes to teach the boy, or cause him to be taught, the profession of a seaman. That is to say, he undertakes to teach the boy the art of navigation, how he should take his ship from one port to another; the rule of the road, as regards both steamers and sailing-vessels; their regulation lights, and fog and sound signals; general ship's signals; the mode of marking, and the use of the lead and log-lines; the use of the rocket apparatus; stowing cargo; and general seamanship. This, then, is what the ship-owner, or the ship-master, as the case may be, agrees to do. What does he do in reality?

In nine cases out of ten the apprentice, according to the advertisements, is "to be berthed apart from the crew;" "will be taught navigation;" and "have the same food as the officers." But what are the real hard facts of the case? The confiding parent pays the required premium, gets the outfit for his boy, who duly appears among his friends, the admired possessor of brass buttons, and a cap with the badge of the firm upon it. He has in due time notice to join his ship, and with his new uniform on, and with his sea-chest and his other belongings, he reports himself on board; the ship sails, and if his friends could only see him in a month's time they would scarcely recognise him. Instead of the smart youth they said good-bye to, they would see an extremely dirty boy wearing an equally dirty flannel shirt, a greasy and tarry pair of dungaree trousers, and on his head a grimy old "Tammy." He has been probably all the morning cleaning brass-work, or the ship's lamps, and is sitting in "the house," eating his dinner of salt horse and rice, with his chest for a table. The dinner-hour over, he hears an uncouth voice yelling, "Now, then, Jack, get on with your brass-work," or, "Get on with that chipping down in the fore-peak!" Not a very appreciable part of the training of the future officer!

The fact is that in all vessels that take apprentices, except those of a few of the best firms, the apprentice is in every respect treated no better, and no worse, than the ordinary foremast hand, for the simple reason that he is looked upon as exactly on a level with the hands. Some ships take half a dozen or eight apprentices simply to save their equivalent of A.B.'s, and until the present laws are altered will continue to do so.

The vessel—possibly a Glasgow barque, for the canny Scot is perhaps the worst offender in this respect—ought to carry, say, twelve A.B.'s. As a matter of fact, eight seamen only are shipped, six A.B.'s, two ordinary seamen, and the balance is made up with apprentices, who, having to work watch and watch with the men, get so much taken out of them during their watch on deck that when it is their watch below they are only too glad to turn in, and certainly are not much inclined to open a book, or to trouble their heads about mathematics or navigation.

In a few ships, skippers, when they get into the Trades, will have their apprentices aft for an hour or so in the dog-watch, and help them on with their navigation. It is doing the boys good, and it is an amusement for the Master; but where there is one skipper who does this there are twenty who would never dream of such a thing, and who, so long as the apprentices do their work aloft, or slung over the side, painting, or whatever else they may have to do, never trouble themselves at all about them, from the beginning of the voyage to the end.

This miserable treatment of apprentices results in a number of high-spirited boys, who would undoubtedly have made excellent officers, and who would have helped to raise the tone of the profession, throwing it up in disgust. Numbers of boys, sons of well-to-do professional men, clergymen, and others, try one voyage, and have then had quite enough of the sea, and settle down to something on shore; whilst numbers of apprentices make a run of it in the Colonies. Of course, very many remain, a large proportion of whom undoubtedly sink down in the social scale, and under the present wretched system make coarse, foul-mouthed, bullying men; the ultimate residuum that make good seamen and gentlemanly officers, being, unfortunately, but a very small percentage of the entire number of those who originally joined the service.

On all hands it appears to be conceded that Merchant Service officers are considerably behindhand in educational attainments. Can it be wondered at, when a boy is taken, just at a critical age, perhaps from a good public school, where he has been treated as a gentleman's son, and put for four years to sweep decks, clean brass-work, tar and grease down, clean out bilges and pig-styes, shift ballast, and bag coal, in company with a number of men whose every other word is an oath, except when it is something considerably worse.

Of course, there are the training-ships for boys intended for the Mercantile Marine, the *Conway* in the Mersey, and the *Worcester* in the Thames; but, then, these are expensive, and consequently out of the reach of many gentlemen of only moderate means, who perhaps have several sons to provide for; and opinions are a good deal divided among competent judges as to whether a boy who has had a couple of years on board one of these training-ships is really more likely to get on than one who goes straight to sea.

The whole question of apprenticeship to the sea-service requires a thorough over-hauling and much alteration. Of course, there are pauper apprentices, boys apprenticed by the parish authorities, whose ultimate end and goal is to become A.B.'s, and nothing more; but there are also, at the same time, the apprentices whose friends have paid premiums with them, with the intention that they should ultimately become the captains of our ocean liners; and the two classes should not be mixed up, and most certainly the latter class should not be levelled down to the position of the former, as is too much the case at the present day. If the apprentice, on his part, does his duty cheerfully, and to the best of his ability, the other party to the contract, the shipowner, should undoubtedly be made to do his, which, equally undoubtedly, at the present time, for the most part, he does not do.

The apprentices should be under the orders of the master and of the mates alone. They should, when the weather and the work of the ship permitted, be had aft for an hour every day, and be taught navigation and other kindred subjects. They should be employed aloft, and in setting and shortening sail, in setting up rigging, sending down spars, splicing, and the thousand and one things that appertain to seamanship; but they should not be employed in tarring or greasing down, and they should not be made to do painting on stages or in bowlines, nor to clean out pig-styes and closets, nor to clean brass-work or lamps. In port they should be sent into the hold to learn dunnaging and stowing cargo; and they should, as far as practicable, be kept apart from the men before the mast.

If these, or some such rules, were carried out, in the course of a few years a very marked improvement would be observed in the officers of the Mercantile Marine to the benefit of everybody—to the benefit of the apprentice undoubtedly; and certainly to the benefit of the shipowner, as the more competent and the more intelligent the man is to whom a valuable ship, and a valuable cargo, is entrusted, the less the chance to the owners or to the underwriters would there be of loss and disaster. The following graphic description will show how very little the position of the apprentice in the Mercantile Marine has improved within the last sixty years. With very little alteration the picture presented in 1830, would on many ships do equally well for 1898.

Mr. W. S. Lindsay, in his work on merchant shipping, thus describes the accommodation provided for apprentices in the year 1830. He says—

"I have the most vivid recollection of the forecastle of the ship in which I served my apprenticeship, and a description of it may serve to illustrate an ordinary specimen of the sea homes of sailors at that time.

"The vessel in which I served was about four hundred and twenty tons register, and of North American build. She was ship-rigged, and had a flush deck, that is, there were no erections upon the deck except the galley or cook-house, which stood before the long-boat; on each side of both were lashed, to ring-bolts in the deck, the spare spars, and to these were again lashed a row of puncheons or butts filled with fresh water.

"This vessel was employed in the trade between Great Britain and Demerara, making occasionally a voyage to the Bay of Fundy, Nova Scotia, for lumber, a description of boards used for the heading of rum and molasses casks and sugar hogsheads. Her crew, she had more than the usual complement, consisted of twenty-one persons all told, comprising the master, or 'captain,' first and second mates, and steward, all of whom lived in the cabin. Besides these there were the carpenter, cooper, and cook—who with the steward were expected to assist in seamen's duties—ten seamen, and four apprentices. One of the latter lived with the carpenter and cooper in a place called the 'steerage,' that is, a small place temporarily separated by some rough stanchions and boards from the cargo in the square of the after-hatch. Here their tools, with various rope and sail stores, were also kept.

"The cook, ten seamen, and three apprentices had their abode in the forecastle. This place, which was in the ''tween decks' at the extremity of the bow, may have been about twenty-one feet in width at the after, or widest, part, tapering gradually away to a narrow point at the stem. The length in midships was somewhere about twenty feet, but much less as the sides of the vessel were approached. The height was five feet from deck to beam, or about five feet nine inches from deck to deck at the greatest elevation between the beams; the only approach to it being through a scuttle or hole in the main deck, about two and a half feet square.

"Beyond this hole, there were no means of obtaining either light or ventilation, and in bad weather, when the sea washed over the deck, the crew had to do as best they could, without either, or else receive the air mixed with spray, and sometimes accompanied by the almost unbroken crest of a wave, which, in defiance of all the tarpaulin guards, too frequently found its way through the scuttle.

"Here fourteen persons slept in hammocks suspended from the beams, and had their daily food. There was no room for tables, chairs, or stools, so that the tops of their sea-chests, in which they kept their clothes, and all their possessions, were substituted for those useful and necessary household articles. In fact, so closely were these chests packed, that it was difficult to sit astride them, the mode which the sailors found most convenient for taking their meals, especially in rough weather.

"But the whole of even this limited space was not appropriated to the use of the crew, for it contained a rough deal locker, in which the beef and soup-kids and other utensils were kept; while the stout stanchions, or knight-heads which supported the windlass on the upper deck, came through the forecastle, and were bolted to the lower beams; and too frequently, when the ship was very full of cargo, a row of water-casks and casks of provisions were stowed along the after bulkhead, which was a temporary erection; whilst on the top of these, cables, coils of rope, and numerous other articles were piled.

"At all times it was a foulsome and suffocating abode, and in bad weather the water and filth that washed about the deck, and among the chests and casks, created the most intolerable and loathsome stench.

"Here, however, these fourteen sailors and apprentices slept, washed, dressed, and had their food, except in fine weather, when they took their meals on deck, their food consisting almost entirely of inferior salted pork, beef which was sometimes nearly as hard and unpalatable as the kids in which it was served, and brown biscuits too often mouldy and full of maggots. To make matters worse, the forecastle of the ship was full of rats, and I have the most vivid recollection of one of these animals on more than one occasion finding its way into the hammock where I slept.

"In the West Indies the place was so suffocatingly hot that the sailors invariably slept wherever they could find a clear space upon deck, or in the tops; and in winter, when approaching the English Channel, or when on an intermediate voyage to the Bay of Fundy, it was as bitterly cold, no stoves or fires of any kind being allowed on board, except in the galley and in the cabin.

"No Siberian slaves ever suffered so much from the intensity of the cold, as did those of the sailors and apprentices of that ship who had not deserted, during two months of a winter when she lay at anchor in one of the roadsteads of the Bay. The bow ports were then obliged to be open to receive the cargo, and could only be covered with matting during the night. One of these ports opened upon the forecastle, so that its occupants might almost as well have slept upon deck, their damp clothes as they lay upon the chests, or hung suspended from the beams, being frequently frozen to such an extent that the ice had to be beaten from them before they could again be used."

CHAPTER XXII.

The officers—The second mate—The chief mate—His duties and responsibilities—The master—His duties—The official log-book.

Having seen something of the men and of the apprentices, we must now consider the officers—the master and the mates. As previously stated, the law contemplates three grades only —the master, the first mate, and the second mate; but the great liners usually carry four, five, or sometimes even six mates. The ordinary sailing-ship, however, and most of the ocean tramps, have as a rule the master, and a first and second mate only, with occasionally, in the larger vessels, a third mate.

The second mate's position varies considerably in different ships. In the great mail lines it is one which carries with it a large amount of responsibility. Here the second officer, as he is called, rather than second mate, is usually a well-educated gentleman, holding most probably a master's certificate; he is a good sailor, and one who in due course will be the master of a similar ship himself. The same thing holds good in the larger sailing-ships, and in most of the large steamers other than the mail and passenger liners;—the second mate looking forward in a short time to become a chief mate, and after that to obtain a command.

In the small three or four hundred ton barque, and in the smaller steamers, the second mate, from a social point of view, is very often scarcely removed from the foremast hands; having a handle to his name, certainly, being Mr. Brown, not Bill Brown, and having a certain amount of authority; but in manners, speech, and dress scarcely distinguishable from the men. He goes aloft, reefs and takes in sails, and does, for the most part, pretty much what the men do. There is one point, however, in which he does differ from the men, and that is that he never takes a wheel.

He lives aft, usually having a cabin to himself, and has his meals in the main cabin, although generally, and necessarily, after the captain and the chief mate, as he must take charge of the watch on deck while the first mate is below. He is, however, one step up the ladder towards being one day a skipper, although sailors have a saying "that being second mate doesn't get your hand out of the tar-pot." A second mate must be at least seventeen years of age, and must have served four years at sea either as an apprentice, or as a seaman before the mast, and unless it be a steamer, one year of the four must have been served in a square-rigged foreign-going sailing-ship.

The chief mate is a more experienced seaman and navigator than the second mate; he must be at least nineteen years of age, and must have served five years at sea, one year of which must have been as second mate, or as a junior mate holding a second mate's certificate, in charge of a watch. He occupies a very arduous and a very responsible post. He is the representative in everything of the master, who intimates to him what he wishes to have done, and then leaves it to the mate to carry it out. He engages the crew, superintends the stowing, the safe-keeping, and the delivery of the cargo—seeing that the tallying out corresponds with the tallying in, and not infrequently having to pay for any deficiency—and he is responsible for anything and everything about the ship, from a rope yarn to an anchor. He keeps account of everything that comes aboard, or that goes out of the ship; provisions only excepted, for which the steward, if there be one, is responsible.

It is his duty to continually examine all parts of the rigging, and to report anything that is of importance to the master. If any one comes on board the ship, such as an agent, or a carrier with goods, or any other person, indeed, he is always referred to the mate or chief officer.

In going out of or coming into dock, in getting under way, or in coming to an anchor, it is the duty of the chief officer to attend to the anchors and cables, and the warps and hawsers, and to see that everything is in readiness. If getting under way from an anchorage, he will usually take his station forward, where he can see the cable as it enters the hawse-hole, informing the master when the anchor is "a peak," at the same time ordering the men aloft to loose the sails; and when the ship is under way, the master being in command, and looking after the yards and sails, the chief officer will see to the catting and fishing of the anchors. Similar duties will devolve upon him in bringing up.

On board a sailing-ship, if there be a third officer, that officer is in the first mate's (the port) watch. Then if anything has to be done, as setting the jib, or taking in a royal, the mate will whistle for his third mate, and he and the third mate will do it, the chief mate not, however, leaving the poop. But if a heavier job has to be done, as for instance setting a top-sail, the chief mate will take his stand on the main hatch, or where he is best able to see all that is going on. In tacking ship the chief mate's place is at the lee main braces, the second mate's at the crojack * braces, and the third mate's on the forecastle-head for the fore-tack, and the head-sheets.

In stowing sails or shortening down, the chief mate's station is anywhere where he can get a good view of the sail that is being taken in. The second mate slacks away the halliards and sheets, and the third mate the braces. In stowing, the second and third mates, who are on the yard, take the bunt, the second to windward, and the third to leeward. When no officer is on the yard the A.B.'s take the bunt, and the ordinary seamen or boys are at the yard-arms.

When at sea the chief officer is responsible for everything that goes on on board, and, if it be possible, his responsibility is even greater when in port, for then the captain will be ashore a great part of the time attending upon owners and merchants, and seeing after the business affairs of the ship. It is part of the duties of a chief mate to keep the ship's log-book, and when at sea he takes the sun every day, and works out the ship's position, comparing notes with the master, and entering it and all particulars of the weather, and all other special circumstances of the day in the log.

By law he is the successor to the master—that is to say,

* Cross-jack yard, pronounced "crojack," the lower yard on the mizen-mast, corresponding to the main yard on the main-mast.

should the master die during the voyage, the command legally devolves upon the chief mate, and that he should be competent to fill that position is one of the objects of the Board of Trade examination and of the certificate.

In sailing-ships and in ordinary cargo steamships, the chief mate takes his meals in the cabin with the captain, and is the only person on board occupying a position of anything like equality with him. In the large passenger lines there is considerable diversity of practice. In some lines the chief officer sits down to table in the saloon with the passengers and the captain; in others, with the view of keeping the ship's officers as much apart as possible from the passengers, all the officers, the captain only excepted, have their own mess. In some of the great lines, when entertainments and dances are got up for the amusement of the passengers, the chief officer and the other officers will join in them, even going so far as to discard the company's uniform, and to appear in ordinary evening dress; whilst in other lines no officer is ever permitted to take part in anything of the kind, but must devote the whole of his time to the duties of the ship.

In some mail lines, where there are four officers—a chief, second, third, and fourth—three only keep watch at sea—the chief, second, and third—and these for only two hours each, so that they have two hours on deck, and four hours below, the fourth officer being on all day, attending to the navigation, and looking after the passengers' games—cricket, deck-quoits, and so forth, he then sleeping in all night. But in home waters, coming up Channel and the like, the ordinary port and starboard watches of four hours each would still be kept—the chief and fourth in the port watch, and the second and third in the starboard. At such times extra precautions are always taken, tarpaulins being covered over all places from whence lights might be seen from the bridge, as they would tend to render it more difficult for the officers on the bridge to make out lights and buoys and other marks for which they may be on the look-out.

It is the duty of the mates to assist the master in everything to the utmost of their ability, and things go best where there is cordial co-operation between the master and his subordinate officers. Some masters are exceedingly jealous of the mates knowing too much about the navigation of the ship, keeping them as much as possible in the dark about it, not caring that they should even so much as see the chart. Where this feeling exists on the one side there will not be much sympathy on the other. A steamer was once run ashore upon a well-known coast on a very fine night. The officer of the watch had seen the land for some time, the ship evidently closing in with it, and yet he did nothing for her safety upon the plea that "if the captain set a course which put the ship on shore, it was no business of his." One can easily imagine the kind of relationship existing between that master and that officer.*

The master—by courtesy the "captain,"—with the sailors universally, whatever his age, "the old man," and familiarly "the skipper"†—is lord paramount, absolutely an autocrat on board his own ship. His word is law, which nobody must dispute, and which permits of no argument. He must be obeyed in everything without a question, even by his first officer. He stands no watch, comes and goes when he pleases, and is accountable to on one except to his owners.

He has entire control of the discipline of the ship; so much so that none of the officers under him have any authority to punish a seaman, or to use any force without the master's order, except only in cases of urgent necessity that admit of no delay. He has to be informed of everything of importance that takes place on board; and such things as descrying a sail, a light, or land, or the sudden shoaling of the water, or signs of any change in the weather or in the direction of the wind must be instantly reported to the master.

In a sailing-ship, when he is on deck, the weather side of the poop belongs of right to the captain, and as soon as he appears the officer of the watch usually leaves that side, and goes over to leeward, or else goes forward.

* Blackmore's "British Mercantile Marine."

† This is a survival from Danish times; "skipper" is Danish for the master of a ship; in Dutch it is "schipper."

In carrying on the ordinary routine of the ship the master usually acts entirely through his officers. With regard to the sails, for instance, if only a slight alteration is required to be made, the master will tell the officer of the watch to take in or to set such or such a sail, and then will leave to him the particular orders as to the braces, sheets, and so forth. But as the principal manœuvres of the ship—such, for instance, as getting under way—going about, reefing topsails, and the like—will often require all hands, it is usual for the master himself then to take the command, and to give his orders in person, standing usually at the break of the poop, the chief officer then superintending the forward part of the vessel under the master, whilst the second mate assists in the waist. In the ordinary work on board, however, the captain does not superintend personally, but gives general instructions to his chief officer, whose duty it is to see that these instructions are carried out. If the captain sees anything of which he disapproves, it is not etiquette for him to speak to the men about it, but he will convey all his requirements through his chief officer; indeed, the less a master interferes personally, the smoother the way in which the work goes on.

There have been many instances in which the mate has been, perhaps, on the forecastle head, superintending some particular piece of work, and the captain has come forward and put in his spoke, upon which the mate has turned on his heel and gone aft, leaving the captain to finish the job. Here the latter could not reasonably complain, as by universal custom he had no right to have come and interfered.

The captain takes the bearing and distance of the last point of departure from the land, and from that point the ship's reckoning begins, and is regularly entered day by day in the log-book, which is kept by the chief officer, the master examining, and, if necessary, correcting the reckoning. The master also attends to his chronometers, azimuth compass, and other instruments on board, and takes the altitude of the sun at midday, or the lunar, and other observations, with the assistance of his officers. Every day a few minutes before noon, if there be the slightest chance of getting the sun, the master comes on deck with his sextant. As soon as the sun is on the meridian "noon is made," eight bells struck, and a new nautical day commences.

On board the ordinary sailing-ship, or on board a steamship, if she be a tramp with no passengers, the master's position is sufficiently lonely. He is on friendly terms with his officers, but it is the intimacy of men who are not equals; and should there unfortunately be, as is sometimes the case, rather strained relations between them, then the captain is absolutely alone, and must fall back upon himself and his books. When at sea he always has a good deal of spare time on his hands; but when in port the matter is very different, for he has to manage the entire business relations of the ship. He represents the owners, and very frequently has to arrange for cargo, decide questions of freight, and sometimes, unless he be in telegraphic communication with the owners, to settle the future destination of the ship. He has to possess a knowledge of invoices, charter-party, bills of lading, bills of exchange, surveys, averages, and all matters of a kindred nature, and he is answerable for the "official log," which must be kept on board every ship, and which may, at the discretion of the master or owner, be kept distinct from, or united with, the ordinary ship's log, so that in all cases the spaces in the official log-book be duly filled up.

With regard to this official log-book the Merchant Shipping Act prescribes that every entry is to be made as soon as possible after the occurrence to which it relates, and if not made on the same day as the occurrence recorded, it must then be made and dated so as to show the date of the occurrence, and the date of the entry respecting it.

Every entry in the official log-book must be signed by the master and by the mate, or some other of the crew, and if it be an entry of illness, injury, or death, it must be signed by the surgeon or medical practitioner on board, if there be one. If it be an entry of wages due to, or the sale of the effects of, a seaman or apprentice who has died, it must be signed by the mate and by some member of the crew besides the master. If it be an entry of wages due to a seaman who enters her Majesty's Naval Service, it must be signed by the seaman concerned, or by the officer authorised to receive the seaman into that service.

Every entry made in the official log-book is admissible in evidence in a Court of Law.

The master of every ship for which an official log is required, must enter, or cause to be entered, the following matters: Every conviction by a legal tribunal of a member of his crew, and the punishment inflicted by the court; every offence committed by a member of the crew for which it is intended to prosecute, or to enforce a forfeiture, or to exact a fine. For instance, supposing a ship to be in a foreign port, and that one of the men has been on leave ashore, and comes back drunk; if the man goes to his berth, and does not create a disturbance, he will probably hear nothing more of it. But should he become abusive or begin fighting he will most likely be told when sober that the next time a similar state of things occurs he will be "logged;" that is, the offence will be recorded in the official log-book, and it will then be attended with a fine. Say that it does occur again; he is then "logged" forthwith, with the effect that when the ship comes home, and is paid off, and the man receives his wages, five shillings will be deducted as a fine. For a second offence the fine will be increased to ten shillings, and so on; and when he obtains his official discharge, instead of having G. (good) or V.G. (very good) stamped on the discharge, he will have B. (bad). It is by law, however, competent to the seaman who would have had B. stamped on his discharge to decline to have anything put upon it; but as nobody would object to G. or V.G., the absence of any marking is perfectly intelligible; and as all these discharges are recorded by the Registrar-General of Seamen, the character of any seaman can, if it be requisite, be readily obtained.

Every case of illness or injury happening to a member of the crew must be entered, together with its nature and the medical treatment adopted (if any). Every marriage taking place on board must be duly recorded, with the names and ages of the parties. The sale of the effects of any seaman or apprentice who dies during the voyage must also be entered in the official log, including a statement of each article sold and the sum received for it; and a variety of similar matters.

If the official log-book be not kept in the manner required by the Act, or if an entry directed by the Act to be made is not made—a record of a marriage, for instance—the master is liable to a fine of five pounds.

If the master or any person makes, or procures to be made, or assists in making, any entry in the official log-book, in respect of any occurrence happening previously to the arrival of the ship at her final port of discharge, more than twenty-four hours after that arrival, he is liable to a fine of thirty pounds. Thus, say, for instance, that on board a ship bound for the port of London there has been say, in coming up Channel, some serious disturbance, and at eight o'clock on Monday morning the ship enters the West India Docks; then it would be competent for the master at any time during that Monday to make an entry in the official log-book of the particulars of the disturbance; but to do so after eight o'clock on Tuesday morning would render him liable to the fine.

If any person should wilfully destroy, or mutilate, or render illegible any entry in the official log-book, or should make any false or fraudulent entry therein, he is to be deemed guilty of a misdemeanor, and is liable to a term of imprisonment. And within forty-eight hours after the ship's arrival in port the official log-book must be handed over to the Board of Trade superintendent, before whom the crew is discharged.

An additional duty has within the last two years been imposed upon masters of vessels, and that is the duty of reporting derelicts. An Act of Parliament, known as "the Derelict Vessels (Report) Act," was passed in 1896, which enacts that

"every master or other person for the time being in command of any British ship, after the passing of this Act, who shall become aware of the existence on the high seas of any floating derelict vessel, shall notify the same to the Lloyd's Agent at his next place of call or arrival, and shall, together with such notification, furnish to the Lloyd's Agent all such information as he may possess as to the supposed locality or identity of such derelict vessel, and the date when and the place where the same may have been observed by, or reported to him, and the Lloyd's Agent shall forthwith on receipt of such notification and information transmit the same to the Secretary of Lloyd's, in London.

"And if any such master fails to make such a report he shall be liable, on summary conviction, to a penalty not exceeding five pounds.

"Any information received by the society of Lloyd's as aforesaid, in pursuance of this Act, shall be published by the society forthwith in the same manner and to the same extent as its reports of shipping casualties, and the society shall also forthwith communicate such information to the Board of Trade."

As a consequence of this new Act, an official list of derelicts is published in each number of the *Shipping Gazette*. The above particulars are sufficient to show some of the responsibilities of the master, who in every possible respect is absolute ruler and head on board his own ship; and, as being in charge of a community often thousands of miles from any other authority, this position is one of absolute necessity.

"Upon the character and the course of conduct pursued by the captain depend in great measure the character and the success of the ship, and the conduct of the officers and men. He has a power and an influence, both direct and indirect, which may be the means of much good or of much evil. If he be profane, passionate, tyrannical, indecent, or intemperate, more or less of the same qualities will inevitably show themselves among the officers and men, which would have been checked if the head of the ship had been a man of high personal character. He may make his ship almost anything he pleases, and may render the lives and duties of his officers and men pleasant and profitable to them, or may introduce disagreements, discontent, tyranny, resistance; in fact, he may make the situation of every one on board as uncomfortable as can possibly be imagined. Every master of a vessel who lays this to heart, and considers the greatness of his responsibilities, may not only be a benefactor to all those whom the course of many years' command will bring under his authority, but may render a service to that very important part of the community to which he belongs, and do much to raise the character of the English Mercantile Marine." *

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* W. S. Lindsay.

CHAPTER XXIII.

Work on board ship—The port and starboard watches—The nautical day—Watches and bells—The dog-watches—The wheel—Steering—Work aloft—Heaving the log—Patent logs—Heaving the lead—The lead-line—Hand-line—Deep-sea lead—Deep-sea soundings—Sounding-machines.

On board all ships the crew are divided into two parts, or watches; half the hands forming the larboard, or port watch, under the chief mate, and the other half the starboard watch, under the second mate. The latter watch is sometimes called the captain's watch, doubtless from the fact that in the earlier days of the Mercantile Marine, when vessels were smaller, there was often but one mate, and then the master stood his own watch, as is at present the case in coasters and similar craft.

It is usual at the commencement of the voyage, as soon as the ship is fairly at sea, to call up all the hands, and the first and second mates then choose the men for their respective watches. The first mate has first choice, and picks out a man; then the second mate chooses one, and so on until all the hands are chosen; and the men then remain in whichever watch they may have been selected for until the end of the voyage.

Occasionally, in sailing-vessels, but not very frequently, the master makes the division himself, after consultation with his officers, but the more usual course is for him to leave it to the mates. If the number of men be unequal, the larboard watch claims the odd "hand," since the chief mate does not go aloft, or do other parts of the men's duty on his watch, as the second mate does on his. If there be a carpenter, and the larboard watch, having the odd hand, is the larger watch of the two, the carpenter generally goes aloft when required with the starboard watch; otherwise—that is to say, if the watches are equal—he is expected to go aloft with the larboard watch. As soon as the division is made, and the men apportioned between the two watches, if the day's work be over, the watch is set, and the other watch is sent below.

Among many customs prevailing at sea, of which the origin is not easy to trace, is the one that on the first night of the passage out the starboard watch takes the first four hours on deck, and on the first night of the homeward passage the larboard watch does the same. The sailors explain this by the old saying that "the master takes the ship out, and the mate brings her home."

By this arrangement of watches half the crew are at work whilst the other half are off duty, and have either turned in, or are at their meals, or mending their clothes, smoking, reading, or what not.

The nautical day is sub-divided in a somewhat different fashion from the day ashore, and consists of a certain number of bells and watches, each portion of four hours constituting a watch. Thus, from eight o'clock in the evening until midnight is the first watch; from midnight until four o'clock in the morning is the middle watch; from four in the morning until eight is the morning watch; from eight o'clock till noon is the forenoon watch; and from noon until four o'clock is the afternoon watch. Now, if the next four hours, from four o'clock until eight, were also one watch, there would be an even number of watches, and the men who kept the morning watch on the first day would always keep the morning watch, and the men who kept the middle watch would always keep the middle watch. To obviate this, and to shift the watches, the four hours from four o'clock in the afternoon until eight are sub-divided into two watches of two hours each, called the dog-watches; from four to six being the first dog-watch, and from six to eight the second dog-watch. This makes an uneven number of watches, and the men who to-night are on deck from eight o'clock till midnight, and again from four in the morning till eight, will to-morrow night only have from midnight till four in the morning, and so on, the watches getting thus alternated.

Each watch is sub-divided into eight bells of half an hour each. Eight o'clock in the evening is eight bells; half-past eight is one bell in the first watch; nine o'clock is two bells in the first watch; half-past nine is three bells, and so on up to midnight, which is eight bells again. Half-past midnight is one bell in the middle watch; one o'clock in the morning is two bells in the middle watch, and so on. The bells are struck on the ship's bell, and, unlike the striking of a clock, the strokes are distinctly in pairs. Thus four bells is not struck as a clock would strike, one—two—three—four, but one two—one two; five bells, one two—one two—one, and so on.

Perhaps one of the most irksome parts of a sailor's duty is taking his "trick at the wheel," as sailors call the duty of steering. To be at the wheel for two hours at a spell—and that is the time that each man usually has to steer—becomes extremely monotonous at night when perhaps it is as dark as pitch all round, possibly blowing hard and raining or snowing, and the man's whole attention has to be centred on the little compass-card, lighted up by the binnacle lamp. Then it is that he eagerly looks out for four bells or eight bells, as the case may be, which is the signal for him to be relieved.

On some ships in very bad or cold weather the tricks at the wheel are reduced from two hours to one hour, and if it be blowing a gale, or there is a very heavy sea and the ship steers badly, two men are placed at the wheel at the same time. In this case the man who stands on the weather side of the wheel is the responsible helmsman, the man at the lee side being supposed merely to assist him. Of course, all this simply relates to sailing-ships, or to vessels where the old-fashioned mode of steering obtains. Upon most of the great ocean steamers steam steering-gear is now used, the engines doing all the mechanical work; so that in the heaviest weather one man with his little finger is able to steer the largest ship. On board the large Indian troopers, the *Serapis*, *Crocodile*, *Jumna*, and the rest, where they had double wheels, it was not an unusual thing in very bad weather to see eight men, four at each wheel; now, with steam steering-gear one man can do the work quite as efficiently.

When the wheel is relieved the retiring man gives the man who relieves him the course to be steered, say S.E. by S.¼S., and the relieving man must answer "S.E. by S.¼S." In the same way, when the officer of the watch gives a new course, say S.E. by E., the helmsman must repeat the order, "S.E. by E.," not merely giving the usual "Aye-aye, sir"—this in order that there may be no possible mistake as to the course to be steered; and the man who is relieved must not relinquish the wheel until the relieving man has firm hold of the spokes.

There is a prevalent notion among land folks that a vessel once at sea, there can be little or nothing to do, other than the actual sailing of the ship. Nothing really is farther from the truth. Every day brings with it its regular day's work precisely as is the case ashore; so that, considering the addition of his night work, Jack works as hard or harder than most of his brothers ashore do. The day commences with the watch on deck turning-to at daybreak, and washing down the decks, scrubbing, swabbing, and generally tidying up. This lasts until seven bells (half-past seven), when all hands get breakfast. At eight bells the day's work begins, and lasts, with the exception of an hour for dinner, until six o'clock in the evening. During all this time there is no such thing as idleness on board ship; everybody has his work to do, and the officer of the watch generally takes care to see that he does it.

No conversation is allowed among the crew at their duties, and although when aloft, or when working in close proximity to each other, the men will talk, yet they always stop if an officer is at hand. On board there never is a time when nothing more remains to be done. All the running rigging has to be constantly overhauled, and that which is worn, or unfit for use, sent down and replaced with new rope, if the owners are sufficiently liberal as to have much on board; but as this is very often not the case, then the old ropes must be spliced, and made as reliable as is possible under the circumstances. Many ships are so ill-found in stores that something is everlastingly carrying away, and on their arrival in port after an average voyage, the entire rigging is nothing but knots and splices.

Whenever any of the numberless ropes, or the yards, or other spars are chafing, then "chafing-gear," as it is called, must be put on. Taking off, putting on, and repairing the chafing-gear alone upon a moderate-sized vessel would provide constant employment for two or three hands, during working hours, for the entire voyage.

Then all the standing rigging, such as stays, back-stays, and the like, is always working slack, and has to be set up, the seizings and coverings taken off, tackles got up, and after the rigging is bowsed well taut, the seizings and coverings must be replaced; and there is such a connection between one part of a ship and another, that it is scarcely possible to touch one rope without altering another one. It is impossible to stay a mast aft by the back-stays without slacking up the head-stays, and so forth.

If a ship leaves the Thames with her best and stoutest canvas bent, as soon as she gets into warmer latitudes where there is not so much likelihood of gales of wind and dirty weather, all these sails are unbent and sent down, and older and more worn sails bent in their place. Then, before she gets to the Cape, preparatory to running down her easting, the process has to be reversed, and the stouter canvas rebent. And if to all this be added the tarring down, greasing, oiling, chipping rust, scraping, painting, and varnishing, to say nothing of cleaning brass-work, the ship's lamps and so forth, that is constantly required; and all this in addition to the look-out at night, the steering, the work aloft in reefing, furling, setting, and taking in sails, pulling, hauling, and climbing in every possible direction, the wonder is, not that there should be anything to do, but rather that there should be time in which to do it. But if it should ever so happen that, for the moment, there was nothing very particular or very urgent that was required to be done upon the rigging or elsewhere, then there is always the standing job of making spun-yarn, sennit, and the like, to fall back upon.

There is, of course, a great difference in officers and skippers;

many, of course, are good judges of the weather, and are considerate and reasonable men. Some, however, can scarcely be so considered; they are always thinking that it is going to blow, or if it is blowing, then that the weather is going to moderate; and so they will have some of the lighter sails set, taken in, and set again once or twice in a watch, thus keeping the men constantly hard at it the whole of the time that they are on deck. In most ships work is knocked off on a Saturday afternoon, which the men are supposed to have to themselves; but even here a good many officers seem to find a special delight in curtailing even this short period of leisure, by being extra particular in having such jobs as heaving the log done, when perhaps the log has not been hove once in the forenoon watch. This, as may be supposed, is not regarded with any very marked favour by Jack, and logs are very frequently *lost* under these circumstances. A log-line is not a particularly stout line, and a sailor's knife is always fairly sharp, so that it is perhaps not remarkable that on a Saturday afternoon the line occasionally breaks, and the log is lost.

On board a well-regulated ship the log is hove at frequent regular intervals—usually every two hours—and it is an important operation; for when, on account of thick or dirty weather no observation can be taken, the ship's position can be roughly ascertained by what is called "dead reckoning." The particulars of the ship's rate of progress each time that the log is hove are entered in the ship's log-book, and at the end of the day, due allowance being made for the ship's leeway, and for the set of currents, and other matters, the distance run can be found; and the courses steered being known, the ship's actual position can be approximately ascertained.

The ordinary log is commonly a drogue or conical-shaped canvas bag, to the mouth of which the log-line is attached, and the log is hove or thrown out astern to ascertain the rate at which the ship is travelling. The log-line, which is wound on a reel, is divided into spaces called "knots." At the first knot is a piece of leather; at the second knot is a piece of leather with two tails, and at the third knot an ordinary knot is tied, and so on. A glass like an ordinary hour-glass is used to mark the time that the knots take to run out, and the glass contains such a quantity of sand as will run through in exactly 14 or 28 seconds. The log-line is measured to correspond with a glass running 28 seconds, the distance between each knot on the log-line bearing the same proportion to a real knot, or geographical mile (6080 feet), that the 28 seconds of the log-glass bear to the seconds in an hour. No calculation, therefore, is necessary; the number of knots run out on the log-line in the 28 seconds is the number of real knots, or geographical miles, that would be run in an hour.

One man attends to the log, while another man holds the glass. When everything is in readiness the log is thrown overboard. The first twenty or thirty fathoms of line that run out are waste, and are not counted, as they simply allow the log to settle down quietly in the water. The commencement of the log-line that counts is marked by a piece of white rag. Directly the white rag goes over the ship's rail the glass is turned. The man who is heaving the log sees that the line runs out clear, whilst the other man watches the glass. The moment the sand has all run out he calls "Stop," and the man checks the line, noting the exact distance run out. The distance run in the 14 or 28 seconds, as the case may be, is thus ascertained, and the number of knots run out on the line is the number of actual knots that the ship is travelling in the hour.

Very often, however, there is not in reality any very great amount of reliance to be placed upon the rate thus ascertained, and for the following reason: In most ships there is a certain amount of rivalry existing between the two watches; the mate does not care to hear that the ship is making less progress during his watch than she was making during the second mate's watch, so that it is not unusual to hear a dialogue somewhat after this fashion. The man who is holding the glass will say, *sotto voce*, "Bill, what shall I make her go?" To which the other man will reply, "Oh, make her go eight knots; it'll please the mate." Then, by holding the glass not quite upright, it is very easy to check the sand in running out, and instead of 28 seconds perhaps nearer 56 seconds have elapsed before all the sand has run out, with, of course, an additional number of knots to be recorded. When the log is hove in this manner the accuracy of the dead reckoning is apt to suffer.*

At the present time on board many ships brass patent logs are used, which record automatically the exact distance run, but although usually accurate, they are somewhat expensive, and, moreover, they easily get out of order; so that on board the generality of sailing-ships the more simple and old-fashioned log above described is the one most frequently used.

An instance of the danger of relying too implicitly upon these automatic logs occurred this year, in the case of a steamer that was lost on the coast of Portugal, where the automatic log, being out of order, had recorded a totally different distance from that actually run, with the result that the master entirely mistook his position, and put his ship ashore.

There are also now electric logs which constantly record on a dial on board the vessel the rate at which the ship is running; but these are more expensive still, and are extremely delicate in their mechanism. Both these logs are, of course, when in use, towing astern, and cases have occurred where a passing shark has taken a fancy to an automatic log which has thus been suddenly lost.

Besides heaving the log, there is another important operation on board ship, particularly when making the land, and that is taking soundings, or heaving the lead, and the omission of this very obvious duty has conduced to the loss of many a fine ship. Frequently in thick weather, when near the land, it is almost the only thing upon which the mariner can rely, and a master will often be able to form a very fair opinion of his position simply by the depth of water and the nature of the bottom. Ships frequently feel their way up Channel with the lead, in thick fogs, without seeing

* I knew one ship, where a very straightforward young fellow, who would always act "square" with the glass, was never allowed to hold it; as when he held it the ship never went fast enough to please the mate.

land or sun for days, accuracy of survey and the peculiarities of the bottom enabling them to do this.

Soundings are taken by means of the lead-line, and the process of taking soundings with the lead-line is called "heaving the lead." There are two kinds of lead-lines—one, the "hand-line," 20 fathoms long, and the other the "deep-sea lead," of 200 or more fathoms in length. Both are divided into "marks" and "deeps." The deeps have nothing to distinguish them, but the marks have pieces of rag or leather. The 20-fathom hand-line has, at 2 fathoms, a piece of leather with two strips; at 3 fathoms a piece of leather with three strips; at 5 fathoms a piece of white rag; at 7 fathoms a piece of red rag; at 10 fathoms a piece of leather with a hole in it, and so on. At the end of the line is the lead itself, about 2 inches in diameter and 8 or 9 inches long, weighing from 7 to 14 pounds. At the bottom of the lead is a hole filled up with tallow, and to properly fill up the lead with tallow is called "arming it." The object of this is, that when the lead strikes the bottom, some of the sand, or mud, or fine shells, or of whatever the bottom may be composed, will adhere to the tallow, and when the line is hauled in the nature of the bottom will be ascertained—a matter that is often extremely useful, as affording additional information as to the ship's position, the particular description of the bottom being invariably indicated on the chart.

To properly heave the lead requires some considerable practice. The man who is going to heave it, and who is called the "leadsman," gets on to the rail, or some other convenient place, and, with the coil of line in his left hand, he with the other hand whirls the lead with a sufficient length of line just to clear the water, two or three times over his head, until it has acquired the necessary impetus, and then throws it forward as far as he can into the water; the object of throwing it forward being to give it time to sink to the bottom by the time that the ship, which is under way, shall have come up to the place where the lead sank, so that the line, being perfectly vertical, the exact depth may be correctly taken. The leadsman can see at a glance, by the pieces of leather or coloured rag, what the depth of the water is, and calls out, "Deep eight;" "By the mark seven;" "And a quarter five;" "Quarter less six;" "And a half nine;" and so forth, meaning respectively that he has 8 fathoms, 7 fathoms, $5\frac{1}{4}$ fathoms, $5\frac{3}{4}$ fathoms, and $9\frac{1}{2}$ fathoms.

For soundings over 20 fathoms a deep-sea lead is required, but the actual process with a deep-sea lead, for ordinary depths, is pretty much the same as that for the hand-line described above, the speed of the ship being reduced to give the lead time to sink. When deep-sea soundings are required, for surveying or other purposes involving great accuracy, the vessel must bring up, as in great depths the sinker takes some time to reach the bottom. A deep-sea line with an iron sinker of 96 lbs. weight will take 27 minutes to reach the bottom in 900 fathoms, which is rather over a mile—a considerable depth of water, but a depth that is to be found as near home as within 80 miles of the south-west corner of Ireland.

The taking of deep-sea soundings is one of the most important operations in navigation, and it is, at the same time, one that is too frequently neglected, as is abundantly shown by the number of casualties every year brought about by "neglect of the lead." The old plan of taking deep-sea soundings involved much trouble and loss of time, besides seriously vitiating the reckoning for the ship's position, through rounding-to and stopping for a cast of the lead. The whole watch was required, and even then, with the ship drifting, an accurate cast could not easily be obtained. In a ship running up Channel before a gale of wind, it would frequently be dangerous, or even impossible, to shorten sail and round-to for a cast of the lead, and the only thing to be done under the system was to run on, trust to good luck, and chance it. Under these circumstances, it was not surprising to find that the master of a ship, although anxious to obtain a sounding, would run on as long as he possibly could, rather than stop his ship for a cast. But now this tedious operation is no longer necessary, as Lord Kelvin (Sir William Thomson), has provided a machine by which it is easier to obtain accurate soundings, in any depth up to 100 fathoms, than it is to take a cast with the hand-lead. With the fine steel wire used in this machine, very little resistance is offered to the sinker going to the bottom, and two men can easily take a trustworthy sounding every ten minutes or quarter of an hour, while the ship is going at any speed up to 16 knots, and in any depth of water up to 100 fathoms. In order, however, properly to make use of Lord Kelvin's sounding-machine for determining the ship's position, it must be used frequently and methodically. A single cast, or indeed several casts, taken at random, are of comparatively little value; but if the lead be used systematically and frequently, it will be an absolutely sure guide for showing the course the ship is making. The taking of soundings is very often put off till it is too late, and very frequently the ship is actually in a position of danger before the sounding-machine is brought into use. It ought to be a rule on board every ship, when out of sight of land and in less than a 100 fathoms, that the sounding-machine should be always kept going.*

If the sounding-machine be not always kept going, depend upon it Mercantile Jack is. Mercantile Jack is always hard at it in the hardest of weathers, as he mostly is in all weathers, poor Jack; as may be gathered from the foregoing very slight outline of a few of the multifarious duties of Jack afloat. Of course, in some vessels he is kept harder at it than he is in others. Some captains and officers are fairly considerate for their men; whilst others take every possible opportunity of "hazing" them, and if there should be nothing very important that actually requires to be done, take a pleasure in making work rather than that Jack should have any leisure, thus carrying out the commandment of the "Philadelphia Cathechism"—

> "Six days shalt thou labour, and do all that thou art able,
> And on the seventh—holystone the decks, and scrape the cable."

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* W. Bottomley, on sounding-machines and patent logs.

CHAPTER XXIV.

The Suez Canal—Ancient canals—M. de Lesseps—Scheme for a canal—The concession—Formation of the Company—Opposition of the English Government—The work commenced—Description of the Canal—The working of the Canal—The Canal dues—At the opening—At the present time—The cost of the Canal—The takings—The dividends—Suez Canal shares—Lord Beaconsfield's action—Present value of the shares—Traffic through the Canal—The Company's rules.

PROBABLY no single event ever exercised so powerful an influence upon, or more completely revolutionized, our shipping trade with the East, than did the opening of the Suez Canal, in 1869; and there is no waterway in the world so much frequented by every kind of British merchant ship bound to all the ports of India, of China, and Australia, and indeed to ports scattered over half the entire globe, as the canal now joining the Mediterranean and the Red Sea.

The idea of a water communication between these two seas was not a new one, some antiquarians being of opinion that such a means of communication did actually exist in former ages. Eastward of the present canal are the ruins of Pelusium, whence an ancient canal is said once to have joined the Mediterranean to the Red Sea, and by that waterway Cleopatra is supposed to have sought a retreat, with her treasures, after the defeat of Actium. We know for certain that Pharaoh Necho * (610 B.C.) did commence a canal from the Nile to

* This is the Pharaoh Necho of the Twenty-sixth Dynasty, who commenced his rule over Egypt in B.C. 612, and who reigned until B.C. 596. In B.C. 608, he advanced to the reconquest of Assyria, and defeated and slew Josiah, King of Judah, who was opposing him, at Megiddo, a little to the south of Nazareth in Galilee (see 2 Kings xxiii. 29). It is possible that he commenced the canal with a view to facilitate his military operations against the King of Assyria.

the Red Sea, which, starting from the neighbourhood of Suez, passed through the Bitter Lakes to Lake Timsah, and then turned westward to Bubastis on the Nile. Herodotus describes this work with its water gates, and tells us that vessels sailed through it in four days. This cutting ultimately became choked up with sand, but was afterwards cleared and re-opened by Amr ibn el-Asi, the general of Caliph Omar in the seventh century, when Egypt was brought under the domination of the Arabs.

For many centuries, however, nothing more was attempted in this way until, in 1798, Napoleon conceived the idea of such a canal, and directed an engineer to survey the isthmus with a view to ascertaining whether such a scheme was really practicable. For some reason or other this engineer came to the conclusion, and so reported to Napoleon, that the waters of the Red Sea were very considerably higher than those of the Mediterranean; and as a consequence of this report Napoleon allowed the scheme to fall through. Yet it has been ultimately reserved for France and for M. Ferdinand de Lesseps, in spite of the strongest opposition by England, at length successfully to carry out this great and most important undertaking.

From 1831, to 1838, M. de Lesseps was employed as consular agent for the French Government in Egypt; and it was during this period that he first started the project of a canal. After endless negotiations with the Ottoman Government, which all resulted in nothing, M. de Lesseps at last, in 1854, obtained from the then Viceroy of Egypt, Mohammed-Said-Pacha, the necessary concession for the work, and then he at once returned to France to raise the requisite funds for the undertaking. From France M. de Lesseps came to England, holding public meetings in all the great commercial centres; but in this country, although many of the merchants and shipowners expressed themselves as entirely favourable to the scheme, it experienced the most determined opposition from Lord Palmerston, and the English Government.

The public subscription for the formation of the capital for the enterprise was opened on the 5th of November, 1858, and closed the 30th of the same month; it extended to 400,000 shares of 500 francs each, being a capital of 200 millions of francs. More than half the subscription was taken up in France, and it is a curious thing that the great bulk of the subscribers came from among the peasantry. It has always been said in France that "the Suez Canal was made by the old women of France," and it is an undoubted fact that hundreds of the country people—small farmers, old market-women, and the like—invested the five-franc pieces that they had carefully stored away in the old stocking, in the shares of the Suez Canal. A charter, dated the 15th of December, 1858, constituted the General Company for piercing the Isthmus of Suez and for working the Canal; and on the 25th of April, 1859, the first stroke of the pick-axe was given at Port Said, in the trench that was hereafter to become the Suez Ship Canal.

The English Government, in no way slackening its opposition, now endeavoured to exert pressure upon the Viceroy and upon the Porte, with a view to putting a stop to the works; and in October, 1859, at the instance of the English Ambassador at Constantinople, the Sultan sent to Egypt a high functionary, the bearer of a letter from the Grand Vizier enjoining the Viceroy at once to put a stop to all works in course of execution in the isthmus. The question thus clearly put had to be decided. The Ottoman Porte was compelled to pronounce one way or the other, in fact, officially; and, after much further delay, it somewhat reluctantly declared "that the piercing of the isthmus was not unfavourable to the interests of the Ottoman Empire."

The works were now vigorously carried forward; but in 1863, Ismail Pacha succeeded Mohammed-Said, and another Grand Vizier's letter was sent from Constantinople to the new Viceroy, intimating to him instructions to modify the basis of the agreements passed between the Egyptian Government and the Canal Company; and if the Company did not accept these proposed changes within a period of six months, then the suspension of the works was to be at once imposed by force.

These "new conditions" imposed upon the Company menaced its very existence, and at the instance of M. de Lesseps, the Viceroy appealed to the Emperor Napoleon III., asking him to decide the controversy, declaring beforehand his acceptance of the Emperor's decision as arbitrator. This decision, which was announced on the 6th of July, 1864, amicably settled all points of difference between the Egyptian Government and the Company, and the Porte was called upon to ratify it, which it, however, would not consent to do until eighteen months later.

Again the works were pushed on, and by dint of the greatest exertions, and by the use of engines of extraordinary power, and especially by extremely powerful dredgers, M. de Lesseps and his workmen were enabled at last to complete their task; and on the 17th of November, 1869, the Suez Canal, available under the same terms for everybody, was opened for navigation.

The Canal, extends from Port Said, on the Mediterranean, to Suez, at the top of the Red Sea, a distance of 80 geographical miles, or about 92 statute miles. The navigable channel of the Canal for deep vessels is a cutting 72 feet wide between sea and sea, intersected by lakes, which extend perhaps nearly 20 miles out of the total length of its course. The depth of the Canal is 26 feet, which admits of vessels drawing 24½ feet passing through. Every tenth kilomètre (every six miles) a *gare*, or siding, is provided, to enable ships to be moored out of the main channel, so that other vessels may pass; and it is by this means that the traffic is carried on, the width of 72 feet being, of course, insufficient to allow two vessels to pass each other when under way. Several deflections from the generally straight course of the Canal occur, and these have tended greatly to interfere with its otherwise easy navigation. But during the last few years over a million sterling has been spent by the Canal Company in improving these curves; so that at the present time a vessel grounding and blocking the traffic is a comparatively rare occurrence.

A ship entering the Canal from the Mediterranean passes between two breakwaters, the western about two miles long, and the eastern about a mile. Although there is no perceptible tide, yet a slight current that there is from the westward would soon silt up the mouth of the harbour with mud from the Nile, were it not for these breakwaters, and for a constant system of dredging.

Gas buoys on either hand mark the channel, from outside the breakwaters to Port Said, those on the starboard hand being painted red, and those on the port hand green, and this same system of buoys is continued all the way through the Canal itself. Passing along in front of the town of Port Said, and through the Ismail Basin, the steamer enters the Canal proper, which runs at first through a wet, flat, sandy plain, scarcely higher than the level of the water, on the eastern side, and actually below it on the western, where are the swamps and marshes of Lake Menzaleh, itself a vast half marshy lagoon of brackish shallow water, dotted with islets, and usually covered with large flocks of wild fowl, including hundreds of pelicans and flamingoes.

At twenty-six miles from Port Said, Kántarah is reached. Here was a low hill of sandstone that had to be cut through for the Canal, and it was across this low ridge that every invading army must in the olden time have entered Egypt. Between Al Kántarah and Lake Timsah seventeen miles of narrow canal with high banks have to be traversed. At the commencement are some difficult curves, and this is one of the places where a steamer does sometimes get ashore, and obstruct for a time the general traffic. The cutting through this part was the hardest piece of work on the whole of the Canal, the ridge of Al Guisr rising from seventy to a hundred feet above the desert, so that it was an exceedingly costly work to cut it through. Along this strip is the ancient desert route to Syria, and at the pontoon ferry fully equipped caravans may even now very frequently be seen, waiting their turn of crossing.

At Lake Timsah is situated the town of Ismailia, clustering round a summer palace of the Khedive. The town, which is modern, was admirably planned, with one solitary exception—no provision whatever was made for the drainage, other than discharging it into the fresh-water canal, which afforded the only drinking water for Ismailia. Drinking water polluted with sewage can have but one result, and Ismailia was absolutely decimated with typhoid, from which it has not yet entirely recovered, the place being still practically deserted.

From Lake Timsah, the Canal cutting goes through Toussoum to the northern entrance of the Bitter Lakes, a distance of about nine miles, on either hand of the Canal being the desert. The Bitter Lakes are the remains of a now dried-up arm of the Red Sea, on which once flourished the ancient port of Arsinoe. To the west is seen the verdured line of the fresh-water canal that now runs from the Nile to Suez, whilst behind this rises the Geneffeh range, which affords extensive quarries of limestone and marble. The neighbourhood of the Bitter Lakes is generally supposed to have been the scene of the crossing of the Israelites, under Moses, and it was here that the host of Pharaoh perished through the sudden springing up of a south-westerly gale.

From the Bitter Lakes to Suez the canal has continuous hard banks. At Chalouf the cutting is carried through sandstone; after that to Madama it passes through sandhills, and increases in width; at Madama the banks are of marl and clay; and thence to the Suez entrance it runs again through sandhills, the tidal influence in the southern portion of the canal extending from Suez to about four miles north of the southern end of the Bitter Lakes.

For some reason, said to have been political, M. de Lesseps did not bring his Canal through the ancient channel, and past the old town of Suez; but when about five miles off he turned it eastward, avoiding altogether the head of the gulf, through which the direct course would seem to have led, and formed for it a port of its own, named Port Tewfik, about two miles from the town of Suez itself, at the end of the fresh-water canal, surrounded by land as yet only partially reclaimed from the sea.

The working of the Canal is conducted upon a modification of the block system, and an ingenious but simple contrivance invented by M. Chartrey de Menetreux, the director of the transit department at Suez, is used for this purpose. At Port Said, Ismailia, and Suez, are principal offices of the Company, and at each of these offices a narrow trough about fifteen feet long represents the particular section of the canal worked from that office. Above the model of the canal is a shelf containing a number of small model ships, each bearing a national flag. When a ship passes the office to enter that particular section, one of the small models is placed in a corresponding position on the model canal; and when a ship comes out the small model that represented that ship is removed and replaced on the shelf. As the news is received by telegraph that such or such a ship has passed such or such a siding, the small model is moved on to correspond, and orders are telegraphed to the particular *gare*, or siding, where the ship is to make fast, in order to allow vessels going in the opposite direction to pass. Thus the exact position, at any particular time, of every ship in the Canal is known at the head offices, and telegraphic messages relating to the ships are constantly being sent up and down the Canal. By these means the immense and constant traffic through the canal is quietly regulated in the most methodical and business-like manner.

At each of the stations, or *gares*, there are signal-posts, from which ships are directed to "go into the siding," or "go into the canal," as may be required; a full code of these signals by day and night being supplied to all ships by the Canal authorities. Vessels provided with the necessary electric light "projector," throwing a light 1300 yards ahead, are permitted to navigate the Canal by night, and at the present time nearly as much traffic goes on by night as by day. To assist the navigation by night the whole length of the Canal is lighted with gas-buoys, filled with compressed gas, which is kept always burning. In 1880, the average time occupied by a vessel in passing through the Canal was 55 hours. This was reduced by 1885, to 43 hours, and it has since been gradually still further reduced, until at the present time 18 hours is about the usual time occupied in the transit.

At the opening of the Canal in 1869, and for nearly three years subsequently, the Canal dues were levied at the rate of 10 francs a ton (the maximum tariff under the concession) on the registered net tonnage of steamers. About the middle of 1872, the Board of the Company determined to levy the same toll, not on the net, but on the gross tonnage of all vessels; and this they proceeded forthwith to do, making thereby an alteration in their charges which amounted to something like forty or fifty per cent. beyond the dues previously paid by shipping.

The consequence of this change was a very serious commotion, and appeals were made right and left by shipowners to Her Majesty's Government to protect British interests. The result of this agitation against the action of M. de Lesseps and his colleagues, was the appointment by the Ottoman Porte, of an International Commission to determine the basis upon which the dues should be levied. After much deliberation the Commission recommended the adoption of the *net* tonnage scale of charge, but gave a surtax of 3 francs, thus raising the tariff to 13 francs a ton, the surtax to be subject to reduction as the traffic increased.

As the charge then being made by the Canal Company rather exceeded 15 francs a ton, M. de Lesseps protested against this decision, and positively refused to allow it to be carried into effect. A display of force, however, being threatened by the Egyptian Government, the Canal Company accepted the inevitable, and with great reluctance proceeded to put the new tariff into operation. Since that time the Canal dues have been gradually still further reduced, and the present rate is 9 francs per register ton for the vessel, and 10 francs additional for every passenger above 12 years of age, and 5 francs for each passenger under 12 years of age; so that such a steamer, as for instance the P. and O. steamer *Himalaya,* with a couple of hundred adult passengers on board, would pay from thirteen to fourteen hundred pounds for passing through the Canal.

The total cost of constructing the Canal has been, from first to last, rather over twenty millions sterling. The original share capital of the Company amounted to £8,000,000 in 400,000 shares of 500 francs. The borrowed capital amounted to another eight millions, and the amount of the indemnity paid by the Egyptian Government in accordance with the award of the Emperor of the French, in 1864, for the relinquishing by the Company of certain privileges under the original concession, amounted to £3,360,000 more, all of which has been expended in the work.

During the time of the construction of the Canal the shareholders received dividends equivalent to 5 per cent., of course paid out of capital; but these payments were to cease, and did cease, when the works were completed, and the Canal opened for traffic. For the first three years after the opening, the earnings of the Canal were not such as to admit of any dividend at all; but in 1874, a dividend at the rate of 25 francs per 500 franc share was paid out of earnings, and since that time the amount of dividend has steadily increased. In 1876, it was 28 fr. 55 c.; in 1878, it was 31 fr. 43 c.; in 1880, 46 fr. 88 c.; in 1882, 81 fr. 22 c.; in 1884, 88 fr. 25 c.; and so it has gone on increasing. The receipts for the year 1893 were £2,826,692; for the year 1894, £2,951,072; and for the year 1895, £3,124,148; and so on.

The English Government, under the administration of Lord Palmerston, had always shown itself exceedingly hostile to the Canal. Lord Beaconsfield adopted a more enlightened policy, and, taking advantage of the improvidence of the Khedive, Ismail Pacha, in 1875, secured for England the shares, to the value of £4,000,000, that had belonged to the Egyptian Government. These shares are now worth £22,627,000; thus, besides making an extremely good investment, Lord Beaconsfield secured for this country a large voice in the management of the Canal—a point in every respect most advisable when it is considered that the Canal is now our high road to India, and that 80 per cent. of the tonnage passing through the Canal sails under the English flag.

The actual amount of tonnage passing through the Canal has been as follows, viz.:—

		Number of vessels.
In 1870	436,609 tons	”
” 1875	2,009,984 ”	”
” 1880	3,057,421 ”	”
” 1885	6,335,753 ”	”
” 1890	6,783,187 ”	3,425
” 1893	7,659,068 ”	3,341
” 1894	8,039,175 ”	3,352
” 1895	8,448,383 ”	3,434

The whole of the British steam traffic with the East is now conducted *viâ* the Suez Canal. Steam has been employed, it is true by the Cape; but it has never been remunerative, because the distances between the coaling stations were such as to make it necessary for steamers to carry coal with them, almost to the exclusion of cargo. The Cape route is, therefore, essentially the sailing route, the Canal the steam.

The distances, in nautical miles, from London to the principal ports in India, China, and Japan, respectively, by the Cape route and *via* the Canal, with the saving effected by the latter route, are thus:—

	Viâ the Suez Canal.	*Viâ* the Cape of Good Hope.	Saving by the Canal.
London to Bombay	6,274	10,719	4,445
" Calcutta	7,974	11,606	3,632
" Hong Kong ...	9,730	13,149	3,419
" Shanghai ...	10,466	13,805	3,339
" Yokohama ...	11,651	14,497	2,846

By a convention, signed on October 29, 1888, the Suez Canal was exempted from blockade, and vessels of all nations, whether armed or not, are to be allowed to pass through it, both in peace and war.

Extracts from the Official Regulations for the Navigation of the Suez Canal.

" *Compagnie Universelle du Canal Maritime de Suez.*

" The transit through the Suez Canal is open to ships of all nationalities, provided that their draught of water does not exceed seven mètres and eighty centimètres (25 ft. 7 ins. English), and that they conform to the following conditions :—

" Sailing vessels above 50 tons are bound to be towed through.

" Steam-vessels may pass through the canal by means of their own steam-power, or may be towed, subject to the conditions hereinafter notified.

" Of course the towage of steamers through the Canal is not compulsory on the Company; it will only be performed in so far as they have disengaged tugs.

" The maximum speed of all ships passing through the Canal is fixed at ten (10) kilomètres, equal to 5⅓ nautical miles, per hour.

" Every vessel of more than 100 tons gross must take on board a pilot of the Company, who will furnish all particulars as to the course to be steered.

" The captain is held responsible for all groundings and accidents of whatsoever kind, resulting from the management and manœuvring of his ship by day or by night.

" Pilots place at the disposal of captains of vessels their experience and practical knowledge of the Canal; but as they cannot be specially acquainted with the defects, or the peculiarities of each steamer and her machinery, in stopping, steering, etc., the responsibility as regards the management of the ship, devolves solely upon the captain.

"When a ship intending to proceed through the Canal shall have dropped anchor either at Port Said or Port Tewfik, the following written information must be handed in by the Captain:—

"Name and nationality of the ship, to be identified by exhibiting the ship's papers relating thereto.
"Name of the captain.
"Names of the owners and charterers.
"Port of sailing.
"Port of destination.
"Draught of water.
"Number of passengers, as shown by the passenger list.
"Statement of crew, as shown by the muster roll and its schedules.
"Capacity of the ship, according to the legal measurement ascertained by producing the special Canal certificate, or the ship's official papers established in conformity with the Rules of the International Tonnage Commission assembled at Constantinople in 1873.

"The Company determine the hour of departure of each ship, and her subsequent stoppages at sidings, in such manner as to give full security for the navigation, as well as to ensure as much as possible the rapid passage of mail steamers.

"Therefore no ship can demand as a right an immediate passage through the Canal, neither will any claim be admitted in connection with any delay originating from the foregoing causes.

"Mail steamers, viz. steamers performing a regular mail service under contract with Government, at fixed dates appointed in advance, and having been duly vouched for as such, shall carry at the foremast head a blue signal with the letter P * cut out in blank in the centre.

"Until further orders, navigation by night-time, by means of the electric light, is authorized for steamers, under the following conditions:—

"Steamers intending to go through the Canal at night must first satisfy the agents of the Company in Port Said, or Port Tewfik, that they are provided—
"1st, Forward, with an electric 'projector' throwing a light 1200 mètres ahead. This projector must be placed as near as possible to the water-line;
"2nd, With an electric lamp and shade suspended above the upper deck, and powerful enough to light up a circular area of about 200 mètres diameter.

"Navigation by night-time for steamers unprovided with electric light is only authorized under exceptional circumstances, the captain accepting full responsibility in writing, for any delay, mishap, and damages that might happen to his own ship, as well as for any similar accidents he might cause to other ships in transit, or to the Company's craft and plant happening to be in the Canal.

"Navigation by night is entirely forbidden to sailing-ships and boats.

"The net tonnage resulting from the system of measurement laid down by

* Poste.

the International Commission of Constantinople, and inscribed on the special certificates issued by the competent authorities, or on the ship's official papers, is the basis for levying the special navigation due, which is at present *nine francs* (9 fr.).*

"Until further orders, ships in ballast will be allowed a reduction of 2 francs 50 centimes per ton on the tariff for transit.

"The charge of ten francs (10 fr.) per passenger above twelve years of age, or of five francs (5 fr.) per passenger from three to twelve years old, as well as the transit dues, must be prepaid on entering the Canal at Port Said, or Port Tewfik.

"The charges for towage in the Canal by the Company's tug service, are fixed as follows:—

"For sailing-vessels of 400 tons and under, 1200 francs; for sailing-vessels above 400 tons, 1200 francs for the first 400 tons, and 2 fr. 50 centimes for every ton above that amount.

"For steamers measuring above 400 tons, 2 francs per ton, without any distinction, upon their whole tonnage; but on the condition that they use their propelling power, or keep it in readiness for assisting the tug.

"Steamers under 400 tons, and also steamers not intending to give the assistance of their propelling power, will pay the same as sailing-vessels.

"(*Signed*) FERDINAND DE LESSEPS,
"*President-Director*.

"Paris, September 6, 1882."

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* Thus the toll for passing through the Canal is 7*s*. 2*d*. per ton, with an additional charge of ten francs a passenger; so that a two-thousand-ton steamer, with a hundred passengers on board, would pay rather over £750.

CHAPTER XXV.

Lighthouses—Ancient lighthouses—The Colossus of Rhodes—The Pharos of Alexandria—Roman Pharos at Dover—At Boulogne—The Tour de Corduan—Rock lighthouses—The Eddystone—The Bell Rock—The Skerryvore—The lighthouse on the Wolf Rock—Force of the waves at exposed lighthouses—The Bishop Rock, Scilly—Pile lighthouses—The Maplin—Shore lighthouses—The North Foreland—Coal fires.

Any account of the Mercantile Marine of England would be incomplete without some reference to the means taken to light our coasts, and a short description of the lighthouse, and the lightship, whose friendly rays warn the passing mariner of peril, or guide him on his way, cannot fail to be of interest.

But little is known of the lighthouses of a remote antiquity, the probability being that, with possibly a very few exceptions, before the Christian era no lighthouses existed. At all events, of two only have we any particulars at all, and of these two our knowledge is extremely meagre. Three hundred years before Christ, Chares, the disciple of Lysippus, constructed the celebrated brazen statue known as the Colossus of Rhodes, which stood at the entrance of the harbour. Its height seems to have exceeded a hundred feet, and it is said to have borne a light; but whether it could be considered as in any sense a lighthouse, would seem to be extremely problematical.

Rather more, however, is known of the celebrated Pharos of Alexandria, which was regarded by the ancients as one of the wonders of the world. It was built by Ptolemy Philadelphus, about 300 B.C., and it is recorded by Strabo that the architect, Sostratus, having first cut his own name on the solid walls of the building, covered the inscription over with plaster, and then, in obedience to the command of Ptolemy, caused the following inscription to be made on the plaster: "King Ptolemy to the Gods, the Saviours, for the benefit of sailors."

If this were so, it would seem to point clearly to the destination of the tower, which is said to have been square on plan, consisting of many stories, diminishing upwards; and whose height has been given as five hundred feet. This latter statement, however, is open to great doubts, but the name of the building, taken from the island of Pharos, upon which it was built, has ever since been applied to buildings designed for lighthouse purposes.* A fire is said to have been kept perpetually burning upon the summit of the tower; and Josephus records that the light of this fire was visible to seamen from a distance of thirty miles.

Upon the heights at Dover are the remains of a building sometimes known as Cæsar's Tower. It stands within the precincts of the Castle, adjoining the ancient church, and is octagonal in shape, the walls being constructed of flint and stone, with occasional courses of Roman tiles. The present upper story is of more recent date than the rest, but the lower and original part was undoubtedly built prior to the year 53 A.D., and it is still known as the "Pharos." Upon the opposite coast, at Boulogne, the foundations still remain, in Roman brickwork, of the ancient Tour d'Odre, said to have been built by Caligula. Both this tower and the tower at Dover are conjectured, with a large amount of certainty, to have been erected as lighthouses, and the Tour d'Odre is believed to have been the earliest lighthouse in northern waters. It is said to have been of octagonal form, twenty-five feet in breadth, and, like the Pharos of Alexandria, to have possessed several stories, diminishing upwards, whilst upon the top a fire is said to have been kindled every evening at sunset, to serve as a beacon for the guidance of mariners. Pennant describes the remains of another Roman pharos near Holywell, in Flintshire; and there are the remains of two others, one at Flamborough Head and the other on St. Catherine's down, at the southern extremity of the Isle of Wight.

After the termination of the Roman occupation of Britain,

* As, for example, in *le phare*, the French for lighthouse; pharology, &c.

all through the Middle Ages, the coasts, certainly of this country, and most probably of all other countries, were left in darkness during the long hours of the night; the first lighthouse of more modern days being the Tour de Corduan, which is situate at the mouth of the river Gironde, and which still serves as a guide to the shipping of Bordeaux. This lighthouse was begun in the year 1584, but was not completed until 1610, at the close of the reign of Henri IV., the building, which was a handsome structure, being 197 feet in height. The light, as first shown, was obtained by burning billets of oak in an iron brazier on the top of the tower; and the first improvement effected was the substitution of a coal fire for the wood. Later on an inverted cone of metal was placed over the fire, in order to throw the rays of light downwards, but without much success; and in 1780, M. Lenoir was employed to substitute for the fire, argand lamps and reflectors, which, in their turn, in 1822, were displaced by the more modern dioptric apparatus.*

One of the most celebrated of English lighthouses, and one of the oldest, is the Eddystone, erected on a reef of rocks about nine miles and a half from Ram Head, on the Cornish coast. The Eddystone rocks were extremely dangerous, lying, as they do, in the fair way of vessels, and particularly of vessels going into or coming out of Plymouth; and what rendered these rocks the more dangerous was the fact that deep water—thirty and thirty-one fathoms—is found right up to the reef itself. In consequence, then, of the many wrecks that had occurred on these rocks, it was determined, towards the close of the seventeenth century, to erect a lighthouse on the Eddystone, and in 1696, a wooden tower was commenced by a Mr. Winstanley, and in November, 1698, the light was exhibited for the first time. The design of the tower, although picturesque, was totally unfitted for a situation so exposed as the Eddystone, and it was soon found that the heavy seas that came rolling in from the Altantic under a westerly gale, were very much more formidable than had been anticipated, the

* This lighthouse at the present day shows a fixed dioptric light, showing a bright light over a certain arc, visible 21 miles; red over another arc, visible 17 miles; and green over a third arc, visible 16 miles.

THE EDDYSTONE LIGHTHOUSE.

[To face page 320.

lantern, which was sixty feet above the rock, being at such times entirely overwhelmed with the sea and spray. Mr. Winstanley, therefore, set to work to strengthen the structure, and to raise it to a height of 120 feet. In November, 1703, some further repairs being needed, Mr. Winstanley, accompanied by his workmen, went to the lighthouse to carry them out, but on the night of the 26th of November a furious storm raged in the Channel, and on the following morning not a vestige of the lighthouse remained,—Mr. Winstanley, his work-people, and the lightkeepers having all perished.

The want of a light on the Eddystone soon made itself again felt in the total loss of the *Winchelsea*, man-of-war, with the greater part of her crew, in 1704. Two years, however, elapsed after this event before the Trinity House could obtain a new Act of Parliament to so extend their powers as to enable them to commence the construction of another building, and it was not until July, 1706, that the new lighthouse was begun, under the direction of Mr. John Rudyard. Unlike Winstanley's tower, it possessed no architectural embellishments whatever; but was a solid, sensible, and business-like structure. It, like Winstanley's lighthouse, was built of wood, and was circular from the base to the lantern, which was placed at a height of 92 feet above the rock, the diameter of the tower being 23 feet at the base. On the 28th of July, 1708, the new light was shown for the first time, and it continued to be regularly exhibited until the year 1755, when, after standing for forty-seven years, the whole fabric was destroyed by fire; otherwise there is no reason why it should not have stood for a very much longer period.

So valuable had a light upon the Eddystone proved to have been that it was determined at once to rebuild the lighthouse, and Mr. Smeaton was entrusted with the work. On the 5th of April, 1756, he first landed on the rock, and the preliminary works were commenced. The first stone was laid on the 12th of June, 1757, and the building was completed in August, 1759. In order to secure the solidity of his structure, Smeaton dove-tailed the lower courses of the stone of which the lighthouse was built into the live rock itself; and then the stones of each succeeding course were dove-tailed, not only into the adjacent stones on either side, but also into the stones above and below them, so that the whole tower was almost as though it had been constructed out of one solid block.

The masonry was 76 feet 6 inches, and the top of the lantern 93 feet, above the foundation, and consequently the light was over 100 feet from the water. The tower was 26 feet in diameter at the level of the first entire course, and 15 feet just under the cornice. Although the lighthouse was carried up to so great a height, yet during severe storms green water and spray would fly right over the top of the lantern. The light was first exhibited on the 16th of October, 1759, the lantern being then lighted with a chandelier of twenty-four wax candles, five of which candles weighed two pounds; but in 1807, when, upon the expiry of a long lease, the property of this lighthouse again came into the hands of the Trinity House, oil lamps with argand burners, fitted with parabolic reflectors of silvered copper, were substituted for the original chandelier of candles.

This lighthouse, which has always been considered as one of the finest examples of engineering skill of modern times, stood uninjured through every storm for more than a hundred years; and would probably have stood for a hundred more, had not the rock itself upon which it was built, become gradually undermined by the sea, thus threatening the destruction of the building. Smeaton's lighthouse has, in consequence, been recently taken down and replaced by a new one in many respects the counterpart of its predecessor, but of greater height, whilst the lighting arrangements have been brought up to the requirements of modern times. The new Eddystone, instead of the old fixed light, is now fitted with a powerful dioptric apparatus showing two quick flashes every half-minute, visible for 17 miles; whilst, from a chamber at a lower level in the lighthouse, a fixed bright light is shown over Hand Deeps.

The new Eddystone lighthouse, like the old one, is built of grey granite; but many lighthouses are, at the present time, painted in various colours in order to render them the more conspicuous, and to distinguish one lighthouse from another. A lighthouse built of stone, from the natural

THE EDDYSTONE LIGHTHOUSE BY NIGHT.

[*To face page* 322.

effects of the weather, soon begins to look grey, and, if on a rocky coast, is not easily seen; and as lighthouses, besides their use at night, are largely used as marks by day, anything that tends to render them the more conspicuous is of value; the colour of the background against which the lighthouse is usually seen being taken into consideration in determining the particular mode of painting to be adopted.

Another very famous British lighthouse is that erected on the Bell Rock, off the coast of Fifeshire. This rock had always been a source of much danger to mariners, so that at last the Abbots of Aberbrothick, from whose abbey it was distant some twelve miles, caused a float to be moored there, carrying a bell, from whence came the name of the Bell Rock, so celebrated in poetry and in legend.

Among the many bad wrecks that have occurred on the Bell Rock, one of the most disastrous was the total loss of the *York*, 74-gun line-of-battle ship, with the whole of her crew; part of the wreck being afterwards found on the rock, while fragments strewed the adjacent coasts. This terrible calamity induced a certain Captain Brodie, R.N., to set on foot a small subscription, by means of which he erected a wooden beacon on the rock; but his beacon was soon carried away by the sea. He again collected money, and placed a second beacon there, only, however, almost immediately to share the fate of its predecessor.

In 1802, the Commissioners of Northern Lights determined upon the erection of a lighthouse on the rock, as it was extremely dangerous to shipping making the Firth of Forth or the Firth of Tay, and the more so as at spring-tides it was covered to a depth of two fathoms. They therefore applied to Parliament for the necessary powers, and in 1806, obtained an Act authorizing the erection of the light. Various ingenious plans were suggested for overcoming the serious difficulties attending the erection of a lighthouse on an isolated rock twelve miles out at sea, and particularly on a rock that was covered twice a day with twelve feet of water.

After much consideration the designs of Mr. Robert Stevenson, the Engineer to the Lighthouse Board, after being submitted to Mr., afterwards Sir, John Rennie, were at length adopted, and it was determined to erect a tower of masonry similar to Smeaton's tower at the Eddystone. On the 17th of August, 1807, Stevenson commenced the work, and the first stone was laid on the 10th of July, 1808; but he experienced very great difficulties at first from the short time during which the men were able to work at the rock, on those days when they could work at all, whilst on many days nothing whatever could be done. Upon one occasion Stevenson and his workpeople, thirty-one persons in all, were very nearly drowned, the tide having risen much more rapidly than usual, and their attendant boat having, by some means, got adrift.

By October 10th, 1810, the whole of the masonry was completed, and the light was first exhibited from the Bell Rock lighthouse on the night of the 1st of February, 1811.* The tower is 100 feet in height, 42 feet in diameter at the extreme base, and 15 feet in diameter at the top. The entrance door, which is placed 30 feet up from the base, is approached by a strong copper ladder, the tower between the door and the rock being of solid masonry. The total cost of erection was £61,331 9*s.* 2*d.*

Another very celebrated lighthouse is the Skerryvore, on a reef of rocks lying twelve miles to the south-west of the island of Tiree, on the western coast of Scotland. The Skerryvore is a collection of rocks extending for nearly eight miles in a direction from W.S.W. to E.N.E. It has been the scene of numerous shipwrecks, no less than thirty vessels having been lost on this one reef between the years 1800, and 1844. At last the erection of a lighthouse upon these dangerous rocks was determined upon, and Mr. Alan Stevenson was the engineer selected to carry out the arduous task.

The portion of the reef that appeared to offer the best site for the erection of the lighthouse was nearly three miles distant from the main cluster of rocks, and was in a most exposed situation, open to all the force of the tremendous waves of the Atlantic. The rock itself which was selected is composed of a very compact gneiss, worn as smooth as glass

* The character of the light has been much improved of late years. At the present time the light shown from the Bell Rock is a dioptric of the first class, revolving once in a minute, showing bright and red alternately, visible 15 miles.

by the constant action of the sea, whilst at ordinary high water the rock is very nearly covered.

Nothing whatever could be done upon the rocks except the actual fixing of the stones, so that everything needed for the construction of the lighthouse had to be brought as it was wanted. Barracks for the accommodation of the workmen had to be built on the Island of Tiree, and also on the Isle of Mull, where the granite for the tower was quarried. Operations commenced in the summer of 1838, and the first thing that was done was the erection of a wooden staging for the works, and a rough kind of wooden house for the protection of the men when they were compelled through stress of weather to remain at the rock. This was all completed by the autumn, but on the 3rd of November, 1838, a terrific gale carried the whole structure away, and in one night obliterated the incessant work of several months.

As soon, however, as the winter gales were over the work was begun again, and this second wooden house braved the storms for several years after the works were finished, when it was taken down, and removed from the rock, lest its sudden destruction in some storm might injure the new lighthouse. Mr. Stevenson, the engineer, thus graphically describes the scene at the wooden house. He says—

"Perched forty feet above the wave-beaten rock, in this singular abode, with a goodly company of thirty men, I have spent many a weary day and night at those times when the sea prevented any one going down to the rock, anxiously looking for supplies from the shore, and earnestly longing for a change of weather favourable to the recommencement of the works. For miles around nothing could be seen but white foaming breakers, and nothing heard but howling winds and lashing waves. At such seasons much of our time was spent in bed, for there alone we had effectual shelter from the winds and spray, which searched every cranny in the walls of the barrack.

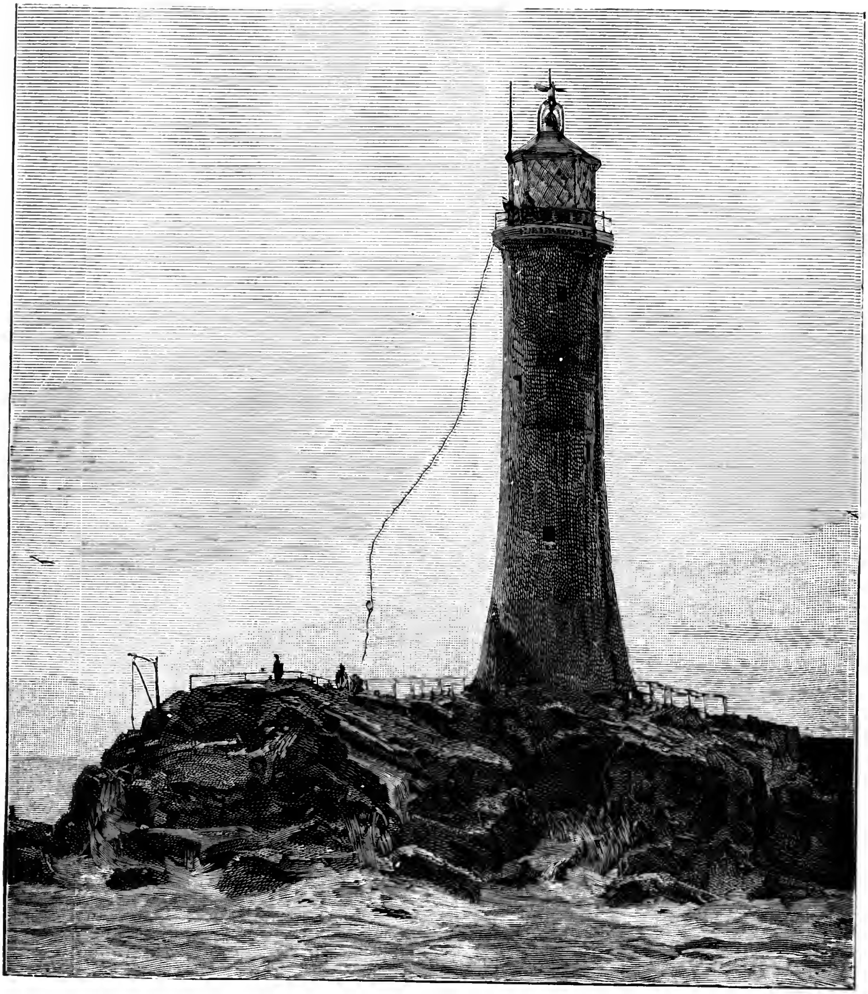
"Our slumbers, too, were at times fearfully interrupted by the sudden pouring of the sea over the roof, the rocking of the house on its pillars, and the spurting of the water through the seams of the doors and windows—symptoms which to one suddenly aroused from sound sleep recalled the appalling fate of the former barrack, which had been engulfed in the foam not twenty yards from our dwelling, and for a moment seemed to summon us to a similar fate. On two occasions in particular, those sensations were so vivid as to cause almost every one to spring out of bed; and some of the men fled from the barrack by a temporary gangway to the more stable, but less comfortable, shelter afforded by the bare walls of the lighthouse tower, then unfinished, where they spent the remainder of the night in darkness, wet, and cold."

The design of the Skerryvore is an adaptation of Smeaton's Eddystone, to the peculiar situation and to the particular circumstances of the case, at the Skerryvore Rocks. The tower is 138 feet 6 inches in height, 42 feet in diameter at the base, and 16 feet at the top. It contains a mass of stonework of about 58,580 cubic feet, or more than double that of the Bell Rock Lighthouse, and nearly five times that contained in the Eddystone. The whole of the works were successfully carried out, and the light was first shown in 1844, the entire cost of the Skerryvore Lighthouse being £86,977 17*s.* 7*d.* The light at the present time is a dioptric of the second class, showing a revolving bright light every minute, visible 18 miles.

Another very fine, and a still more recent lighthouse, is that on the Wolf Rock, off the Land's End, in Cornwall, erected by the Trinity House in 1870, from the designs of Mr. James Douglass. In this lighthouse Smeaton's plan of dove-tailing the adjacent stones was also adopted, each granite stone being dove-tailed not only into its adjacent stones laterally, but also into the stones immediately above and below it, so that the whole when fitted together, and run in with hydraulic cement, was literally one solid mass of masonry. A preliminary survey of the site was made in 1861, and the foundation was commenced in March, 1862. In so exposed a situation as the Wolf, entirely open, as it is, to the Atlantic, the works could only be carried on during the fine weather of the summer months, so that the lighthouse was not entirely completed until July, 1869, the light being shown for the first time in 1870. It is a dioptric of the second class.

Another fine modern lighthouse, more recent still, is the Longships, erected in 1883, upon an isolated rock off the Lands' End, the grey granite tower of which is 117 feet in height. From the lantern is shown a first-class dioptric occulting bright light, visible 16 miles.

The force of the waves that these isolated lighthouses have to contend with is almost incredible. Mr. Stevenson constructed an apparatus that recorded automatically the force of the waves that struck it, and this apparatus, fixed at the Skerryvore Rocks, gave, as the result of five summer months



THE LONGSHIPS LIGHTHOUSE, LAND'S END.

[*To face page* 326.

in 1843, and also in 1844, an average pressure of 611 lbs. to the square foot. The average result for six winter months in the same years was 2086 lbs., the greatest force registered at the Skerryvore being on the 29th of March, 1845, during a strong westerly gale, when a pressure of no less than 6083 lbs. to the square foot was recorded.

In the North Sea, at the Bell Rock, the greatest result obtained was 3013 lbs. per square foot. This lesser force is accounted for by the comparatively narrow space through which the waves in the North Sea have to travel compared with the broad expanse of the Atlantic. But even these results, large as they are, appear to be far less than that found at the Bishop Rock Lighthouse, Scilly, which is probably the most exposed lighthouse in the world. On the 30th of January, 1860, during a heavy gale from the south-west, a wave struck the tower, which shook it to its foundations, and tore away the bell, weighing 3 cwt., from its support at the top of the tower, more than 100 feet above the sea.

Lighthouses are, however, often required in situations where the requisite solid foundation that a rock offers for the construction of a stone tower does not exist, as upon certain sands and shoals, and here a screw-pile lighthouse has been found to be entirely successful. Wrought-iron piles about 6 inches in diameter, having a single turn of a screw some 4 feet across at the bottom, are driven down into the sand from 18 to 25 feet, and upon these piles the lighthouse is erected. One of the first of these iron-pile lighthouses was that erected on the Maplin Sand at the entrance of the Thames, in 1838, and which has stood there ever since. There are nine screw-piles, one at each angle of an octagon, and one in the centre, and on the top of these, about 20 feet from the water, is the light-room, above which, again, is the lantern, the light being 36 feet above high-water mark. It is an occulting red light every half minute, and is visible for 10 miles. There is another similar lighthouse at Mucking Flat, and another at the Chapman Head, both in the Thames, besides others at Queenstown, Belfast, and elsewhere; indeed they are now by no means uncommon, being particularly suitable for the shallow waters of estuaries and the like

—more so, perhaps, than for exposed situations in the open sea.

Previous to the erection of the present noble granite tower on the Bishop Rock, Scilly, one of these iron-pile lighthouses was attempted there. It was completed up to the base of the lantern, when, in the course of a tempestuous night in January, 1850, the whole thing disappeared.

Of course, no such difficulty exists with the erection of lighthouses on the land as is the case in a lighthouse perched on a solitary rock at sea, and many of the earlier examples of land lighthouses were simply ordinary houses with a lantern or some other appliance placed on the roof. A well-known example of this was the North Foreland light, which was instituted during Charles I.'s reign to warn vessels of the proximity of the dreaded Goodwin Sands. It was then an ordinary half-timbered farmhouse with a glass lantern on the roof, from which the light was displayed. This house was burned down in 1683, and soon after that the lower part of the present tower was erected, upon the top of which was an iron grate for burning coals. This coal fire, however, was far from satisfactory, for when there was a strong wind blowing on shore, and when, therefore, the light was most needed, the coals were all black to seaward, whilst to leeward the bars of the grate were almost melting. From the difficulty thus experienced in keeping up a proper and uniform flame in windy weather, in 1732, the top of the tower was covered in with a sort of lantern with large sash windows, and the coal fire was kept burning brightly by means of large bellows, which the lightkeepers blew throughout the night. This, again, was not found to be successful, the lantern was therefore removed, and the open fire restored to its original condition; and this state of things went on until 1790, when the tower was raised to its present height of 70 feet, and lamps with reflectors were substituted for the old coal fire.

These coal fires were nearly universal for lighthouse purposes during the last century, and Smeaton reported favourably of the one used at Spurn Point at the mouth of the Humber, alleging that it could be seen thirty miles off. This, no

ST. CATHERINE'S LIGHTHOUSE, ISLE OF WIGHT.

[To face page 328

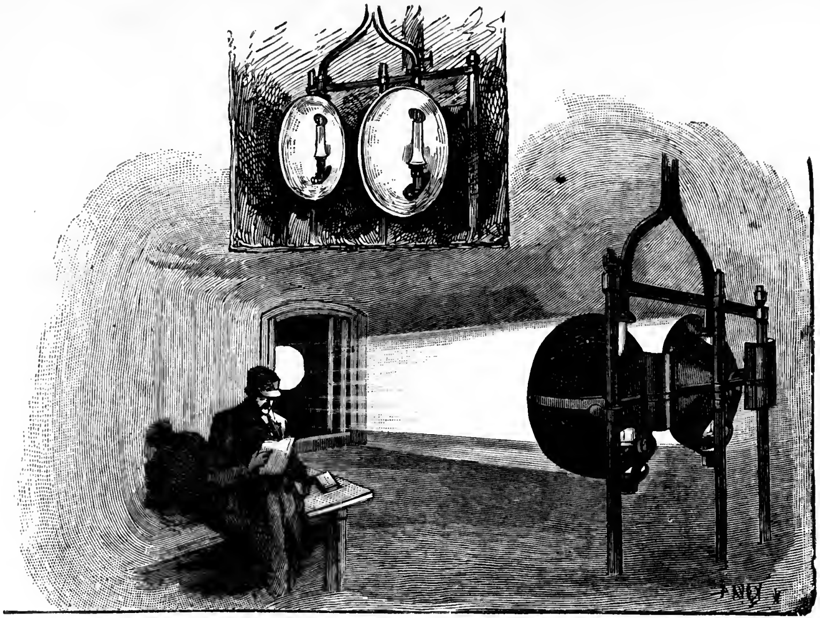
doubt, would sometimes be the case; at other times, doubtless, it would not be seen from five miles off. These coal fires, even if they had been a good means of illumination, which they were not, were, of course, never applicable to an isolated rock lighthouse; no lighthouse of that description being able to afford storage room for the quantity of coal that would be required; to say nothing of the difficulty that would very frequently be experienced by vessels in getting alongside with the requisite supplies. Coal fires, however, were retained at many shore lighthouses until well into this century, the Isle of May Lighthouse, at the entrance of the Firth of Forth, having a coal fire until 1810; the lighthouse at Flat Holm, in the Bristol Channel, having also a coal fire until 1820; and that on St. Bee's Head, Cumberland, until 1823; whilst at certain lighthouses abroad the coal fire was still in use down to 1850.

Wherever it is equally efficacious, a shore lighthouse is always very much to be preferred to an isolated rock lighthouse, not only on account of its being in every way much more accessible, but as the opportunity then exists for the erection of all the numerous subsidiary buildings that are required at a first-class lighthouse; the engine-house in connection with the electric light, the house for the fog-syren, and very much better quarters for the men. As a typical example of such a shore lighthouse, with all its accessory buildings, we give an illustration of the Lighthouse at St. Catherine's Point, at the back of the Isle of Wight. This lighthouse, when viewed from seaward, is seen against a background formed of grass, and trees, and all the verdure of the Undercliff, and is therefore, with all its outbuildings, painted a most dazzling white.

CHAPTER XXVI.

The means of illumination—The catoptric and the dioptric systems—The catoptric system—Primitive reflectors—More recent improvements—Fixed lights—Revolving lights—M. Augustine Frenel—The dioptric system—The French lights—Mr. Stevenson's improvements—The apparatus—The lenses—The lamp—Evidence as to the dioptric system given before the Royal Commission—Distances at which lights are visible —Experiments at the South Foreland—Electric lights—Mineral oil—Gas—Report of the Committee—Control of lights—The Trinity House—Other bodies—Lightships—Their lights—Revolving lights—Flashing lights—The moorings of lightships—Casualties to lightships—Crew of a lightship—Relative visibility of lights—Gongs and sirens—Beacons—Buoys—Bell buoys—Whistling buoys—Gas buoys—Communication between lightships and the shore—Light dues—The different rates—The present mode of collection—Thorough reform needed.

There are two distinct systems employed for the illumination of lighthouses and lightships, one of which is known as the catoptric, or the reflector system, the other as the dioptric, or the lens system. Every ordinary uncontrolled light gives off its rays in every direction, forming a globe, in fact, of which the wick is the centre, the rays of light being horizontal, and from horizontal at all angles, both upwards and downwards, to vertical. Now, for lighthouse purposes it is obvious that all the vertical rays, whether tending upward or downward, are entirely lost and wasted, and it was early seen that to obtain the full effect of a light, and to utilize these vertical rays they must be bent into a horizontal direction. To effect this purpose reflectors were adopted, and the earliest improvement upon the then existing system of lighthouse illumination was the adoption of the catoptric or the reflector system, and the earliest type of reflector was that applied to the Cordouan light in 1727.



REFLECTORS FOR THE LOWER LIGHT OF THE EDDYSTONE.

[*To face page* 330.

The means of illumination at this lighthouse, as was the case at all early lighthouses, was an ordinary coal fire, and for the purpose about two hundredweight of coals were ignited at once, whilst over the fire was placed a roof shaped like a kind of hollow cupola. When M. Bitri, in 1727, was employed to remodel the lantern of this lighthouse, he removed this cupola altogether, and substituted for it an inverted cone whose apex projected downwards over the fire. The cone was covered with bright tin plates, the object being by means of these plates, or reflectors, to bend the rays which would otherwise have gone upward and been lost, into a horizontal direction, and thus materially to intensify the light; but by what means M. Bitri proposed to keep the reflecting plates free from soot, and from tarnishing by the smoke from the fire beneath, is not recorded.

Here, then, was the first rude element of the reflector system, which was soon to be still further developed; and when the coal fire was superseded by lamps, this was effected by placing a polished metal reflector behind the lamp. This polished reflector was shaped to such a parabolic curve as would have the effect of throwing a large number of the rays of light from the lamp all into a horizontal direction, and this system of a lamp in front, with a parabolic reflector behind it, is practically the catoptric system in use for lighthouses at the present day.

Between 1763, and 1777, parabolic reflectors were first used for lighthouse illumination by Mr. Hutchinson, dockmaster of Liverpool. In his work on "Practical Seamanship," published in 1777, he states that the Mersey lights were fitted with reflectors formed of small facets of silvered glass, and made, as he says, "as nearly as they can be to the parabolic curve;" and this is unquestionably the earliest published notice of the use of parabolic reflectors for lighthouse illumination. Of these Mersey reflectors the smallest were three feet in diameter, the largest twelve feet. The smallest were made of tin plates soldered together; the largest were made of wood covered with plates of looking-glass.

In 1786, the catoptric system was adopted in Scottish lighthouses, the reflectors here being first moulded in plaster, and afterwards filled in with facets of looking-glass; but they were not considered as very satisfactory, and these primitive reflectors about the end of the last century gave place to reflectors of silver-plated copper formed to the parabolic shape by hand-hammering, burnishing, and polishing; and the first Scottish lighthouse to be fitted with these improved reflectors was the Inchkeith Lighthouse, in the Firth of Forth.

Up to 1782, the wicks of the lamps used were of a flat form, but in that year M. Argand, of Geneva, introduced wicks and burners of a hollow cylindrical form which admitted a central current of air through the burner, so as to ignite the cone of gas issuing from the wick both within and without, these having ever since been known as "Argand" burners. Count Rumford afterwards improved on Argand's invention by making several concentric rings of wick; and in more recent times, since the introduction of the use of paraffin for the lamps, the number of concentric wicks has been increased to five, six, or even more.

The reflectors at present used by the Trinity House for lighthouse purposes are known as Huddart's reflectors; they are made of copper silvered, those used for shore-lights being 21 inches in diameter, having a total reflecting surface of 518·6 inches, and costing £31 10*s.* each. Those used for the Scottish lighthouses are 24 inches in diameter, and cost £43 each. Fitted with Argand burners an inch in diameter, their power is equal to about 450 times that of the unassisted flame.

By the reflector system, where a fixed light has to be shown all round the horizon, a number of lamps and reflectors are placed round the outside of a stationary chandelier, twenty-four or twenty-five being usually required, and by this means a number of beams of light of nearly uniform intensity are sent out. By arranging a number of the lamps and reflectors on a frame having three or more sides, and each side being fitted with from one up to as many as ten reflectors, by giving the frame a horizontal circular motion by machinery a *revolving light* is obtained. As the faces of the frame come round a beam of light sweeps the horizon, succeeded by an interval of darkness, depending on the rate of revolution,

PUMPS FOR FORCING THE OIL UP TO THE LAMPS AT THE
EDDYSTONE LIGHTHOUSE.

[*To face page* 332.

until the next face, with its set of lamps and reflectors, comes into view.

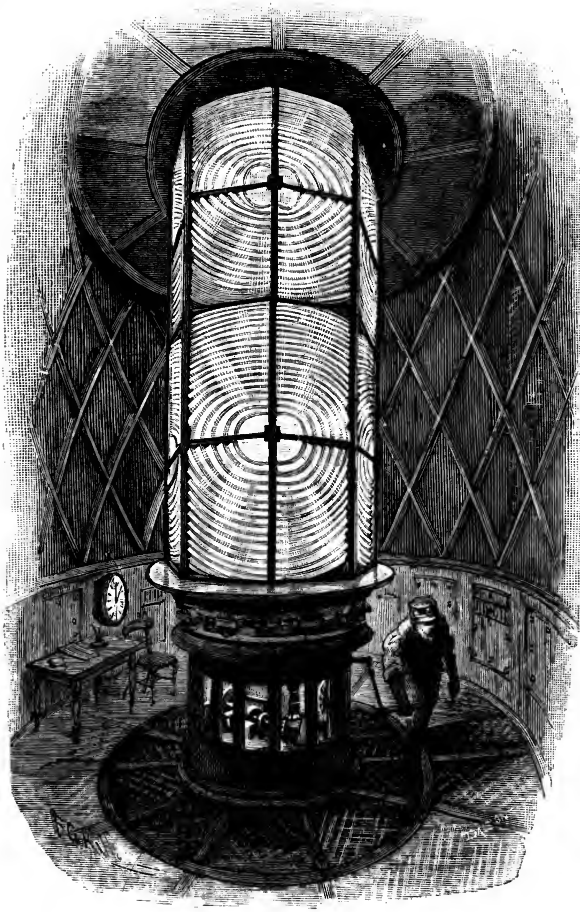
The brilliancy of the rays issuing from the reflector is stronger in the direction of the axis—that is to say, when viewed directly in front of the lamp—than it is when viewed obliquely, and for this reason: when a ship is passing a fixed catoptric light the brilliancy of the light will vary, it becoming brighter when the ship gets into the direct line of the axis of the reflector, and less bright as she passes out of that line, becoming brighter again as she gets into the line of the next lamp, and so on. This, however, is not altogether a disadvantage, as it enables the sailor to distinguish the light from a dioptric light, which is equally brilliant from whatever point it is seen, and so in certain cases it enables him to distinguish one fixed light from another; but in consequence of the increasing power and brilliancy of ships' lights at the present day, fixed lights for lighthouses are gradually being altogether discarded in favour of revolving, or flashing lights, both the latter being more readily identified than the ordinary fixed lights.

Beginning about the year 1820, M. Augustine Fresnel, the eminent French mathematician, entirely revolutionized the previously existing lighthouse system by means of his annular lenses, cylindric refractors, and totally reflecting prisms. In all lighthouses prior to 1822, the mode of getting up the required power was by employing a sufficient number of separate reflectors, each of which required its own separate lamp—that is to say, the catoptric system. Instead, however, of these numerous independent lamps and reflectors, M. Fresnel used a single central lamp which had four concentric wicks, and was fed with oil by a pump worked by clockwork. Surrounding this central lamp was a stationary cylindrical glass refractor, whilst above and below it were rings of totally reflecting prisms, the lamp being thus enclosed, as it were, in a kind of glass cage, and this beautiful instrument continues in use for dioptric lights to the present day.

The number of lighthouses on the French side of the Channel previous to M. Fresnel's invention was very much smaller than the number of lights on the English side; but no sooner was the undoubted success of the new method established than the French Government determined upon one grand uniform system of lighting the French coasts, and upon adopting for that purpose M. Fresnel's dioptric apparatus.* The new mode of lighting used in the French lighthouses soon attracted the attention of Mr. Robert Stevenson, and in 1824, Mr. Stevenson was commissioned by the Scottish Lighthouse Board to visit the various French lighthouses where the new system, then known as "the French system," was in operation, and to report as to its efficiency. Mr. Stevenson's report was considered so satisfactory that the Board determined at once to make a trial of it at the Isle of May light, in the Firth of Forth, and the light of the new description was first shown in October, 1825.

Mr. Stevenson, in introducing the new dioptric system for British lights, effected certain improvements upon what he had seen in France. Owing to certain difficulties in construction, M. Fresnel adopted a polygonal instead of a cylindrical form for his refractor, but Mr. Stevenson succeeded in getting Messrs. Cookson, of Newcastle, to construct a first-order refractor of a truly cylindric form. In forming a refracting instead of a reflecting instrument, to obtain a lens of such magnitude as would be required out of one piece of glass would be hardly possible, and if it were possible, the necessary thickness of the glass would greatly obstruct the light, and the whole merit of M. Fresnel's invention, and Mr. Stevenson's improvements upon it, consists in building up the glass refractor of separate rings of glass. The light thus obtained is found

* Here it may incidentally be remarked that, as a whole, the French lighthouse system is distinctly superior to the British system. We have many lights on our side that are quite equal to any on the other side of the Channel; but the whole of the French lights are uniformly excellent; and the merit of their system is particularly obvious in their smaller, subsidiary lights, as, for instance, harbour lights and the like. All lights, great and small, are in France under the control of a department of the Ministry of Public Works, and a special commission called "La Commission des Phares," consisting of naval officers, marine engineers, hydrographers, members of scientific bodies, and other gentlemen distinguished in various branches of science, deals with all matters connected with the lights. As a consequence, besides the great and important lighthouses, pier lights, harbour lights, tidal lights, and all the rest, in France are excellent.



THE DIOPTRIC APPARATUS AT THE EDDYSTONE.

[*To face page* 334.

by experiment to be equal to that afforded by nine common reflectors; and it is calculated that by a consumption of oil equal to that of seventeen common Argand lamps with reflectors, an effect is produced equal to that of thirty such lamps and reflectors, or very nearly double the amount of light.

The oil-lamp commonly used for this system of illumination has four concentric wicks of the respective diameters of 0·857, 1·69, 2·52, and 3·39 inches, and consumes a pint of oil an hour. A first-order fixed dioptric apparatus is about 6 feet in diameter, and 12 feet high. It consists of the central belt of refractors forming a hollow glass cylinder 6 feet in diameter and 30 inches high; below it are six triangular rings of glass ranged in a cylindrical form, and above it a crown of thirteen rings of glass, forming by their union a hollow cage composed of polished glass twelve feet high and six feet across.

A first-order lenticular apparatus of this description, with light-room and lantern, costs from £2500 to £3000, the cost of the lenses alone being from £1300 to £1550. A sixth-order, or smallest size of harbour lens light, is 11¾ inches in diameter, and costs £70.

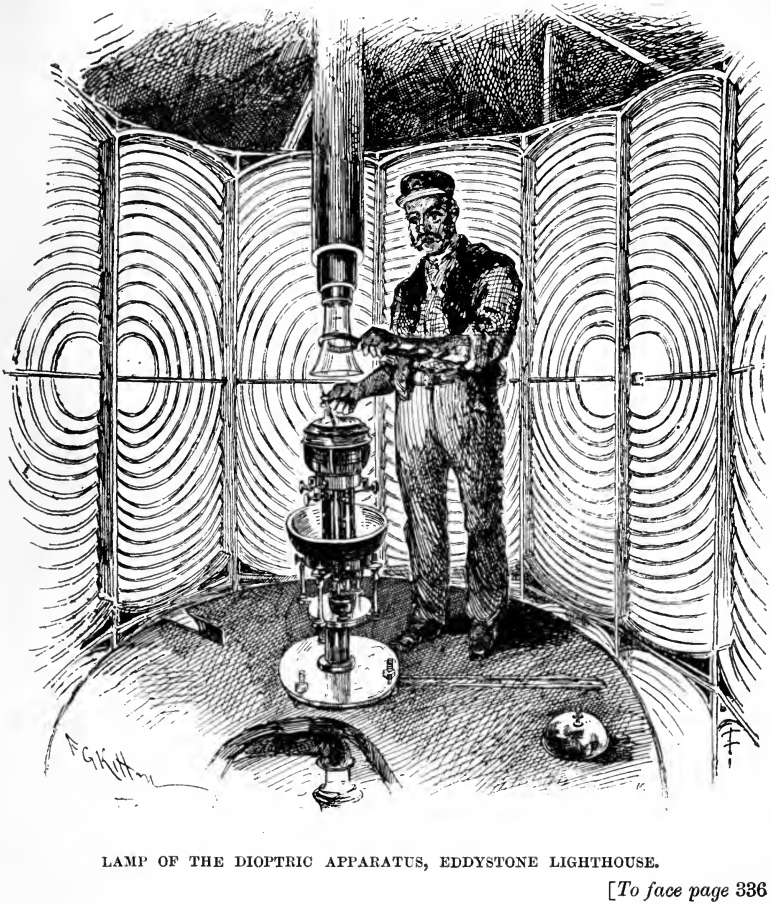
But ever since the introduction of the dioptric system, it has been a moot point with many as to whether the advantages are so greatly on its side as has been asserted, and the question cannot be said to be absolutely determined even at the present day. The matter was the subject of a Royal Commission in 1860, and in the Report of the Commission, issued in March, 1861, they say—

"It has been generally assumed that the dioptric is preferable to the catoptric system; but while your Commissioners do not controvert this opinion, they have conclusive evidence that many of the catoptric lights of England are not only excellent in themselves, but exceed in efficiency the dioptric lights on its shores. The first part of Question 7, of Circular VIII., addressed to mariners, runs thus: 'What British light have you usually seen farthest off?' Out of the 579 witnesses who have answered this question, the greatest *distances* are mentioned with reference to the lights at Lundy Island, the Calf of Man, Tuskar, Flamborough Head, Beachy Head, and Cromer; and the greatest *number* of witnesses mention Lundy Island, the Lizard, Flamborough Head, Beachy Head, the Start, and the South Stack, all of which are catoptric revolving lights, with the exception of the Lizard, which is catoptric fixed, and Lundy and the Start, which are dioptric revolving."

The distance at which the principal lights are visible is generally only limited by the horizon; and many lights, if only a sufficient elevation could be obtained from whence to view them, would probably be visible for a hundred miles, or even more. During the work on the trigonometrical survey of England, a Bude light on the top of Lincoln Minster was found to be distinctly visible from Snowdon, which was over a range of a hundred and fifty miles as the crow flies. Obviously the higher the light the further will it be seen; but there are certain disadvantages as far as nautical purposes are concerned connected with its being placed at too great an altitude, as it is then apt to be obscured by low clouds and sea mists, and for this reason many lights that were formerly high up have been since brought down nearer to the sea-level. Both the Needles light, and the light at St. Catherine's Point, at the southern extremity of the Isle of Wight, were formerly on the tops of the downs some 500 feet above the sea; both now are brought down, the one to 80 feet, and the other to 134 feet above high-water mark, the one at its present lower elevation being visible for 14 miles, and the other for 20 miles.

The oils used for lighthouse purposes have been of all kinds—lard, seal, spermaceti, rape or colza, olive, cocoanut, and more rarely hemp-seed. Until recently colza oil was very largely used, but now paraffin has almost entirely superseded it, giving not only a more brilliant light, but having the additional advantage of being very much cheaper.

Of late years, since 1887, the lanterns of the most modern light-vessels have been lit with heavy mineral oil, with a flashing-point of about two hundred and thirty degrees Fahrenheit, so that an explosion from spilt oil caused by the rolling of the lightship is not at all likely to occur, although there might, perhaps, be some danger in the use of light mineral oil flashing as low as one hundred and fifteen. The economy effected by the use of paraffin is indeed considerable. Until about 1840, sperm oil was in use, which cost from 5*s.* to 8*s.* per gallon. Next, rape oil was adopted at 3*s.* 8*d.* per gallon, and although the price of this oil nowadays has fallen as low as 1*s.* 8*d.* a gallon, yet when the heavy mineral oil can be



LAMP OF THE DIOPTRIC APPARATUS, EDDYSTONE LIGHTHOUSE.

[*To face page* 336

obtained for only 4½*d.* per gallon, the saving to be effected, when one lightship lantern alone can consume six hundred gallons in the course of a year, is well worthy of consideration.

Much difference of opinion has existed as to what was really the best illuminant for lighthouses, and during the years 1884, and 1885, a number of experiments were conducted by the Trinity House at the South Foreland, with a view to testing the relative merits of electricity, gas, and mineral oil, and in August, 1885, the Special Committee presented their Report to the Government, it being soon after printed and circulated as a Parliamentary paper.

The experiments, which were conducted in three temporary wooden towers, marked respectively A, B, and C, erected at the South Foreland, covered a wide area of contingencies such as fine clear weather, hazy weather, fog, and dense fog; and the conclusions arrived at established the fact that in the worst weather—that is, viewed from a lighthouse point of view—namely, dense fog, all lights are equally useless to navigators, the electric light being visible, perhaps, a few hundred yards or so further than either gas or oil, but not more.

The Committee agreed—

"that the *electric light* must take the first place in the rank of lighthouse illuminants during clear weather, and that for first-class points of coast lighting nothing can be more desirable, if expense be no consideration. Its range, definition, and where a distinctive character is employed, as for group-flashing, its unmistakable superiority to all other modes of illumination betoken its excellence and pre-eminence. A curious result, however, elicited by the experiments has established the fact that one electric light is equally effective with two or even three electric lights superposed, whereas with the gas or oil lights, the advantage of two or more superposed lights is an increase of power proportionate to the number of lamps employed. The definition of any area, with the electric light, is so exact that at a moderate distance a man may, without changing his position, move his head so as to be in full glare, or in perfect darkness, or in a red ray or a bright* ray, as the case may be.

"The *mineral oil light* in these trials fully justified the confidence reposed in it by the Trinity House Authorities after many years' experience, as at once

* By a *bright* light is meant a white or ordinary light, in contradistinction to a red light or a green light.

the most serviceable illuminant, the most economical, the safest, and the easiest for storage, and a light that is equally available for rock, floating, or coast light-stations. The lamp in which this material is used has been so perfected by Sir James Douglass, the Engineer to the Trinity House, as to be equal to the electric and gas lights in its capability of increase of power to adapt it to the varying atmospheric conditions. The Trinity House oil lamp possesses concentric rings of wicks, from three up to nine in number, giving a high power of perfect combustion, upon which the brilliancy of the light depends.

"The *gas light*, as adopted by the Irish Lighthouse Board in several stations upon the coast of Ireland proved very satisfactory as to its brilliancy, but the system is open to certain objections. The expense of installation and continued production place it between the electric light and oil in point of cost. Its employment is impracticable upon rock, or floating stations; and n coast stations the very great heat emitted in the light-room, often resulting in the fracture of the lenses, and inconvenience to the attendants, materially restricts its use. Its effective power is quite equalled by the mineral oil, at a much less cost, and with entire freedom from the objections above stated."

The Official Report concludes thus:—

"Finally, your Committee beg thus to sum up their opinion in regard to the relative merits of electricity, gas, and oil as lighthouse illuminants—

"1. That the electric light, as exhibited in the A experimental tower at the South Foreland has proved to be the most powerful light under all conditions of weather, and to have the greatest penetrative power in fog.

"2. That for all practical purposes the gas light, as exemplified by Mr. Wigham's multiform system in B experimental tower, and the oil light, as exemplified by the Trinity House Douglass six-wick burners in multiform arrangement up to triform in C experimental tower, when shown through revolving lenses are equal, light for light, in all conditions of weather; but that the quadriform gas is a little better than the triform oil.

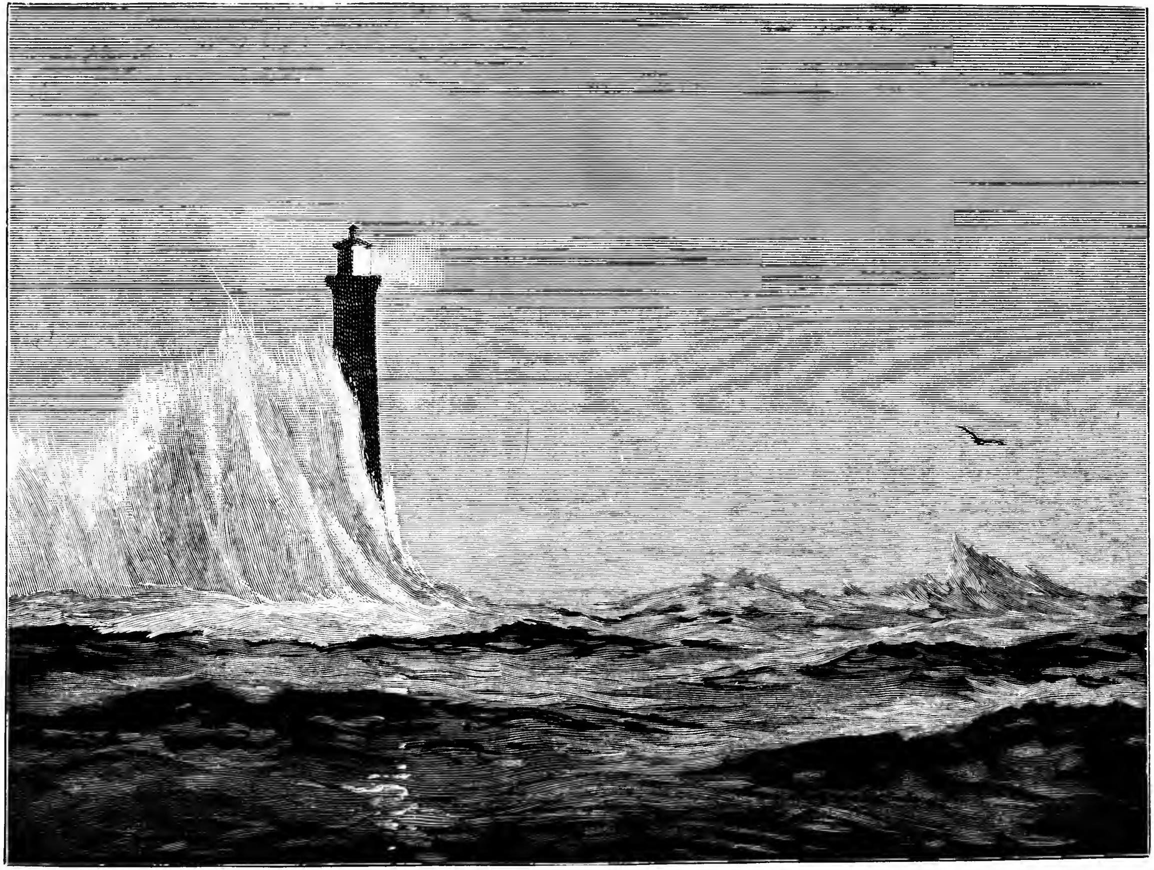
"3. That when shown through fixed lenses, as arranged in the experimental towers, the superiority of the superposed gas light is unquestionable. The larger diameter of the gas flames, and the lights being much nearer together in the gas-lantern, give the beam a more compact and intense appearance than that issuing from the more widely separated oil-burners.

"4. That for lighthouse illumination with gas, the Douglass patent gas-burners are much more efficient than the Wigham gas-burners.

"5. That for the ordinary necessities of lighthouse illumination, mineral oil is the most suitable and economical illuminant, and that for salient headlands, important landfalls, and places where a powerful light is required, electricity offers the greatest advantages.

"**Trinity House, London, August 7, 1885.**"

Where the electric light is adopted, in order to prevent at any time the possibility of a breakdown, everything is in



THE NEEDLES LIGHTHOUSE.

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duplicate—two steam-engines, two dynamos, and two sets of lamps; whilst this also affords the opportunity, by using simultaneously both sets of machinery, of duplicating the power of the light in exceptional weather, although, according to the above report, it would now appear that two electric lights are no better than one.

In Great Britain there are many bodies having control of the lighthouse system, but the first and the greatest body exercising such control is the ancient Corporation of the Trinity House, of Deptford Strond, which was originally founded by Stephen Langton, Archbishop of Canterbury, in the reign of King John. The custom of wrecking and pillaging vessels had been carried to such a length that Stephen Langton determined, if possible, to put a stop to it, and he accordingly organized in London a Corporation of

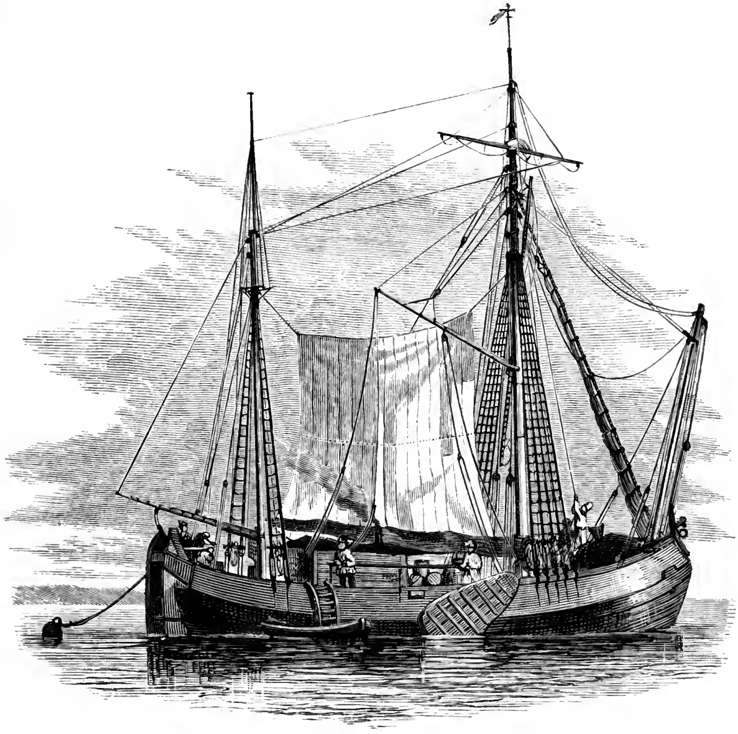
"godly disposed men who, for the actual suppression of evil disposed persons bringing ships to destruction by the shewing forth of false beacons, do bind themselves together in the love of our Lord Christ, in the name of the Masters and Fellows of Trinity Guild, to succour from the dangers of the sea all who are beset upon the coasts of England, to feed them when ahungered and athirst, to bind up their wounds, and to build and light proper beacons for the guidance of mariners."

This guild continued for many centuries, subsequent sovereigns confirming its rights, and granting it additional powers. The same guild was in existence in the reign of Henry VII. as a "respectable Company of Mariners in the College of Deptford," having authority to prosecute persons who should destroy sea-marks, etc., and Henry VIII., in the sixth year of his reign, May 20, 1514, continued their powers, and formed them into a perpetual corporation by the style and title of the "Master, Wardens, and Assistants of the Guild or Fraternity of the Most Glorious and Undivided Trinity, and of St. Clement, in the Parish of Deptford Strond, in the County of Kent."

This Charter was confirmed by Edward VI., Mary, Elizabeth, and James I. It was revoked by Oliver Cromwell in 1647, but was renewed by Charles II. on the Restoration, and so continues to this day. The interests which the Trinity Corporation represented having, however, by the great extension of commerce grown in subsequent years into great magnitude, the Government have at different times interfered, and have altered some of its privileges, notably in 1854, when the Board of Trade partook of the supervision of the lights.

In Scotland the lights are under the control of the Commissioners of Northern Lighthouses, who were incorporated by Act of Parliament of the 38th George III. c. 58; and in Ireland the Ballast Board of Dublin exercises this control. Besides these three greater bodies numerous local authorities deal with local lights, as for instance the Liverpool Board, the Trinity House of Newcastle, the Trinity House of Hull, and various municipal bodies; altogether in Great Britain and Ireland there being no less than 174 different authorities who direct certain of the lights, with the result that many of our smaller lights are of a very inferior description, in some instances merely an ordinary gas light with a coloured pane of glass placed in front of it. The whole of these lesser authorities, however, are to a large extent controlled by the Trinity House, insomuch that no municipal body, for instance, can place a new light, or alter the character of an existing one, without first obtaining the sanction of the Trinity House.

There are many places round the coast where a light is exceedingly requisite, but where, for many reasons, the erection of a stone, or even of an iron pile lighthouse, would be a difficult and therefore a costly operation, and here a lightship has been found satisfactorily to meet the requirement. A lightship, however, can never equal a fixed lighthouse, from the fact that its floating character must always preclude the use of the more delicate apparatus always possible in a firm and solid structure; and, moreover, a lightship is, apart from its first cost, a very much more expensive means of illumination than a lighthouse. The average first cost of an English lightship is from £4000 to £6000, but even £12,000 would not be considered an extravagant outlay for some of the more important lightships, whilst from £1500 to £2000 has been spent upon a fog-syren and its gear alone. Then, again, the annual cost of the maintenance of the lightship is from three



A DUTCH GALLIOT.

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to four times that of the lighthouse. Three men are sufficient for a rock lighthouse—a lightship requires eleven men. The annual cost of maintenance of a first-class lighthouse in England is from £265 to £340; in Scotland, £380; and in Ireland from £400 to £490. The annual cost of maintenance for a lightship is in England from £1100 to £1200; and in Ireland from £1200 to £1350.

Dutch vessels, the fishing schuyt and the sturdy galliot, have ever been celebrated for riding safely in foul weather, and particularly for riding safely when at anchor; and it was for this reason that in the last century Dutch galliots were frequently purchased for conversion into lightships, and even at the present day the lines of the most scientifically designed light-vessels are still founded on those adopted by the Dutch shipbuilders of two hundred years ago.

In the last century the Trinity House owned but five light-vessels—the *Nore*, the *Dudgeon*, the *Owers*, the *Newarp*, and the *Goodwin*. At the present time this country possesses in all sixty-two lightships, and Ireland eleven; and out of this number sixteen are placed around the mouth of the Thames, and seven are in the estuary of the Mersey; the oldest lightship on the British coasts, and probably the oldest lightship in the world, being the *Nore* light at the entrance of the Thames, a light-vessel having been first placed here in 1732.

All the light-vessels belonging to the Trinity House are painted a dull red, and have their names, as the *Nore*, the *Gull*, or the *Mouse*, painted in white letters on the side; on the Irish coasts the lightships are painted black, with a white ribbon. All light-vessels show a bright riding-light on the fore-stay at a height of six feet above the rail, to show the direction in which they are riding.

In spite, however, of the fact that some of the modes of illumination that are adopted in the fixed lighthouse ashore, cannot be made available in the case of the light-vessel afloat, yet every means is taken to render the light-vessels thoroughly efficient, and out of the seventy-three lightships around the coasts of Great Britain and Ireland, sixty show either revolving or flashing lights. The reflector system is invariably adopted for lightships, the parabolic reflectors being similar to those in the lighthouses, but smaller, being only 12 inches in diameter. For fixed lights eight lamps and reflectors are generally used, one lamp occupying each angle of the octagon-shaped lantern; for revolving lights, the number of lamps varies from four to eight, the lamps being all hung on gimbals to ensure their preserving a vertical position during the rolling of the vessel. In occulting lights, instead of the lantern itself revolving, a shade or "eclipser" is passed in front of the lamps. In the case of an ordinary revolving light, when viewed from a distance, the light begins faintly, increasing in brilliancy until it reaches its brightest, and then as gradually declining. This arises from the gradual revolution of the lamps allowing the light to be seen before the actual line of axis of the light is presented to the spectator. In the case of occulting lights, where the "eclipser," or shade, is suddenly passed across the lamps, the flash of light is shown instantaneously, and as instantaneously extinguished. The flickering of the light when seen from a distance, caused by the interposition of waves, is perhaps more apparent in the case of a light-vessel than in that of a lighthouse, the light shown by the former being lower down to the level of the water than is the case with the latter.

The value of electric lighting afloat has not as yet been conclusively proved. The experiment recently tried on the lightship in the Mersey was anything but successful. It is held by many seamen of the old school that a "dazzling, blinding" light is by no means desirable, while the electric flash-lights, or so-called "lightning lights," exhibited from one of the towers on Cape La Hève, are open to many objections. The lighting apparatus is four-sided, and the intensity of the beam is stated to exceed twenty millions of candles, each flash lasting only one-tenth of a second, and being repeated every five seconds. With this the main defects are—first, the inequality in the intensity of the flashes when the largest carbons are in use; secondly, the rapid decrease in the intensity of the light as the distance from it increases; thirdly, the cessation of the "lightning" effect at long ranges. Our own St. Catherine's light, visible at twenty-three miles,

THE GULL-STREAM LIGHTSHIP: THE LANTERN.

To face page 342.

with its flash of five seconds' duration, is possibly of far more service to the mariner as a picking-up light.

From the very nature of the case many light-vessels are moored in exceedingly perilous situations—situations which in heavy weather, with the wind in a particular quarter, leave them a dangerous sand immediately to leeward; every precaution has, therefore, to be taken with their moorings. In the old days lightships were simply moored by hempen cables, which only too often started during heavy gales. Now, even the *Nore* is moored, in its three and three-quarter fathoms of water, by one and a half inch diameter chain-cables tested to a tensile strain of fifty-six and a half tons, and two thirty-two hundredweight mushroom anchors. Once every year the whole of the cables of all light-vessels have to be hauled up on deck one at a time, the inner ends, clinches, and shackles examined, and the tiers cleaned out, and then to be re-staved and blacked as they are paid down again. The bower anchor is always ready for letting go, and there is kept on deck during unsettled weather, and in all weathers from October to April, a range of the best bower cable sufficient to take it to the ground.

It is a remarkable fact that lightships lying in very exposed situations—as, for instance, that at the Seven Stones, off the Land's End, or the Saltees, off the coast of Wexford—ride very much easier than those in shallow, though more sheltered waters, as the *Varne*, the *Galloper*, and the like. This is owing to the amount of heavy cable that is out in the case of the former lightships, acting as a spring, preventing the vessel from pitching heavily while she crosses the sea, whilst the short cables of the latter render such a lightship in bad weather one of the most unpleasant situations in the world. In shoal water, when the wind is strong, the lightship will sometimes ride broadside to the tide and sea, but where the swell is much larger, as in the open ocean, the tides are not so strong, and the vessel rides more easily.

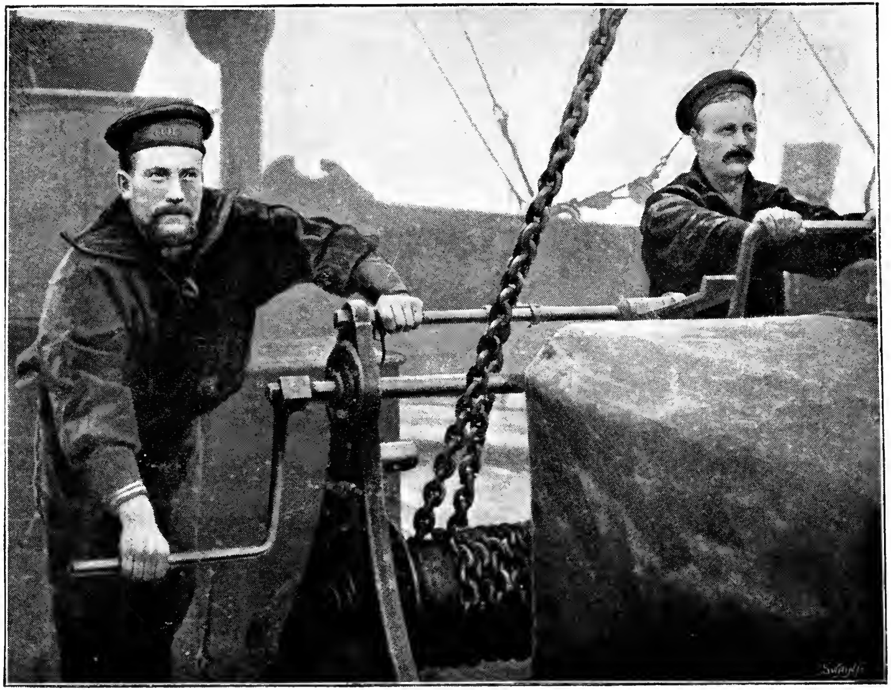
Still, however bad the weather, it is extremely unusual for lightships to go adrift, although they do occasionally get run down. The most serious of such accidents that have happened of late years have been the running down of the

Kentish Knock, the *Tongue*, and the *South Sand Head* light of the Goodwins. The first of these casualties occurred on December 1, 1886, when an iron barque, the *Salawin*, bound from Shields to Valparaiso, struck the *Kentish Knock* lightship on the starboard bow, cutting her right through, so that she sank in about three minutes, the wind being W.N.W., and the weather perfectly clear. The *Kentish Knock*, sinking under the *Salawin's* forefoot, the crew had barely time to save their lives by getting on board the colliding vessel, which in its turn was soon reported to be sinking. Fortunately, however, the *Draco*, of Hull, sighted the signals of distress hoisted, and the crews of both lightship and barque were landed safely at the North Foreland.

During the stormy winter of 1896–97, the *South Sand Head* lightship of the Goodwins was singularly unfortunate. At about a quarter to four on Saturday morning, December 19, 1896, the light on the *South Sand Head* lightship was seen from Deal to be suddenly extinguished, and almost immediately afterwards signals of distress were shown, in response to which the Walmer lifeboat and other boats were launched. It was found that the lightship had been run into by the barque *Ceres*, of Rostock, bound for Amsterdam. Three of the crew of the barque jumped on board the lightship, which, except having her mast and lantern apparatus carried away, was practically uninjured, and they were taken off by the lifeboat and landed at Deal.

On the 3rd of March, 1897, during a very heavy gale from the south-west, the same lightship broke from her moorings, the sea at the time rolling up mountains high towards the Goodwins, and at times quite enveloping the vessel. Before she began to drift she strained so terribly that it was at one time thought that she must sink at her moorings. Fortunately, she was discovered by the tug *Conqueror*, of Ramsgate, and safely towed into that port.

The crew of a lightship usually consists of a master, a mate, three lamp-trimmers, and six able seamen, the latter being selected from A.B.'s of either the Royal Navy or the Mercantile Marine. The maximum pay of the master is £88 10*s.* a year, with an additional victualling allowance of 1*s.* 9*d.* per day;



THE GULL-STREAM LIGHTSHIP: HAULING UP THE LANTERN.

[To face page 344.

carpenters get £45 a year, with a certain allowance for victualling; lamp-trimmers receive £43 16*s.*; fog-signal drivers, £41 2*s.*; and seamen of five years' service, £39 6*s.*

The majority of lightships show bright lights, either fixed, revolving, or flashing; a few show red revolving, as the *Prince's Channel* and the *Varne;* a still less number green revolving, as the *Mouse*, and the *East Goodwin*; whilst some show a red flash, as the *Galloper*, and some a bright flash and a red flash alternately, as the *Tongue*, the *Sunk*, the *Owers*, and the *Dudgeon*. By means of such diversity every precaution is taken to prevent the possibility of one lightship being mistaken for another.

As there is a strong family likeness among lightships, a description of one may well serve for all. We will take one that is, perhaps, as well known as any, lying, as it does, immediately opposite to Ramsgate, the *Gull Stream*, one of the four light-vessels which keep constant watch and ward round the ever-dreaded Goodwin Sands. It is a lightship of medium size, not the largest, but still there are many smaller, and it shows one revolving bright light every twenty seconds.

The lantern, as shown in the picture, is a far more elaborate affair than most people would imagine; indeed, it may be described, with its clockwork motion, as a somewhat complex piece of machinery. During daylight it is housed in a strong metal chamber on deck; but at sunset its lamps are lit, and it is hauled up the mast (the mast passing through the centre of the lantern) by means of a windlass, until it stands close under the cage, or ball, about forty feet above the surface of the water. Below the deck is an elaborate clockwork movement, which requires winding up every hour, and which strikes a warning bell when its weight has just upon reached its lowest point. By means of a connecting-rod and cog-wheel the motion of this clock is communicated to the lantern on the mast, and the lantern turns slowly round once in every twenty seconds. At the *Gull Stream* each flash of the light is due to the conjoined beam from three mineral oil lamps furnished with silvered reflectors.

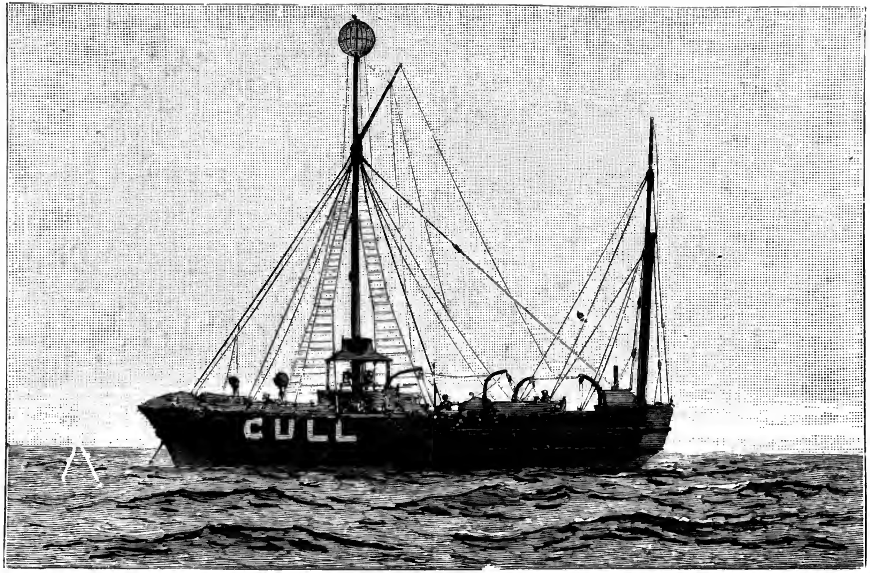
The crew of the *Gull Stream* consists of twelve men, the master, the mate, a carpenter, three lamp-trimmers, and six seamen; and of this number seven are usually to be found on board, the other five, including the master or the mate, being usually ashore; the master and the mate being relieved every month, the men every two months. When the men are ashore they are not idle, but are employed in painting buoys, repairing and refitting such light-vessels as may be at the time in dock, or engaged upon other work in the service of the Trinity House.

Returning to the lightship, we find on going below, there is a main cabin occupying the greater part of the length of the vessel, and this serves at once the purposes of kitchen, mess-room, and sleeping-berth for the crew. Forward is the stove used for warming the cabin and for cooking; down the centre is a long deal table, and in the beams overhead are hooks to which at night the hammocks are attached. Here, in bad weather, or when off duty, the men occupy their spare moments, often in making model ships, sometimes with Berlin woolwork, for all sailors can use their needle, or in reading.

Astern of the main cabin is a small cabin for the master, and beyond that is the lamp-room, with spare lamps, and two iron tanks, each capable of holding 120 gallons of mineral oil; whilst beyond that, again, and consequently right aft, is the magazine, where are stored the cartridges for the signal guns, the rockets, and various others explosives.

During foggy weather a hand horn is used at the *Gull Stream* light, two quick blasts of four seconds each being given at intervals not exceeding two minutes; and quicker if any vessels' signals are heard; whilst besides the horn the fog-gong is kept constantly going. These fog-signals, although primarily intended for the benefit of passing vessels, yet are of no small value to the lightship herself, as making her position known, and so tending to keep her from being run down, a fate which, as we have seen, has occasionally been shared by some unlucky light-vessels.

Should a vessel be seen from the lightship standing directly into danger, a gun is fired, and repeated until observed—this applies both to fair and to foggy weather. The firing of special bright rockets after the gun from the lightship, indicates that the vessel is actually on the sands,



THE GULL-STREAM LIGHTSHIP.

[*To face page* 346.

and that there is need of assistance from shore. Then immediately will be seen the answering signals from the lifeboat stations on shore. From Deal there goes up a red rocket, which means "We see your signal, and are coming." Soon another rocket follows, this time discharging a green star, indicating that "the lifeboat has already been launched, and is now on her way." In like manner from the other stations, at Kingsdown, Walmer, and Ramgate, come similar answering signals, and out into the darkness, generally in a raging sea, go the lifeboats to the work of rescue, Ramsgate having the advantage of the tug *Aid*, which in bad weather is always kept in the harbour, with her steam up, ready to tow out the lifeboat at a moment's notice.

In the case of both lightships and lighthouses, the lamps of different colours show with very different degrees of intensity. White, or bright lights, as they are technically called, show with the greatest brilliancy, and are seen from the greatest distances. Next to white come red lights, whilst green lights are the most feeble of all. In 1870, when the Trinity House determined to show a light with a red and a bright flash alternately from the noble granite tower erected on the Wolf Rock, off the Cornish Coast, a series of experiments were instituted with a view to determining the exact amount of light to be given to the red ray in order that it should be of equal intensity to the white, and it was found that the proportions were as 21 to 9; that is to say, that in order to produce a red flash as brilliant as the white flash, more than twice as much light was required for the red as for the white, and special lenses were prepared accordingly. The magnificent electric light at Cape Grisnez shows three white flashes and then a red flash. During hazy weather it frequently happens that the three bright flashes are perfectly visible, followed by a dark interval until the bright flashes appear again, the red flash not being seen at all.

In thick fog all lights are equally useless, and at such times the position of the lightship can only be indicated by sound. For this purpose all light-vessels, not fitted with more powerful apparatus, are furnished with gongs of Chinese make, about 24 inches in diameter, and costing from three to four pounds each, the gong being kept constantly going during thick weather.

In 1872, a Committee appointed by the Trinity House visited the United States to examine and report upon a new and powerful fog-signal then recently patented by Messrs. Brown, of Progress Works, New York, and known as the "siren." The report of the Committee was so far favourable that a siren was the following year fitted up and experimented upon at the South Foreland, with the result that it has since come into general use for lighthouse and lightship purposes. The instrument is after the fashion of a gigantic horn or trumpet, and is blown either by steam or by compressed air. The trumpet of the siren is about twenty feet in length, the throat being about five inches across, and the mouth about twenty-seven inches. Across the throat is fixed a metal disc with twelve radiating slits in it, precisely like an ordinary circular "hit or miss" ventilator, and behind this is a similar disc, with similar apertures in it, but in this case the disc revolves and is driven by a separate mechanism, so that as it rotates it alternately opens and closes the slits in the fixed disc. The moveable disc rotates at the rate of 2400 revolutions in a minute, and as there are twelve apertures in each disc the whole of the openings are opened and shut 28,800 times in a minute, and steam being passed through the openings, a loud musical note is produced.

Sometimes a single blast is used, as at the siren on the *Kentish Knock* light-vessel, where a blast of 7½ seconds duration is given every 3 minutes; sometimes two blasts in quick succession are given, followed by an interval of silence, as at the *Royal Sovereign* lightship; sometimes the note is varied, as at the *North Goodwin*, where two quick blasts of 2½ seconds' duration are given every minute, the first being a low note and the second a high note; or at the *Seven Stones* lightship, where three blasts are given in quick succession every two minutes, the middle blast being a high note, whilst the two others are low notes; thus, in the same way that the lights of light-vessels are varied as much as possible for the purposes of distinction, so the sirens are varied in a similar way, in order to lessen the danger of one being mistaken for another.

Besides lighthouses and lightships, two other means are

A LIGHTSHIP'S GONG.

[*To face page* 348.

employed in the interests of navigation—namely, beacons and buoys. Beacons are obviously only suitable for use in shallow waters, in rivers, estuaries, and the like, and on sandbanks and shoals. They are made of every possible shape and size, from the ordinary wooden beacon, consisting merely of a tall post surmounted by a lozenge, a triangle, or a cage, up to costly stone or brick structures, as the *Gilkicker* at Gosport. As with the lights and the fog-horns, so with the beacons, every care is taken to render them as distinctive as possible, so that besides differences of shape, differences of colour are adopted, some being painted black, some red, whilst many are striped in different conspicuous colours.

Buoys are of various shapes and sizes; some are spherical, some egg-shaped, some conical, and some, known as "can" buoys, are in shape like a truncated cone. A few are still made of wood, but the majority of buoys are now constructed of iron. For the purpose of marking fairways, of indicating shoals, and for defining the entrances to harbours, apart from warping-buoys and wreck-buoys, there are rather over eleven hundred buoys dotted about round the coasts of Great Britain and Ireland.

The cost of a buoy varies from £30 to £40 for an ordinary "can" buoy, up to £150, £160, or even £200 for a first-class conical buoy. Buoys, like lights, fog-signals, and beacons, are diversified as far as possible, some being painted black, some red, some white, whilst some are chequered, and some striped; but, as a rule, black or red buoys are found to be the most easily seen, and these colours consequently preponderate. Where a buoy is placed to mark a wreck it is invariably painted green.

Besides differences of shape and of colour, many buoys, like beacons, are surmounted by cages, and many bear other devices. Where buoys are used to mark the entrances to channels or ports, the system adopted by the Trinity House is thus: entering the channel or harbour from seaward all the buoys on the starboard hand are conical buoys painted a plain colour, all black, or all red; whilst all the buoys on the port hand are "can" buoys, striped or chequered.

It is manifestly impossible that absolute reliance can be placed on buoys always maintaining their exact positions. Buoys have, therefore, to be regarded more as warnings, and not as infallible navigating marks, especially when in exposed places; and a ship will always, when possible, be navigated by a careful man by bearings or angles of fixed objects on shore, and not by buoys.

At many different spots round the coast are bell-buoys. Upon the top of an ordinary buoy, inside an iron cage is fixed a bell, which bell is struck by four hammers that swing on pivots, so that whichever way the buoy may be tilted up by the waves, one or other of the hammers will fall upon the bell, and thus all day long, and all night long, a mournful tolling is kept up.

A somewhat recent invention is the "whistling buoy." On the top of the buoy is fixed an ordinary whistle, and below the whistle, going through the buoy and deep down into the water, is an iron tube open at the bottom. This tube is consequently full of water up to the surface, and as the buoy rises and falls with the waves, the air in the upper part of the tube between the water and the whistle is compressed and forced through the whistle, emitting a feeble sound. One of these buoys was placed off the Goodwins as an experiment, but it was soon withdrawn, as when it did whistle at all, the sound was apt to be confounded with the whistles of steamships. They have, however, found some favour with the French, and one has for some years been placed off the end of the new digue at Boulogne.

A more successful invention, and one that has now come into very general use, is the gas-buoy. Sufficient gas is placed in the buoy to constitute a supply for a month or six weeks. On the top of the buoy is the lamp with the requisite clock-work apparatus, so that it shows automatically a revolving or an occulting light—it being, in fact, a miniature lightship. The first of these buoys was placed at the *Ovens*, off Coalhouse Point, at the bottom of Gravesend Reach, and was found to be such a decided success that another was soon afterwards placed on the Ouse Sand, and since that time a number of gas-buoys have been stationed at various points round the coast.

The following lighthouses and lightships round the coasts of Great Britain are now connected with the postal telegraph system, but only casualties are reported; and a few of the light-vessels are now in telephonic communication with London, or the nearest ports:—

Kentish Knock	Light-vessel.
Goodwin (North Sand Head)	"
Needles	Lighthouse.
Durlstone Head ...	"
Start	"
Lizard	"
Hartland Point	"
Lundy Island	"
Bull Point	"
Caldy Island	"
South Stack	"
Menai	"
Formby	Light-vessel.
St. Bee's Head	Lighthouse.
Langness, Isle of Man	"
Douglas Head " ...	"
Mull of Galloway ...	"
Corsewall	Lighthouse.
Turnberry Point ...	"
Mull of Cantyre ...	"
Rhynns of Islay ...	"
Ru Stoer	"
Cape Wrath	"
Skroo Promontory ...	"
Fair Isle, Scaddon Promontory	"
Cantick, Orkney ...	"
Tarbett Ness	"
Covesea Skerries ...	"
Souter Point	"
Hasborough	Light-vessel.
Orfordness	Lighthouse.
Shipwash	Light-vessel.
Gunfleet	Pile Lighthouse.
Maplin	" "

No doubt, in the not very remote future every light-vessel and rock lighthouse will be connected by telegraph or telephone with the shore. At the present time the men on the *Kentish Knock* light-vessel can by the aid of the telephone make themselves heard, and hear the news from Kingsgate, whilst those on the *Goodwin Sands* can communicate with Broadstairs. Again, the *Gunfleet*, the *Kentish Knock*, and the *Goodwin* can communicate with each other, or with London, at any time of the day or night.

On June 30, 1898, in reply to a question asked in the House of Commons, Mr. Ritchie, the President of the Board of Trade, stated that

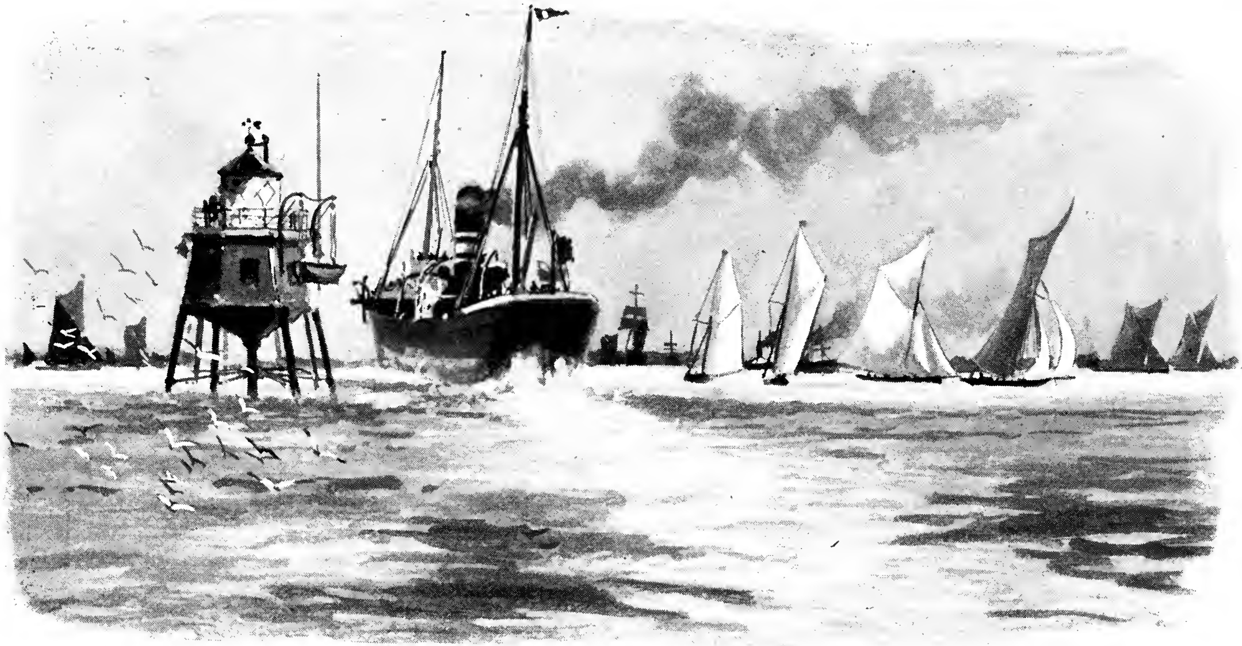
"at the present time three additional lighthouses, namely the Godrevy, the Skerries, and Walney Island, are being connected with the shore by electric cable; but it has been thought better to postpone the work of connecting more lighthouses until the results of experiments with the system of wireless telegraphy are known."

With such a large number of lighthouses, lightships, beacons, and buoys to look after the steamers of the Trinity House are never idle. They are always to be found cruising round the coasts, and one or other of the Trinity yachts may constantly be seen towing out a new lightship that is to replace an old one ordered home for repairs, or with a dozen newly painted buoys on her deck that are going out to take the places of as many more that require overhauling and setting to rights; for, besides the paint getting shabby and worn off from constant exposure to the action of the waves, the bottom of the buoy gradually becomes covered with barnacles and weeds, whilst occasionally the buoy will leak, causing it to float lower in the water than it ought to do. Now and then, too, a buoy gets run down by a passing vessel, the master of which, for obvious reasons, omits to report the casualty, so that, with all these matters to attend to, the officials of the Trinity House must ever be on the alert.

Unlike the lights of foreign countries, which for the most part are kept up by the state, and are thus free to the ships of all nations, British lights are entirely maintained by British merchant vessels, all of which have to pay their light dues for the voyage before they can obtain a clearance from the custom-house.

Three different scales of rates are adopted. First, the home-trade rates—that is to say, light dues payable by all vessels engaged in voyages between any two British ports, as from Liverpool to London, from Hull to Penzance, and the like; or from any British port to any port on the Continent lying between Brest and the Elbe, as from London to St. Malo, or from Plymouth to Amsterdam. Second, over-sea rates—that is to say, rates payable by all vessels on voyages from any British port to any foreign port (with the exceptions mentioned in the next scale), or from any foreign port to any British port, as, for instance, a voyage from London to Genoa, or one from Liverpool to New York, or from Sydney to London, and the like. Third, the half rates over sea—that is to say, rates payable by all vessels engaged on voyages from any British port to either Denmark, Norway, Sweden, or Iceland, or to the Bay of Biscay and Spanish ports this side of Gibraltar.

The charge for each light is for the most part adjusted in accordance with two conditions: first, with the cost of the



A PILE LIGHTHOUSE: MUCKING LIGHT, ON THE THAMES.

[*To face page* 352.

maintenance of such light, an isolated lighthouse, as, for instance, the Eddystone, being far more costly to maintain than an ordinary lighthouse on shore, as, say, the North Foreland, or the Start; the dues, therefore, for the Eddystone are higher than the dues on the North Foreland, or the Start. And secondly, regard has to be had to the number of ships that pass the light. Take, for instance, two lights whose cost of maintenance is precisely the same. One of these lights is situated in a much-frequented locality, where there will be a large number of ships always passing to pay for the light. Here the charge will be relatively small. The other light is in a place where but few ships pass; the charge will, therefore, be proportionately heavier.

All light dues are reckoned in sixteenths of a penny per registered ton, and a ship is charged for every light that she will pass on any particular voyage, whether she passes that light during the day, or during the night. A ship bound foreign—say from Newcastle-upon-Tyne to the Cape of Good Hope—will be charged on the "Over-Sea Scale;" and will pay for the whole of the lights on the east coast of England, and along the English Channel, commencing with the light on Souter Point at the mouth of the Tyne, and terminating with the Bishop Rock Lighthouse at Scilly, and the charge for the whole of these lights is 12 pence and $\frac{6}{16}$ths of a penny per register ton; so that the light dues payable by a ship of 1000 tons register on such a voyage will be £51 11*s.* 3*d.*, less a certain amount of discount. Supposing that the same ship is going from Newcastle-upon-Tyne to Port Said, she will pay exactly the same light dues, plus *one shilling* for the light on Europa Point, Gibraltar, which is the only British light in the Mediterranean, and for which one uniform charge of a shilling per vessel is made.

The rate charged from, say, Cadiz to the Thames, which is at the "Half Rate Over-Sea," is 8*d.* per registered ton; and the rates from or to all other British ports, in a similar way, vary according to the number and the description of the lights that are passed. In addition to the light dues, all vessels entering the Port of London have to pay Trinity dues, which are at the rate of a penny per ton. There is a slight difference made in the light dues between outward and homeward-bound vessels, outward bound vessels not paying for the light on Hanois Rocks, Guernsey, whilst homeward bound ships are charged for it, outward bound vessels not having any business to be near it.

The present mode of collection of the light dues is extremely unsatisfactory, and presses with undue hardness upon the British shipowner, who has to bear the entire cost of the whole British lighthouse system, ships of the Royal Navy, yachts, and fishing-boats paying no light dues at all; whilst all foreign vessels, and indeed British vessels, if they do not start from or come into any British port, may make use of every light along the coast, and yet pay nothing. As a case in point, in May last a vessel of 2565 tons register from Calcutta, discharged at Dundee a cargo of jute, proceeded to Middlesborough, and there loaded a cargo of salt back to Calcutta. She paid £127 7*s.* 6*d.* for light dues in and out. In September, a sister ship of the same tonnage, also from Calcutta, discharged at Hamburg a similar cargo of jute, and there loaded a similar cargo of salt for the same destination. Although she had passed every light from Scilly to the North Foreland, both in and out, she paid nothing.

It is high time that all this was altered, and that the cost of lighting our coasts was charged to the nation, as is the case in many other countries, instead of perpetuating what is a grave and a gross injustice to shipowners. Indeed, shipowners at the present time are not only charged the actual cost of the lights, but very considerably more; for with regard to the light dues, the official returns show that from 30 to 40 per cent. more is charged than the actual cost of the lights. During the twelve years from 1884 to 1896, there had been an overpayment under this head of no less than £860,000.

During last session the Government passed a Bill * for making some slight alterations in the light dues; but it is mere tinkering, and no settlement of the case will be achieved until the British Mercantile Marine is relieved of the light dues altogether, and the charge is borne by the public exchequer.

* See page 272.

THE GULL-STREAM LIGHTSHIP: ON THE LOOK-OUT.

[*To face page* 354.

CHAPTER XXVII.

Flags—The national colours—The Union Jack—The ensign—The white ensign—The red ensign—The blue ensign—Other legal colours—House-flags—Signals and signalling—The International Code—Report of the Committee—The Signal Book—The flags—The signals—The new Code.

The proper national colours for all ships of the British Merchant Service are the red ensign and the Union Jack with a white border. Until the year 1606, the English national flag was that known as the banner of St. George—a red cross upon a white field, this flag being now called the St. George's Jack. After James VI. of Scotland became king of England as James I., and England and Scotland were united under one and the same crown, it became necessary to revise the national flag, in order that Scotland might be represented in it. The Scottish national flag was a white diagonal, or St. Andrew's cross, upon a blue field; the new flag therefore had a red cross with a white border, which white border was the remains of the white field of the old banner of St. George for England, with the St. Andrew's diagonal white cross on the blue ground for Scotland; and in 1606, James I., by royal proclamation, ordered this flag henceforth always to be used as the national flag, the object being to provide a flag which should put an end, once for all, to the constant disputes as to the precedency of the rival banners of St. Andrew and St. George. On the final union of England and Scotland in 1707, this was formally declared to be the "Ensign Armorial of the United Kingdom of Great Britain." This, then, was the first Union Jack; and it was under this flag that all the great naval battles of Rodney, Howe, Duncan, and the rest, during the last century, were fought.

On the 1st of January, 1801, when the union with Ireland was concluded, a place had to be found for the red diagonal cross of St. Patrick, as representing Ireland, and it was placed upon the white diagonal cross of St. Andrew, leaving some of the white of the St. Andrew's cross on either side of it, double the width of white, however, being on one side of it, as compared with the width on the other side; and the Union Jack then appeared as we have it to-day.

The ensign is of three kinds—it is either a red, blue, or white flag, with a Union Jack in the upper canton next the staff. The white ensign * is worn exclusively by ships of the Royal Navy, with the exception of yachts belonging to the Royal Yacht Squadron, which are specially permitted by the Admiralty to fly the white ensign. The blue ensign is the Royal Naval Reserve flag, and the red ensign is the proper, legal, and distinctive flag of the British Mercantile Marine. The Merchant Shipping Act (57 and 58 Vict., section 73) prescribes that—

"(1) The Red Ensign, usually worn by merchant ships, without any defacement or modification whatsoever, is hereby declared to be the proper national colours for all ships and boats belonging to any British subject, except in the case of Her Majesty's ships or boats, or in the case of any other ship or boat for the time being allowed to wear any other national colours in pursuance of a warrant from Her Majesty or from the Admiralty.

"(2) If any distinctive national colours, except such red ensign, or except the Union Jack with a white border, or if any colours worn by Her Majesty's ships, or resembling those of Her Majesty, or if the pennant usually carried by Her Majesty's ships, or any pennant resembling that pennant, are or is hoisted on board any ship or boat belonging to any British subject without warrant from Her Majesty or from the Admiralty, the master of the ship or boat, or the owner thereof, if on board the same, and every other person hoisting the colours or pennant, shall for each offence incur a fine not exceeding five hundred pounds."

The same Act, section 74, prescribes that—

"(1) A ship belonging to a British subject shall hoist the proper national colours—

"(a) On a signal being made to her by one of Her Majesty's ships

* The white ensign bears a red cross on the white field, and is very much the same as the old banner of St. George, only with the Union Jack in the upper canton—indeed, it is known as the white, or St. George's ensign.

(including any vessel under the command of an officer of Her Majesty's Navy on full pay), and

"(b) On entering or leaving any foreign port, and

"(c) If of fifty tons gross tonnage or upwards, on entering or leaving any British port.

"(2) If default is made on board any such ship in complying with this section, the master of the ship shall for each offence be liable to a fine not exceeding one hundred pounds."

All merchant ships, therefore, not only may, but *must*, under very heavy penalties, fly the red ensign and only the red ensign; with the following exceptions in favour of the blue ensign:—

The Blue Ensign.—The following are the Admiralty regulations respecting the Blue Ensign (Royal Naval Reserve flag):—

"(1) British merchant ships commanded by officers of the Royal Navy on the Retired List, or by officers of the Royal Naval Reserve, and fulfilling the following conditions, will be allowed to wear the Blue Ensign of Her Majesty's fleet:—

"(a) The officer commanding the ship must be an officer of the Royal Navy on the Retired List, or an officer in the Royal Naval Reserve.

"(b) Ten of the crew must be members of the Royal Naval Reserve.

"(c) Before hoisting the Blue Ensign, the officer commanding the ship must be provided with an Admiralty Warrant.

"(d) The fact that the commanding officer holds a warrant authorizing him to hoist the Blue Ensign must be noted on the ship's articles of agreement.

"(2) Commanding officers failing to fulfil the above conditions, unless such failure is due to death or other circumstances over which they have no control, will no longer be entitled to hoist the Blue Ensign.

"(3) British merchant ships in receipt of Admiralty subvention will be allowed to fly the Blue Ensign under Admiralty Warrant.*

"(4) The captain of one of Her Majesty's ships meeting a ship carrying the Blue Ensign may, in order to ascertain that the above conditions are strictly carried out, send on board an officer, not below the rank of lieutenant, at any convenient opportunity; but this restriction as to the rank of the boarding officer, is in no way to limit or otherwise affect the authority or the duties of naval officers either under the Merchant Shipping Acts or in time of war."

Hired transports also wear the blue ensign with the yellow Admiralty anchor in the fly; and any ships employed in the service of certain Government offices will also carry the blue ensign with the badge of the particular office in the fly.

The other strictly legal flag for the merchant service is

* For list of such ships see page 260.

the Union Jack enclosed in a white border, which white border must be one-fifth the breadth of the Jack. This flag is to be hoisted at the fore by British vessels, and signifies that such vessel requires a pilot.

Besides the above national colours there are certain other flags which are required to be displayed by Act of Parliament. They are—(1) A pilot's boat flag, the upper horizontal half white, and the lower horizontal half red. This is to be hoisted at the mast-head of all British pilot boats, or displayed in some other equally conspicuous situation. (2) The red burgee (B of the International Code) is to be hoisted or shown when gunpowder or other explosive is being taken on board or discharged. (3) A large yellow flag, of six breadths of bunting, is to be displayed at the main topmast head by a ship having a clean bill of health, but liable to quarantine. (4) A similar flag to the last, but with a black ball of a diameter equal to two breadths of bunting, is to be displayed at the same masthead by a ship not having a clean bill of health. (5) A flag of yellow and black quarterly, of eight breadths of bunting, is to be displayed at the main topmast-head by a ship having the plague, yellow-fever, or other dangerous infectious disease on board.

There is one other flag, which, although not required to be used by Act of Parliament, yet is universally adopted by custom, and that is the Blue Peter (P. of the International Code), a blue flag with a white square in the centre. This flag is hoisted at the fore, and denotes that the vessel so hoisting it is about to proceed to sea, and calls upon all persons interested to proceed on board.

House-flags are particular flags adopted by particular firms, every large shipping company, and the larger firms among private shipowners, having each its own particular house-flag, which flag is always hoisted at the main. These house-flags simply possess the same legal rights as mercantile trade-marks.

From time immemorial flags have been used for signalling purposes, both in the merchant service and in the imperial navies of all countries. Previous to the middle of the present century, many different signal codes had been in use, most foreign nations having their own codes, the English Mercantile

Marine for the most part using Marryat's Code; but there was no system of uniformity—no system of signalling common to all countries.

Eventually it was proposed to establish some code of signals to be used at sea, which should be of universal adaptation. Many suggestions were made, but the matter did not begin to assume any very definite shape until the year 1855, when, in pursuance of a Minute of the Lords of the Committee of Privy Council for Trade, dated the 2nd of July in that year, a committee, consisting of naval officers and officers of the Mercantile Marine, was appointed "to inquire into and report upon the subject of a code of signals to be used at sea;" and on the 24th of September, 1856, they made their Report to the Board of Trade, in which they stated that they had considered what principles should be laid down as the basis for the formation of an efficient code, and had resolved as follows:—

"1. The Code ought to be comprehensive and clear, and not expensive.

"2. It ought to provide for not less than 20,000 distinct signals, and should besides be capable of designating not less than 50,000 ships, with power of extension if required.

"3. It should express the nature of the signal made by the combination of the signs employed, and the more important signals should be expressed by the more simple combinations.

"4. A signal should not consist of more than four flags, or symbols, at one hoist.

"5. A signal should be made complete in one hoist, in one place.

"6. Signals should have the same meaning wherever shown.

"7. The Signal Book should be so arranged, either numerically or alphabetically, in classes, as to admit of the subject being readily referred to, and provision should be made for future additions.

"8. The Code should be so framed as to be capable of adaptation for international communication."

The Committee, in referring to their decision that in any efficient code not more than four flags ought to be shown in one hoist, and that a signal ought to be made in one hoist at one place, made the following observations:—

"Upon these grounds, therefore, the system of numerals appeared to us to be defective for a comprehensive Code, as not being capable of designating in a consecutive numerical series 70,000 distinct signals without at any time showing more than four flags for each signal made; and it is clear, therefore, that it would have been inconsistent with the principles laid down to have proceeded with the framing of a Code upon the basis of a system of numeral signs.

"Having thus set aside the numeral system, we had to consider what other method would best meet the requirements of an efficient Code.

"There was only one other method known to us by which the objects we had in view could be attained.

"It was that of taking a number of signs (or flags) sufficient for the purpose, and by their transposition effecting a certain number of permutations, each different combination of two or more of the signs so taken forming a signal distinct in itself, and having a particular signification.

"The following Table, prepared by the Committee, shows the number of distinct signals which ten or more flags are capable, by permutation, of forming, in hoists of from two to four signs at a time in one place:—

"Permutations
"of which the following Numbers of Signs are capable.

Single signs not reckoned.	With 10.	With 11.	With 12.	With 13.	With 14.	With 15.	With 16.	With 17.	With 18.	With 19.	With 20.
In Hoist of 2 Signs	90	110	132	156	182	210	240	272	306	342	380
In Hoist of 3 igns	720	990	1,320	1,716	2,184	2,730	3,360	4,080	4,896	5,814	6,840
In Hoist of 4 Signs	5,040	7,920	11,880	17,160	24,024	32,760	43,680	57,120	73,440	93,024	116,280
In Hoist of 5 Signs	30,240	55,440	95,040	154,440	240,240	360,360	480,480	742,560	1,028,160	1,395,361	1,860,480
Total, with 2, 3, 4, & 5	36,190	64,460	108,372	—	—	—	—	—	—	—	—
Total, with 2, 3, & 4	—	—	—	19,032	26,390	35,700	47,280	61,472	78,642	99,180	123,500

"From the above Table it will be seen that 18 flags will be requisite to give the number of signals which the Committee have stated to be necessary *i.e.* 70,000 distinct signals, with power of extension to 78,642 signals, each signal consisting of a hoist of not more than *four flags*. Having decided upon this number, the Committee proceeded to the *naming* of the flags or signs, in devising which it appeared to them—

"1. That the characters should be familiar ones.

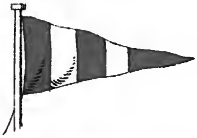
"2. That they should recur in a well-known order, for facility of reference.

"The letters of the alphabet seemed best adapted for the purpose, and the Committee determined that it would be most convenient to assign to each of the 18 flags a letter of the alphabet, leaving out the vowels.

"The omission of the vowels was forced upon the Committee, from the circumstance, that by introducing them every objectionable word composed of four letters or less, not only in their own but in foreign languages, would appear in the Code in the course of the permutation of the letters of the alphabet.

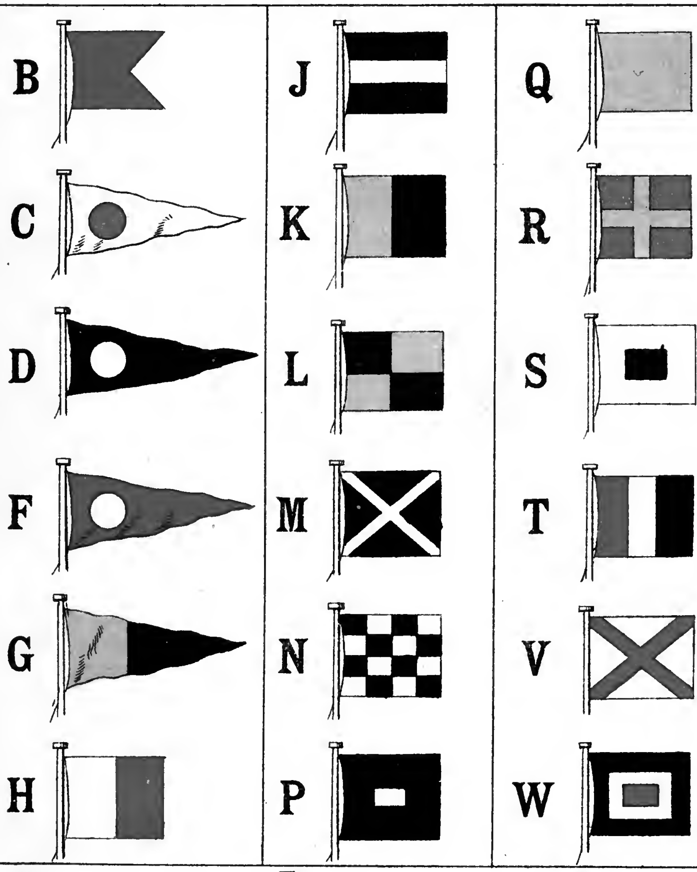
"Too much importance should not, however, be set upon the objection which naturally occurs, that the alphabet is thus incomplete, and that the power of spelling is apparently lost; for it should be understood that the

INTERNATIONAL CODE FLAGS.



"CODE SIGNAL" AND "ANSWERING PENNANT."

N. B.—When used as the "Code Signal," this Pennant is to be hoisted under the "Ensign," when used as the "Answering Pennant," where best seen.



Assent—Yes. Negative—No. Answering Pennant.

letters are not used as *letters*, but as *signs*, characterizing the different flags by the most familiar method, and in an order well known.

"The last consideration which occupied the attention of the Committee was the colouring of the flags to be used.

"In determining this question, the following points were discussed:—

"1. Whether Marryat's flags were the best adapted in shape and colour for signalling?

"2. Whether Marryat's flags being then generally in use on board merchant ships of this and foreign countries, and also at many foreign signal stations, it would not be convenient to adopt them as far as possible?

"The Committee were not prepared to decide the first question in the affirmative, but considering the heavy expense of procuring a new set of flags, and in deference to what appeared to be a general wish—that flags which are, and have been for many years, so generally in use in merchant ships, and with which mariners are familiar, should not, without very strong reasons, be dispensed with—the Committee determined to recommend the adoption of the flags employed in Marryat's Code (with slight variations), as far as they were applicable."

In submitting a Signal Book prepared in conformity with the foregoing Resolutions, the Committee observed—

"We have only to remark, as regards the general contents, that it does not materially differ from other Signal Books.

"The general principles of the Code, and directions for its practical working, are explained in the commencement of the book; but we desire to point out to your Lordships the main advantages which it appears to us to possess over any other Code that we have had before us:—

"First, its comprehensiveness and distinctness, the combination of the signs expressing the nature of the signal made—two flags, or symbols, in a hoist always meaning either *Danger* or *Urgency*—and the signals throughout being arranged in a consecutive series, so that any individual signal, whether a word or a sentence, may readily be found. Secondly, that the flags and pennants are so arranged as by their position to characterize the signals made; thus—

"In Signals made with Two Signs—

"The Burgee uppermost represents	Attention Signals.
A Pennant uppermost represents	Compass Signals.
And a Square Flag uppermost represents ...	Danger Signals.

"In Signals composed of Four Signs—

"The Burgee uppermost represents	Geographical.
A Pennant uppermost represents	Vocabulary.
And a Square Flag uppermost represents ...	Ships' Names.

"And thirdly, that the arrangement of the Code is such as to hold out to foreigners the same advantages that it affords to our own marine.

As has been seen above, the flags of the International Code of Signals are eighteen in number, with the addition of one "Code Signal" or "Answering Pennant." The eighteen signal flags consist of thirteen square Flags, four Pennants, and one Burgee, each representing a consonant of the alphabet from B to W.

Before signalling, the Code Pennant is hoisted *under* the ensign at the gaff, intimating that this Code is about to be used. When used as an Answering Pennant it is hoisted anywhere where it can be best seen. When one ship is signalling to another ship or to the shore, and has completed her signal, the ship *signalled to* runs up the "Answering Pennant" for a moment or two, to say, "I understand"; and when the ship herself has finished her signalling, *she* runs it up for a moment to indicate, "That is all," or, "I have nothing more to say."

There are only two one-flag Signals—Pennant C, which means "Yes," and Pennant D, which means "No."

There are three kinds of two-flag Signals—Attention Signals, Compass Signals, and Urgent or Danger Signals.

Attention Signals have the red Burgee, B, uppermost, as BD, "What ship is that?" BS, "Call the attention of the shore signal-station." In Compass Signals, one of the four Pennants is uppermost: from North to East, the C Pennant; from East to South, the D Pennant; from South to West, the F Pennant; and from West to North, the G Pennant. Thus C G, "North by East, half East;" D P, "South-East by south;" F Q, "South-West by West, half West;" and G R, "North North-West."

Urgent or Danger Signals have a square flag uppermost, as K J, "Get her on the other tack, or you will be on shore"; Q M, "Have you any message or telegraphic communication for me?"

Three-flag Signals, no matter what they begin with, are the ordinary signals of communication, embracing every subject at all likely to be required by seafaring folk, ranging between purely maritime matters and the ordinary topics of everyday life. Thus, B D J, "I am aground;" K R V, "Send a tug to me;" K S M, "Shorten in starboard hawser;" L V H, "I think I must have passed the buoy;" or R T M, "Glad to see you;" R B W, "What is your opinion? What would you do?" **RJH**, "Appearance is not satisfactory;" and so on.

A very considerable number of the three-flag Signals are devoted to numerals, decimals, and fractions, so that by a combination of these particular signals any number can be communicated. Thus, **VWG** is 1, **VWH** is 2, **VWJ** is 3, and so on. A certain number of signals stand for two figures, as **VWR**, 10; **VWS**, 11; up to **WHJ**, 98, and **WHK**, 99. After that they go in hundreds, **WHL** being 100, **WHM** 200, and so on up to 1000; after that in thousands up to 10,000, and ultimately to millions.

As an example, suppose that it were requisite to signal $10{,}011\frac{1}{10}$. Three three-flag Signals would be used: first of all, **WPN**, which signifies 10,000; then **VWS**, which stands for 11; and lastly, **VSP**, which means $\frac{1}{10}$. Or suppose it were required to signal 29·09. Here two three-flag Signals would be employed: first **WCB** would be hoisted, which means 29; and after that **VSN**, which stands for 0·09; and so in a similar manner any number or combination of numbers can be communicated.

After the three-flag come the four-flag Signals, of which there are three kinds, namely, 1st, four-flag Signals with the **B** Burgee uppermost, which are Geographical Signals, as, for instance, **BVCJ**, "Queenstown, Ireland; or **BVDP**, "Goodwin, North Sand Head;" and so on; 2nd, four-flag signals with a square flag uppermost, which are all ship's names: those signals having the **G** uppermost indicating vessels of Her Majesty's Navy, as **GVMK**, "H.M.S. *Widgeon*, screw gunboat, 6 guns;" or **GTFB**, "H.M.S. *Powerful*, twin-screw cruiser, 1st class, 14 guns;" four-flag Signals with any other square flag than **G** uppermost are ships of the Merchant Service, as **NBLT**, "Cunard steamer *Campania*, of Liverpool;" or **JVGT**, "the *Western Lass*, of Plymouth;" and so on.* 3rd, four-flag Signals with a Pennant uppermost are Vocabulary,

* All British registered vessels may have—practically, all do have—a Code Signal allotted to them for, among other uses, making the ship's name known at sea; as, for instance, **TMWL**, "the barque *Mandalay*, of Glasgow." A Code List is published annually by the Committee of Lloyds, for the purpose of enabling officers at signal stations on shore, and masters of ships at sea, to

or Spelling, Signals. These signals are used for communicating any word not already provided for in the other parts of the Code, by spelling such word. Obviously there must be many words having no connection whatever with maritime matters that might occasionally have to be signalled, and by this process—necessarily however, a very slow and tedious process—it is possible to communicate these words. For instance, let us suppose that by some chance the word *omnibus* had to be signalled. The first hoist would be **C D V M**, "om;" the second hoist would be **C D S K**, "ni;" and the last hoist would be **C B J K**, "bus." Thus by three consecutive signals the word *omnibus* would have been spelt; and so by this means any word, English or foreign, not already provided for may be signalled, although in a somewhat cumbrous fashion, by the International Code.

This Code is now employed by all civilized nations as a means of communication at sea. It is used on board Her Majesty's ships, and has been adopted by all the principal maritime powers for their imperial, as well as for their mercantile, navies; with, of course, the reservation that all imperial navies have their own entirely distinct private codes for their own special purposes, and the utmost care is taken by frequent changes to keep these unintelligible to other nations. Every nationality has its own signal-book for the International Code, in its own particular language, so that a signal being hoisted, the master of the ship signalled to, whatever his nationality, turns to his book and runs down the page. The signal hoisted is, say, **J V K**. The skipper turns up **J V K**, and finds that it means in his own language,

signal and report passing vessels. The Code List contains the distinguishing signals, not only of British ships, but of such foreign ships as have an International Code Signal allotted to them.

The Signal Letters are not always issued consecutively—that is to say, the last ship to which a Code Signal has been allotted will not necessarily have the last signal issued; for instance, say that the last Code Signal allotted, yesterday, to a British vessel was **W V T R**, "the *Sinloo*, steamer, of Newcastle;" it does not necessarily follow that the next applicant for a Code Signal should have the next signal, which would be **W V T S**, because a vessel to which a much earlier signal had once been allotted may have been wrecked or broken up, and her signal would then be allotted to somebody else.

be it English, or German, or Norwegian, or what not, "I am short of provisions." He knows immediately that the signalling ship is in want of provisions of some sort, and he can act accordingly.

The New Code.

The International Code of Signals, first issued in 1854, has been continually undergoing revision in a small way by a Committee of which the Registrar-General of Seamen was the chairman; but in process of time the blanks in the Signal Book became filled up, and suggestions were made by some foreign Governments which were not altogether acceptable to other countries. The questions involved thus became too large to be dealt with by a small inter-departmental Committee, and a larger Committee was appointed, to carefully consider the whole matter. In January, 1889, this Committee issued their first report with a revised edition of the Code, but no change of any importance was made, the Committee confining themselves to excising obsolete signals, and replacing them by other signals which were demanded by modern requirements. No addition was made to the number of the Code flags, which still remained at eighteen. This revised edition was forwarded to the foreign maritime powers, and to the British Colonies, and a statement showing the nature of the replies received was printed with the second report, which was issued in July, 1892.

In April, 1897, the third and final report of the Committee was issued. The most important suggestion received by the Committee originated with the French Government, who applied a most careful examination to the Committee's work, and printed a very valuable pamphlet embodying their views upon the subject. This suggestion, which was that two new flags representing the letters "X" and "Z" should be added to the existing number of Code flags, was supported by some of the other maritime nations. It was found that the addition of two new flags would necessitate re-writing practically the whole Code, and it was then resolved to go still further, and to add, not only flags representing the letters "X" and "Z," but also flags to represent all the vowels of the alphabet. This, therefore, has now been done. Vowels were not introduced originally, for the reasons stated in the original report upon the existing Code.

The increased utility of the proposed new Code through the addition of eight new flags is astonishing. The possible permutations of 18 flags is 78,660; the possible permutations of 26 flags is 375,076, or nearly five times as many as can be made by 18 flags. The number of two-flag signals may be more than doubled, and three-flag signals trebled, whilst five times as many signals can be made with four flags. The advantages of the proposed additional flags were deemed so important that the Committee have not hesitated to adopt them, although the step involves the abandonment of the Code suggested by them in 1889, and the preparation of an entirely new Signal Book. The great advantage of the new Code, therefore, will be that no general signal will contain more than three flags in a hoist, and that there will be an extensive addition to the number of two-flag signals. All the two-flag signals are now *Urgent* and *Important* Signals, the letter "**N**," which is so well known all over the world as a distress signal, being still retained specially for vessels in distress. Compass Signals in the new Code are given in degrees, instead of in points and half-points, as in the present Code, and the bearings are true instead of being magnetic; but the bearings in points and half points are, however, still given besides, with magnetic bearings, should they be preferred.

Several important signals can be made by one flag between vessels towing and vessels being towed, the flag being held in the hand, and only shown just above the gunwale. Otherwise the one-flag signals have not been extended, from the fear that they might be mistaken for house-flags; but the Code pennant has been utilized to make a large number of two-flag signals, and such flags as have a special meaning by themselves, as **B** (the gunpowder flag), or **L** and **Q** (the quarantine flags), with the pennant over them, will retain the meaning that they have at present. The *Spelling* Signals have been very much improved and enlarged, as also is the case with the *Geographical* Signals. The new Burgee flag "**A**" has been utilized, together with the present "**B**" Burgee, as the distinguishing flag of the signal.

The very large number of places on the coasts of the various countries of the world which have sprung into notice during the last few decades is so great that there was probably no part of the old Code which more required revision than that containing the Geographical Signals, and although additions had from time to time been made, yet they entirely failed to render the list of names of places even approximately complete. The Geographical Section of the new Code contains something like 10,000 names of places, or about three times as many as appear in the present Code, and includes the name of practically every sea-coast place of any importance; and, following a suggestion of the Danish authorities, a special sign is to be added to the names of places at which life-saving stations have been established.

No change has been made in the colours of the flags in the existing Code, except "F," which it is proposed shall have a white cross instead of a white ball, as at present, and "L," which is to be changed from blue and yellow squares to black and yellow. This change will, doubtless, be appreciated by seamen generally, as L and K are constantly mistaken for each other.

Under the heading of "Distant Signals," at the beginning of Part II. of the new Code, three different modes of signalling are given, viz. by balls, cones, and drums; by balls, flags, and pennants; and by the semaphore. Of these three systems the only one which is new to the Signal Book of the International Code is the first—balls, cones, and drums—and this is the system which in the opinion of the Committee is the most likely to prove of immediate use to the Mercantile Marine. Signals made by balls, cones, and drums cannot only be distinguished at much greater distances than those made by hoists of flags, but they are much less liable to be affected by atmospheric conditions and the absence or direction of the wind. Three balls, two cones, and one drum, are all the apparatus that is required, and the gear is both less expensive and far more durable than flags. This system, although given under the heading of "Distant Signals," being equally applicable at close quarters, will probably meet with the approval of owners of small craft who might very naturally be afraid of the additional cost of the new and more extensive code. Although the new Code will mean an additional cost at first for all concerned, yet in the long run there is not likely to be much difference, since there will be less wear and tear in doing the same amount of work, as the signals will be made with fewer flags.

The arrangement of the Signal Book has been well thought out and planned. To facilitate rapidity in looking out a signal in the general vocabulary, all the principal words in sentences are given, even at the expense of repetition; and not only do the various words in that vocabulary which form headings follow one another in alphabetical sequence, as in the old Code, but the different words and phrases coming under the various headings are also arranged in alphabetical order.

The Committee recommend that the use of the new Code shall come into operation on January 1, 1900—a date sufficiently remote as to admit of the Code being translated into foreign languages. From the commencement of the year 1900 no further copies of the existing Code will be issued; and after December 31, 1901, it is proposed that the old Code shall be considered as obsolete, and that signals from it should be disregarded.

CHAPTER XXVIII.

Ships' lights—Port and starboard lights—Anchor lights—The case of H.M.S. *Blenheim* and *La France*—Norwegian steamer and barque—Sound signals for fog—Signals of distress—Life-saving appliances—Draught of water, and load-line—Plimsoll's mark—Certain cargoes—Dangerous goods—The Rule of the Road.

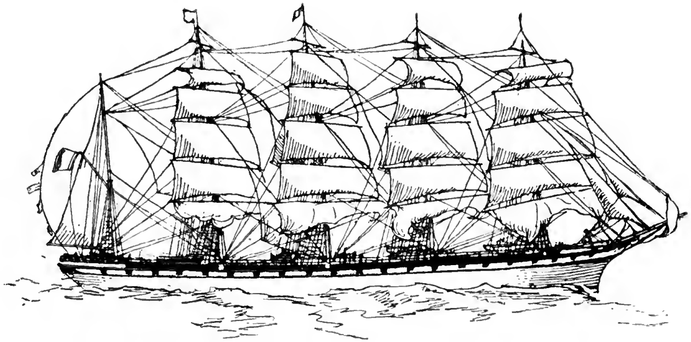
All vessels, both sailing and steam, when under way, are bound by law to carry from sunset to sunrise a green light on the starboard side and a red light on the port side, and a steamer, in addition to these, is obliged to carry a white light at the mast-head. To this law all vessels conform, from the little coasting schooner to the line-of-battle ship; but, as reasonably might be expected, a very large diversity in degrees of excellence prevails, many among the smaller class of vessels being but ill-found in the way of lights, and not always being careful or exact in the manner of displaying such lights as they have. The lamps, besides being poor in themselves, are often badly trimmed and badly tended, and not unfrequently are allowed to go out altogether. Many of the larger ships, on the other hand—all the great ocean liners, for instance—now carry such brilliant side and masthead lights as almost to compete with the lightships and the lesser lighthouses. Many of the great liners are now fitted with powerful electric side and masthead lights, although when this is the case it is not unusual for them to discard the electric in favour of mineral oil when in home waters, or in waterways where the traffic is considerable, as there is less likelihood of the lights failing at, perhaps, just a critical moment.

Now and then an odd thing will occur with regard to ships' lights. As an instance, not long ago a small Scotch barque left the London Docks for Natal and Mauritius. Very soon after getting out of the Channel the foresheet broke the glass of the starboard light. There was another pair of side-lights on board, so a new green light was brought up and shipped. It was not many days before the foresheet broke that glass too, and the barque went all the way from the Bay of Biscay to Natal with an ordinary white lantern, into which was pasted the green cover of a *Tit-Bits* for a starboard light. With the heat of the flame the green paper speedily assumed a brown tint, but one of the apprentices having a considerable store of literature in his chest, in the shape of a year's numbers of *Tit-Bits*, the green paper was renewed every other night, and the small Scotch barque thus conformed, to the best of her ability, to the law that required her to show a green light on the starboard side.

All sailing-ships and steamers at anchor are required by law to show a white light where it can best be seen, at any height not exceeding twenty feet above the deck. Occasionally ships at anchor, besides showing this anchor-light forward, which they are required to do by law, as an additional precaution show a bright light at the stern, which when at anchor they are not required to do, and which sometimes leads to disastrous results.*

On the night of Monday, January 25, 1897, *La France*, a five-masted sailing-ship, of 4000 tons register, belonging to Dunkerque, on a voyage from Iquique to Dunkerque, with a cargo of six thousand tons of nitrate, was lying at anchor in Dungeness Roads. She had the usual anchor-light hoisted at the bow, and in addition showed a bright light astern. The night was fairly clear. A steamer, which subsequently proved to be H.M.S. *Blenheim*, when several miles away, was seen from the French vessel to be bearing straight for the ship. As the steamer drew nearer it became apparent that she would strike *La France* amidships. The utmost consternation prevailed on board the French ship, the crew shouting loudly to attract the steamer's attention, which they ultimately did, but not in time to prevent the collision which followed. The *Blenheim* at the last moment altered her

* By a recent order vessels of 150 feet or upwards in length, when at anchor *are bound* to show a light at the stern as well as the light forward; but the disadvantages of the rule are clearly shown in the case of *La France*.



"LA FRANCE," ONE OF THE LARGEST SAILING-SHIPS IN THE WORLD.

[*To face page* 370.

course, but she struck *La France* a glancing blow on the starboard quarter, causing extensive damage;—rails, bulwarks, and stancheons being carried away, some of her upper plates ripped off, and the captain's cabin stove in.

Those on board the *Blenheim* stated that the ironclad was steaming up Channel at the rate of about thirteen knots, and that when about four miles south-west of Dungeness the look-out reported two lights ahead, but thought that they were the lights of two fishing-boats, as there was a considerable distance between them. The navigating lieutenant continued his course, thinking to pass between the two fishing-boats; but when close upon *La France* it was seen that what had been mistaken for the lights of two fishing-boats were in reality the bow and stern lights of a great sailing-ship. The helm of the *Blenheim* was immediately put hard over, and her starboard engine was stopped and put full-speed astern, with the result that she quickly came round; but she struck the ship a glancing blow, instead of striking her at right-angles, which if she had done, would undoubtedly have cut the French ship in half. As it was, both vessels received considerable damage; and it was distinctly due to the misconception caused by the stern light of the French ship.

In a somewhat similar case, where a Norwegian steamer, lying at anchor with a bow and stern light, was run into by a barque, the President of the Admiralty Court held that the steamer was alone to blame; and this view was confirmed on appeal, Lord Esher ruling that "the riding light forward was necessary and sufficient, and the stern light a source of error, which might cause, or contribute to, an accident." That in the case of the *Blenheim* the Admiralty took a similar view may be inferred from the fact that, after considering the Minutes of the Court of Inquiry, it was decided that no Court Martial upon those in charge of the *Blenheim* was needed.

A steam-vessel when towing another vessel, has, in addition to her sidelights, to carry two bright lights in a vertical line one over the other, not less than six feet apart.

A vessel which from any accident is not under command, has to carry at the same height as the ordinary mast-head light, two red lights, in a vertical line one over the other, not less than six feet apart, and of such a character as to be visible all round the horizon at a distance of at least two miles.

Pilot vessels, when engaged on their station on pilotage duty, are not obliged to carry the sidelights required in other vessels; but they must carry a white light at the mast-head, visible all round the horizon, and must also exhibit a flare-up light at short intervals, which must never exceed fifteen minutes.

A vessel which is being overtaken by another vessel must show from her stern a white light or a flare-up light, such light to be as nearly as possible on the level with her sidelights.

Besides all these and other official lights, there are now a number of private night signals, which before they are used have to be approved and registered by the Board of Trade, and may only be used at the particular place allowed by the Board. They number something like a hundred and twenty; but the following may be taken as fair specimens of the rest:—

Names and addresses of companies or lines.	Description of signals.	Where used.
Anchor Line (Henderson Bros., Glasgow).	A Red light and a White light exhibited alternately from some conspicuous part of the ship; the Red light to be so exhibited as not to be mistaken for the Red side-light carried under the regulations for preventing collisions at sea.	On and near the coasts of the United Kingdom, and on the high seas.
Castle Line (Donald Currie and Co., Fenchurch Street, London).	A Blue light burned on the bridge, followed immediately by a Roman candle throwing five blue balls to a height not exceeding 150 feet.	Anywhere within British jurisdiction, and on the high seas.
London and South Western Railway Company's Steamers (Docks, Southampton).	A Roman candle throwing out green balls to a height not exceeding 150 feet.	Off Southampton; anywhere within the Solent and Spithead; also off the Channel Islands, and on the high seas.
Cunard S.S. Co. (Water Street, Liverpool).	A Blue light and two rockets bursting into golden stars fired in quick succession.	Off Browhead, in the County of Cork, and off Queenstown Harbour, in the County of Cork.

If these signals are used in any other place, or for any other purpose than that named, they may be liable to be taken for signals of distress, and any vessel answering them would be able to claim salvage.

Sound-signals for Fog, etc.

Every steamship is by law compelled to be provided with a steam-whistle, or other efficient steam sound-signal, so placed that the sound may not be intercepted by any obstructions; and with an efficient fog-horn to be sounded by bellows or other mechanical means; and also with an efficient bell. A sailing-ship must be provided with a similar fog-horn and bell.

In fog, mist, or falling snow, whether by day or night, the following signals are to be used :—

(*a*) A steamship under way must make with her steam-whistle, or other steam sound-signal, at intervals of not more than two minutes, a prolonged blast.

(*b*) A sailing-ship under way must make with her fog-horn, at intervals of not more than two minutes, when on the starboard tack one blast; when on the port tack, two blasts in succession; and when with the wind abaft the beam, three blasts in succession.

(*c*) A steamship or a sailing-ship when not under way, is at intervals of not more than two minutes, to ring the bell.

Signals of Distress.

When a ship is in distress, and requires assistance from other ships, or from the shore, the following signals are to be used :—

In the daytime—

(1) A gun fired at intervals of about a minute.

(2) The International Code signal of distress, indicated by **N C.***

(3) The distant signal, consisting of a square flag, having either above or below it a ball, or anything resembling a ball.

At night—

(1) A gun fired at intervals of about a minute.

(2) Flames on the ship (as from a burning tar-barrel, oil-barrel, etc.)

* **N C,** "In distress—want assistance."

(3) Rockets or shells, throwing stars of any colour or description, fired one at a time, at short intervals.

By the 434th Section of the Merchant Shipping Act—

"If any master of a vessel uses or displays, or causes or permits any person under his authority to use or display, any of these signals of distress, except in the case of a vessel being in distress, he shall be liable to pay compensation for any labour undertaken, risk incurred, or loss sustained in consequence of that signal having been supposed to be a signal of distress."

The same Act provides that every sea-going passenger steamer or emigrant ship must be provided to the satisfaction of the Board of Trade—

(*a*) With means for making the said signals of distress at night, including means of making flames on the ship which are inextinguishable in water, or such other means of making signals of distress as the Board of Trade may previously approve; and

(*b*) With a proper supply of lights inextinguishable in water, and fitted for attachment to life-buoys.

"If any such ship goes to sea from any port of the United Kingdom without being provided as required by this section, then for each default in any of the above requisites, the owner (if in fault) shall be liable to a fine not exceeding one hundred pounds, and the master (if in fault) shall be liable to a fine not exceeding fifty pounds."

Life-saving Appliances.

The Merchant Shipping Act, 1894, provides that the Board of Trade may make rules for Life-saving appliances, by arranging all British ships into classes, having regard to the services in which they are employed, to the nature and duration of the voyage and the number of persons carried; and may define the number and description of the boats, life-boats, life-rafts, life-jackets, and life-buoys, to be carried by such ships.

Section 430 of this Act provides that—

"In the case of any ship—

"(*a*) If the ship is required by the rules for life-saving appliances to be provided with such appliances, and proceeds on any voyage or excursion without being so provided in accordance with the rules applicable to the ship; or

"(*b*) If any of the appliances with which the ship is so provided are lost or rendered unfit for service in the course of the voyage or excursion through the wilful fault or negligence of the owner or master; or "(*c*) If the master wilfully neglects to replace or repair on the first opportunity any such appliances lost or injured in the course of the voyage or excursion; or

"(*d*) If such appliances are not kept so as to be at all times fit and ready for use;

then the owner of the ship (if in fault) shall for each offence be liable to a fine not exceeding one hundred pounds, and the master of the ship (if in fault) shall for each offence be liable to a fine not exceeding fifty pounds."

Thus far the law. How it is possible always to enforce the law is altogether a different matter. A case in point. A short time ago a small barque was loading in the South West India Dock. She had two boats—a lifeboat on chocks amidships, and a small gig on davits on the quarter, the lifeboat being full of ropes and all sorts of gear that was put in her to be out of the way. The Board of Trade Inspector came along, and said that davits must be provided for the lifeboat. The skipper objected. He often used the gig, and he didn't want the davits altered; and he didn't want davits both on the port and the starboard sides. The inspector said that if he did not have the davits altered to take the lifeboat he would not get his clearance, so the master, having no option, reluctantly assented. The alteration was made, and in due course the barque went away to sea; but she was scarcely across the Bay before the carpenter was set to work to alter the davits back again to how they were before, whilst the lifeboat resumed its old place amidships as the receptable of all manner of odds and ends.

Draught of Water and Load-line.

Every British merchant ship, except vessels under eighty tons register, employed solely in the coasting trade, vessels employed solely in fishing, and vessels employed exclusively in trading from place to place on rivers and inland waters, is bound to be permanently and conspicuously marked with lines (called deck-lines) of not less than twelve inches in length, and one inch in breadth, painted longitudinally on each side amidships, indicating the position of each deck which is above water; the upper edge of the deck-lines being level with the upper side of the deck-plank next the waterway at the place of marking. If the ship be painted black, or of a dark colour, the lines must be white or yellow; and if the ship be painted white, or some light colour, the deck-lines must be black.

In addition to these deck-lines every British merchant ship, with the same exceptions, is bound to have, on each side, a circular disc twelve inches in diameter, with a horozontal line eighteen inches in length drawn through its centre; the colours to be the same as prescribed for the deck-lines.

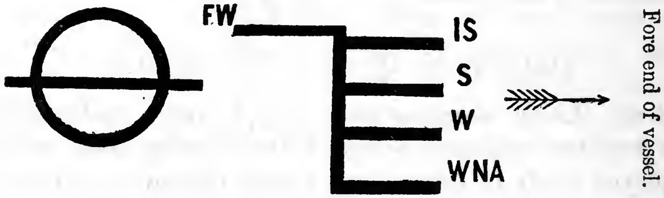
(This is what sailors call "Plimsoll's Eye.")

The centre of this disc has to be placed at such a level as may be approved by the Board of Trade, and it indicates the maximum load-line in salt water to which it is lawful to load the ship. If the ship be so loaded as to submerge, in salt water, the centre of the disc, the ship is to be deemed an unsafe ship, and may, by the Board of Trade, be detained until her loading has been so altered as to bring the centre of the disc again above the water-line.

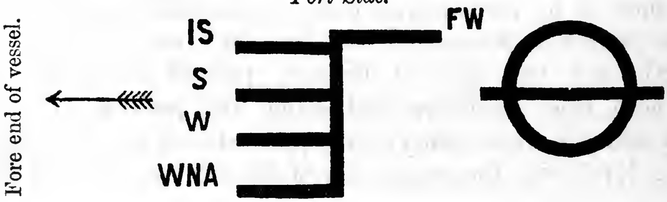
Any owner or master of a British ship failing to have his ship marked as above; or if he conceals, removes, alters, or obliterates the markings; or if he allows the ship to be so loaded as to submerge the centre of the disc;—is liable, for each offence, to a fine not exceeding one hundred pounds.

STEAMSHIP.

Starboard Side.



Port Side.



In addition to the disc referred to above, the same Act of Parliament requires all British ships, with the exceptions mentioned above, to be marked with "load-lines" in accordance with the Freeboard Tables adopted in the Act, and the Committee of Lloyd's Register are empowered by the Act to administer these tables. The markings of disc and load-lines for a steamer are here given. These lines indicate the depth to which the vessel may be legally loaded, and the letters indicate the particular circumstances of such loading, thus:—

F W (for Fresh Water).—The maximum depth to which the vessel can be loaded in fresh water.

I S (for Indian Summer).—The maximum depth to which the vessel can be loaded for voyages during the fine season in the Indian Seas, between the limits of Suez and Singapore.

S (for Summer).—The depth of loading for voyages from European and Mediterranean ports between the months of April and September.

W (for Winter).—Ditto, between the months of October and March.

W N A (for Winter, North Atlantic).—The maximum depth to which the vessel can be loaded for voyages to, or from the Mediterranean, or any European ports from or to ports in British North America, or eastern ports in the United States, north of 37° 30′ north latitude, between the months of October and March, both inclusive.

Salt water is more buoyant than fresh water, so that a vessel will float higher out of water in salt water than she does in fresh. The average weight of a cubic foot of salt water is 64 lbs., and that of a cubic foot of fresh water 62·5 lbs., so that a vessel having a moulded depth of 10 feet will rise 2 inches in passing from fresh to sea water; with a depth of 20 feet, 4 inches, and so on. The density of water varies very considerably in different parts of the world. In different ports of the United Kingdom there is a difference of 25 oz. in the cubic foot; as, for instance, in the Thames outside the Victoria Docks, where the weight of a cubic foot of water is 1000 oz., whilst at Plymouth the weight of a cubic foot of water is 1025 oz. In view of these facts, certain tables have been prepared by means of which the exact point to which any vessel may be legally loaded for any particular port can be readily ascertained.

The above regulations are the result of persistent efforts on the part of the late Mr. Plimsoll, a Liberal M.P. of ardent philanthropy, and the champion of the sailors of our Mercantile Marine who forced from Mr. Disraeli's Government, in 1875, due attention to the danger caused by the overloading of ships, and their despatch to sea in an improper condition. He drew upon himself the need of a full apology to the House of Commons by a scene of extraordinary violence, in which his zeal impelled him to denounce certain ship-owners in the House as "villains," to defy the Speaker's authority, and to shake his fist at the Treasury Bench. His anger had been aroused by the withdrawal of a Government Bill dealing with merchant shipping. Mr. Plimsoll's case, in spite of his behaviour, was strongly supported at meetings of the working-men, and in the end legislation dealt with the subject of overloading, and caused the painting of this famous "Plimsoll's Mark" on the hulls of all British merchant ships, as described above, as the limit of safe flotation for a freighted ship.

Certain Cargoes, and Dangerous Goods.

In the interests of sailors, many rules and regulations as to certain cargoes have been framed, the infringement of which is attended with very heavy penalties. For instance, if any British merchant ship employed in the timber trade arrives at any port in the United Kingdom from any port out of the United Kingdom between the last day of October and the sixteenth day of April, with a deck cargo of timber, the master of that ship, and also the owner, if he be privy to the offence, is liable to a fine not exceeding five pounds for every hundred cubic feet of wood goods so carried in contravention of this law.

In the case of grain-carrying vessels where a cargo of grain is laden on board any British ship, all necessary and reasonable precautions must be taken in order to prevent the cargo from shifting; and if these precautions have not been taken, the master of the ship and any agent of the owner who was charged with the loading of the ship, or the sending of her to sea, is each liable to a fine not exceeding three hundred pounds.

No one may send by any British vessel any dangerous goods, that is to say any aquafortis, vitriol, naphtha, benzine, gunpowder, lucifer matches, nitro-glycerine, petroleum, or any kind of explosives, without distinctly marking the nature of the goods on the outside of each package, under a penalty not exceeding one hundred pounds. In the case of a person who was merely an agent in the shipment of any such goods, and who was not aware of the dangerous nature of the goods, and who did not suspect, and who had no reason to suspect, that they were dangerous, that person is liable to a fine of ten pounds.

The Rule of the Road.

Many regulations have been laid down with a view to preventing collisions at sea, and the aggregate of these regulations form what is technically known as the "Rule of the Road"—a subject fraught with a certain amount of difficulty even to the mariner, and probably with considerably more to the lay reader. Speaking broadly, under ordinary circumstances, when two steam-vessels pass in close proximity to each other they should pass each other on the port (or left) hand, precisely as on shore when pedestrians meet, they pass each other on the left. But if our pedestrian, whenever he met another had to consider on which tack the other man was—whether he had the wind on his right hand or his left, or whether it was at his back, and had also to take into consideration a variety of other conditions, a large amount of complexity would be imported into a proceeding which we now perform intuitively. Happily, with the man in the street the direction of the wind is of no possible moment, but in the case of approaching ships—that is to say, of approaching sailing-ships—it has much to do, and necessarily enters largely into the consideration of the subject, and very materially affects the course to be pursued by either vessel.

The rules at present in force are prescribed by an Order in

Council of the 11th of August, 1884; and they have to be rigidly observed by all vessels, as, in the event of a collision, the defaulting ship is apt to find out. The following are some of these Regulations:—

"Article 14.—When two sailing-ships are approaching one another, so as to involve risk of collision, one of them shall keep out of the way of the other, as follows, viz:—

"(*a*) The ship that is running free shall keep out of the way of the ship that is close-hauled.

"(*b*) A ship which is close-hauled on the port tack shall keep out of the way of a ship which is close-hauled on the starboard tack.

"(*c*) When both ships are running free, with the wind on different sides, the ship which has the wind on the port side shall keep out of the way of the ship that has the wind on the starboard side.

"(*d*) When both ships are running free, with the wind on the same side, the ship which is to windward shall keep out of the way ot the ship which is to leeward.

"(*e*) A ship which has the wind aft shall keep out of the way of the other ship.

"Article 15.—If two ships under steam are meeting end on, or nearly end on, in such manner as to involve risk of collision, each ship shall alter her course to starboard, so that each pass on the port side of the other.

"This Article only applies to cases where ships are meeting end on, or nearly end on, in such a manner as to involve risk of collision, and does not apply to two ships which must, if both keep on their respective courses, pass clear of each other.

"The only cases to which it does apply are, when each of the ships is end on, or nearly end on, to the other; in other words, to cases in which by day each ship sees the masts of the other in a line, or nearly in a line with her own; and by night to cases in which each ship is in such a position as to see both the side lights of the other.

"It does not apply by day to cases in which a ship sees another ahead crossing her own course; or by night to cases where the red light of one ship is opposed to the red light of the other, or where the green light of one ship is opposed to the green light of the other, or where a red light without a green light, or a green light without a red light, is seen ahead, or where both green and red lights are seen anywhere but ahead.

"Article 16.—If two ships under steam are crossing, so as to involve risk of collision, the ship which has the other on her own starboard side shall keep out of the way of the other.

"Article 17.—If two ships, one of which is a sailing-ship and the other a steamship, are proceeding in such directions as to involve risk of collision, the steamship shall keep out of the way of the sailing-ship.

"Article 18.—Every steamship when approaching another ship so as to involve risk of collision, shall slacken her speed, or stop and reverse, if necessary. Every ship, whether a sailing-ship or a steamship, overtaking any other ship, shall keep out of the way of the overtaken ship.

"Where, by the above Rules, one of two ships is to keep out of the way, the other shall keep her course.

"No ship is, under any circumstances, to neglect proper precautions.

"Nothing in the above Rules shall exonerate any ship, or the owner, or master, or the crew thereof, from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper look-out, or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case." *

These rules, so far as they are applied to sailing-vessels, it will be noticed, are based upon an entirely different set of conditions from those in force for steamers, for with the sailing-ship it is only possible to move at a certain time in certain definite directions; the steamship is free to move in all directions. Take, for instance, clause (*d*) of Article 14; it is obvious that the ship which is to windward possesses a power which the ship to leeward does not, and this rule is therefore framed in accordance with that fact. The rules for steam-ships, on the other hand, are of a more arbitrary character. Article 16, for instance, might have equally well decreed that the ship which had the other on her own *port* side should keep out of the way, there being no particular virtue in the fact of her being on the starboard side any more than the port. And so with many other of the rules, all of which, however, have been the result of the most careful and the most anxious consideration.

In order that sailors might have roughly the Rule of the Road at their fingers' ends, the late Mr. Thomas Gray, C.B., Assistant-Secretary of the Board of Trade, put the principal rules into rhyme as aids to memory:—

(1) Two steamers meeting:—

"When both side-lights you see ahead,
Port your helm, and show your RED."

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* Besides the above Rules, which are of universal application, there are many other regulations of a more or less local nature, but which are equally binding upon all vessels, as, for instance: "In narrow channels every steam-ship shall, when it is safe and practicable, keep to that side of the fairway, or mid-channel, which lies on the starboard side of such ship." Thus in the River Thames outward-bound steamers ought to keep, as much as possible, on the Kentish side of the river, and homeward-bound steamers, as much as possible, next the Essex shore.

(2) Two steamers passing:—

"GREEN to GREEN, or RED to RED—
Perfect safety—Go ahead!"

(3) Two steamers crossing. (Note.—This is a position of the greatest danger, and there is nothing for it but good look-out, caution, and judgment, with prompt action.)—

"If to your Starboard RED appear,
It is your duty to keep clear;
To act as judgment says is proper;—
To Port, or Starboard, Back, or Stop her!

"But when upon your Port is seen
A steamer's Starboard light of GREEN,
There's not so much for you to do,
For GREEN to Port keeps clear of you."

(4) All ships must keep a good look-out, and steamships must stop and go astern if necessary:—

"Both in safety and in doubt
Always keep a good look-out;
In danger, with no room to turn,
Ease her! Stop her! Go astern!"

The great difficulty always is to get men to do the right thing at the right moment. It is requisite to see at once the thing to be done, and to do it. Frequently men hesitate; and if in the end they do the right thing, they do it too late, with the result, not unfrequently, of a collision. The same Mr. Gray says in one of his reports—

"Legislation cannot make careless people careful, nervous people strong, ignorant people wise, dull people bright, or sleepy people wakeful. Let them enact rules for ever, collisions will continue to happen, through ignorance, bad look-out, or carelessness, just in the same way that ships will continue to be wrecked or stranded from the same causes."

CHAPTER XXIX.

Lloyd's—Lloyd's Coffee-house in Tower Street; in Lombard Street; at Pope's Head Alley; at the Royal Exchange—The Act of Incorporation—The objects of Lloyd's—Underwriting—The great success of Lloyd's—Parliamentary inquiry in 1810—Lloyd's signal-stations—Lloyd's Register of British and foreign shipping—Classification of ships—Surveyors of Lloyd's Register—The Classification Committee—Number of ships surveyed and classed by the society.

During the seventeenth and eighteenth centuries much of the commercial business of the City of London was transacted at the coffee-houses, of which there were a considerable number in the City. Among them was one in Tower Street, kept by a certain Edward Lloyd, the earliest notice of which occurs in the *London Gazette* of the 18th of February, 1688, and this particular coffee-house was much frequented, partly for business and partly for gossip, by merchants, shippers, and others interested in matters relating to shipping and the sea. In the year 1692, Lloyd's Coffee-House was removed to Lombard Street, in the very centre of that portion of the City of London most frequented by merchants of the highest class, where it soon became the head-quarters of the maritime business of the City, and especially of the business of marine insurance; and it was from this beginning that arose that association of merchants, shipowners, underwriters, and insurance brokers now known as "Lloyd's," whose head-quarters are at the Royal Exchange, and whose agencies are to be found in every part of the civilized world.

At Lloyd's Coffee-house in Lombard Street were started the simple written "Ships' Lists," which constituted the first attempt to establish anything approaching to a system of classification of merchant shipping. After the written "Ships' Lists" had been for some years in existence, Mr. Lloyd commenced, in the year 1696, the publication of a weekly newspaper furnishing commercial and shipping news, in those days an undertaking of no small difficulty. This paper took the name of *Lloyd's News;* and although its life was not a long one, it was destined to be the precursor of the now ubiquitous *Lloyd's List,* the oldest newspaper existing in Europe at the present time, the *London Gazette* alone excepted.

In Lombard Street the business transacted at Lloyd's Coffee-house steadily grew in extent and importance, but throughout the greater part of the last century it does not appear that the merchants and underwriters who frequented the rooms were bound together by any rules, or acted under any organization. By-and-by, however, the rapid increase of marine insurance necessitated an alteration in the then existing system, and improved accommodation became absolutely necessary; accordingly, after finding a temporary resting-place in Pope's Head Alley, the underwriters and brokers finally settled down at the Royal Exchange in March, 1774, and the rooms occupied by them, which had previously been occupied by the East India Company, over the northern piazza of the old Exchange, were known, until so recently as 1820, as "Lloyd's Subscription Coffee-house."

After the final establishment of Lloyd's at the Royal Exchange, one of the first improvements in the mode of effecting marine insurance springing out of the new state of things was the introduction of a printed form of policy. Hitherto various forms had been in use; and to avoid the numerous disputes consequent on a practice so loose and unsatisfactory, the Committee of Lloyd's proposed a general form, which was finally adopted by members on the 12th of January, 1779, and which, with only a few slight modifications, still remains in use at the present day. Perhaps, however, the two most important events in the history of Lloyd's during this century were the reorganization of the association in 1811, and the passing of an Act in 1871, granting to Lloyd's all the rights and privileges of a Corporation sanctioned by Parliament.

According to this Act of Incorporation, the three main objects for which the Society exists are—first, the carrying out of the business of marine insurance; secondly, the protection of the interests of the members of the association; and thirdly, the collection, publication, and diffusion of intelligence and information with respect to shipping. In the promotion of the last-named object, obviously the foundation upon which the entire superstructure rests, an intelligence department has been gradually developed which for wideness of range and efficient working has no parallel among private enterprises in any country.

The rooms at Lloyd's are available only to members and subscribers. The latter pay a certain annual subscription, but have no voice in the management of the institution; the former consist of two classes, namely underwriting members and non-underwriting members, both of which classes also pay subscriptions varying in amount. The management of the establishment is delegated by the members to certain of their number selected as "The Committee of Lloyds." With this body lies the appointment of all officials and agents of the institution, the daily routine of duty being entrusted to a secretary and a large staff of clerks and other assistants.

Lloyd's is thus, in the first place, an association of underwriters, each of whom conducts his business according to his own views. For those views, or for the business transacted by individual underwriters, Lloyd's, as a corporation, is in no way responsible, except that the Committee of Lloyd's, before the election of any underwriting member, requires that the candidate shall place in the hands of the Committee security to meet his underwriting liabilities. For many years this custom has prevailed, and the total securities thus placed at the disposal of the Committee of Lloyd's amount to over £4,000,000. It is difficult to estimate the value of property annually insured by Lloyd's, but it probably amounts to about £400,000,000 sterling. Lloyd's, as a Corporation, and the Committee as its executive, have, however, little to do with marine insurance. Their business is to conduct the affairs of Lloyd's in its corporate capacity, to carry out the supply and distribution of shipping intelligence, and to guard as trustees the corporate funds and corporate property.

It was the wars which lasted from 1775, with but little intermission, until 1815, that raised Lloyd's to the high position which it now holds, bringing home to merchants the necessity of covering their risks as effectually as possible. High premiums adequate to high risks were offered, and merchants of wealth became insurers of property afloat. The wars had the effect of bringing foreign marine insurance from all parts of the world to Great Britain, since the security of Lloyd's then, as now, was unequalled in the world.

In the second place, Lloyd's is an enormous organization for the collection and distribution of marine intelligence. The intelligence department of Lloyd's was originally established at Lloyd's Coffee-house to meet the public desire for information with regard to vessels at sea, and the department has continually developed; indeed, during the French War the Government was often indebted to the Committee of Lloyd's for the earliest information of transactions all over the world.

The great wealth of Lloyd's, and the fortunes made there, attracted general attention, and in 1810, Parliament appointed a Committee to inquire into the affairs of the institution. From this inquiry Lloyd's emerged victoriously, and since that time it has continued to assist in the promotion of every measure which might aid in the preservation of life at sea, the prevention of fraud in connection with marine insurance, and the rapid collection and distribution of maritime intelligence to all interested.

With regard to the business of marine insurance, the mode of effecting an insurance at Lloyd's is extremely simple. The business is done entirely by brokers, who write upon a slip of paper the name of the ship and the name of the shipmaster, the nature of the voyage, the subject to be insured, and the amount at which it is valued. If the risk be accepted each underwriter subscribes his name and the amount which he agrees to take or underwrite, the insurance being effected as soon as the total value is made up. The sum paid by the insured to the underwriters is denominated the premium, a tax upon the profits of the merchant which the progress of science, of the art of shipbuilding, and of the art of navigation has, in these latter days, reduced to a very moderate figure.

Of course, it is perfectly conceivable that to a fraudulent ship-owner, supposing that it were possible for such a person to exist, who had effected a heavy insurance upon his ship, it might be advantageous that his ship should be lost; but under no possible combination of circumstances could it be other than a calamity to the underwriter that the ship which he had underwritten should go to the bottom. This being so, it has always been the aim of Lloyd's, not necessarily from motives of philanthropy, but from self-interest, to promote in every practicable way the building of ships that should not go to the bottom; and therefore, looking at it merely from this low motive, it may truly be said that this great society has done more for the safety of life and property at sea than all the Acts of Parliament put together which have ever been passed for the regulation of merchant shipping. The Corporation has its agents in every port, and there is no line of sea-coast in the whole world which is not watched by some representative of Lloyd's. Various works relative to shipping are published by the Corporation for the benefit of the mercantile community, and at Lloyd's is also maintained a "Captain's Register," showing the services of every master in the Mercantile Marine; and much confidential information of great value to underwriters is collected in the Secretary's Office for the benefit of members and subscribers to the Corporation.

At the present time, when vessels arrive much more quickly than was the case formerly, it is of great importance that the approach of ships to their ports should be known as early beforehand as possible. This information is of great value to dock authorities, who have not only to prepare berths for arriving vessels, but also, in the case of fast ocean liners, to arrange the necessary organization for landing and forwarding both passengers and mails. It is also often necessary that vessels which have been ordered to proceed to some particular port should, on account of changes of markets, or from some other cause, be intercepted and ordered as soon as possible to change their destination for another port.

For these and other reasons the Corporation of Lloyd's has within the last few years devoted much attention to the establishment of signal-stations which can forward this information inland, and can also convey orders to vessels passing the stations, not only in the United Kingdom, but also in the British Colonies and in foreign countries. These signal-stations are, too, of great value in furnishing intelligence upon which underwriters and others interested in shipping depend for the transaction of their business. Vessels arriving off outlying signal-stations often bring important intelligence as to derelicts and wrecks passed on their voyages, as also information of vessels in distress and requiring assistance. Vessels from long voyages, frequently considerably overdue, are also reported from these stations. Not one vessel in ten ever arrives now at a port in the United Kingdom without having been previously reported from one of Lloyd's signal-stations.

Vessels which on passing one of Lloyd's signal-stations in the United Kingdom hoist their ensign and signal letters are, without any charge, reported immediately in *Lloyd's List*, the *Shipping Gazette*, and various leading newspapers. When shipowners wish vessels reported to their own offices, the vessels, in passing the signal-stations have in addition to hoist the letters **P Q G** (of the International Code), meaning, "Report me to my owners." In this latter case a charge of one shilling is made, in addition to the cost of the telegram. Captains may, by leaving with Lloyd's the name and address of the person to whom the report is to be sent, have the passing of their vessel reported from signal-stations to their wives or families at the cost of the telegram if the report be telegraphed, or gratis if the report be sent by post; only it is a condition in such cases that the information is for the use of the officer's family only, and not for business purposes.

The following is a list of the signal-stations of the Corporation of Lloyd's at the present time:—

UNITED KINGDOM.

Southend.
North Foreland.
Deal.
*Dover.
Dungeness.
Beachy Head.
Nettlestone Point (I.W.) (temporarily suspended).
St. Catherine's Point (I.W.)
Anvil Point (near Swanage) (temporarily suspended).
Portland Bill.
Brixham (for Torbay).
*Prawle Point.
*The Lizard.
Alderney (temporarily suspended).
Penzance.
Scilly Islands.
Lundy Island.
Penarth (temporarily suspended).
Barry Island.
Mumbles Head.

St. Ann's Head (Milford Haven).
Calf of Man.
Roche's Point.
*Old Head of Kinsale.
*Brow Head.
Tory Island.
Inishtrahull.
Malin Head.
Rathlin Island.
Tor Point.
Kildonan (mouth of the Clyde).
Stornoway.
Lamlash.
Butt of Lewis (Hebrides).
Dunnet Head (Pentland Firth).
Fair Isle (temporarily suspended).
Peterhead.
May Island.
St. Abb's Head.
Flamborough Head.
Spurn Head.
Grimsby (temporarily suspended).
Aldeburgh.
Orford Ness.

At the stations marked * arrangements have been made to take night-signals. Night-signals made to the Dover signal-station should be shown when the vessel is as near as possible on a straight line between the Grisnez and Dover Lights. The answering night-signal used at Lloyd's signal-stations is made by flashes from a flashing-lamp. The signal to call the attention of a passing vessel is a series of continuous short flashes. The signal to intimate that a vessel's signals have been seen and recognized is a series of long-short flashes repeated as often as may be necessary. If the signal shown by a vessel has not been understood, the lamp is kept dark until the vessel repeats her signals.

ABROAD.

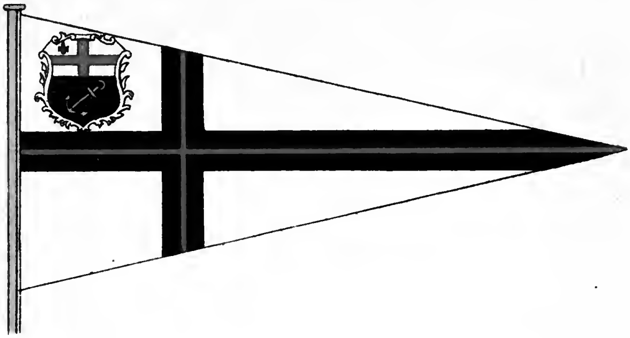
Elsinore (J. T. Lund, Reporter).
Heligoland.
Holtenau (Baltic entrance to Kaiser Wilhelm Canal).—Messrs. Sartori and Berger, Ship Agents and Reporters.
Brunsbuttelkoog (Elbe entrance to Kaiser Wilhelm Canal).—Messrs. Sartori and Berger, Ship Agents and Reporters.
Hoek van Holland (Entrance to Waterway to Rotterdam).—G. Dirkzwager, Ship Agent and Reporter.
Gibraltar.
Malta.
Dardanelles.
Port Said.
Suez.
Perim.
Aden.
Cape Spartel.
Madeira.
Ponta Ferraria } St. Michael's.
Ponta do Arnel } St. Michael's.
Fayal.
Las Palmas (Grand Canary).
St. Helena.
Ascension.
Cape Point.
Cape L'Agulhas.
Bluff (Port Natal).
Fort St. Sebastian (Mozambique).
Montserrat (W.I.).
Bermuda.
Cape Race.
Breaksea Island (K.G.S.).
Goode Island (Torres Straits).
Cape Maria van Diemen (N.Z.)
Farewell Spit (N.Z.).
Nugget Point (N.Z.).
Honolulu.

The following Table shows the number of vessels reported from Lloyd's signal-stations in the United Kingdom during the six months from the 1st of April to the 30th of September, 1897 :—

Station.	Steam.		Sailing.		Yachts.	Total observed.
	Ocean-going.	Coasting.	Ocean-going.	Coasting.		
Southend	2,363	3,361	1,293	1,847	850	9,714
North Foreland ...	2,016	1,678	406	1,385	645	6,130
Deal	3,384	1,880	590	1,437	339	7,620
Dover	6,608	1,655	2,348	2,016	575	13,202
Dungeness	6,668	2,838	1,869	2,116	354	13,845
Beachy Head	2,856	2,002	806	1,555	410	7,629
Nettlestone Point ...	817	704	144	666	1,490	3,821
St. Catherine's Point	5,606	1,591	1,425	1,883	301	10,806
Anvil Point	4,957	3,436	2,387	4,149	1,463	16,392
Portland Bill	613	288	98	200	467	1,666
Brixham	10	37	31	134	69	281
Prawle Point	3,369	2,905	1,375	1,849	969	10,467
Lizard	2,766	5,222	949	2,218	263	11,418
Scilly	1,127	5	178	4	1	1,315
Alderney	1,366	84	115	222	22	1,809
Lundy Island	478	1,399	370	749	16	3,012
Penarth	1,920	992	498	985	5	4,400
Barry Island	6,197	3,026	888	1,905	104	12,120
Mumbles Head ...	459	623	36	485	1	1,604
St. Anne's Head ...	620	3,473	227	2,850	111	7,281
Calf of Man	No	returns	yet.			
Kildonan	963	2,646	158	494	321	4,582
Butt of Lewis	306	6	32	4	2	350
Dunnet Head	1,055	237	158	148	24	1,622
Fair Isle	36	45	112	23	3	219
Peterhead	1,013	2,004	558	1,897	32	5,504
May Island	311	282	352	84	4	1,033
Inchkeith	893	1,099	739	156	88	2,975
North Queensferry ...	1,476	763	693	307	—	3,239
St. Abb's Head ...	1,553	1,026	323	196	37	3,135
Hartlepool	No	returns	yet.			
Whitby	834	399	156	176	12	1,576
Flamborough Head...	1,761	3,327	99	873	7	6,067
Spurn Head	1,122	143	80	210	2	1,557
Grimsby	262	18	4	5	1	290
Cromer	2,365	4,278	836	1,978	25	9,482
Winterton	6,471	9,826	657	3,563	26	20,543
Bacton	3,413	5,886	293	1,785	7	11,384
Aldeburgh	9,088	12,553	3,213	4,452	504	29,810
Orfordness	3,886	12,882	2,845	5,797	520	25,930
Roche's Point	471	594	244	228	51	1,588
Old Head of Kinsale	691	71	74	132	—	968
Brow Head	585	298	73	116	9	1,081
Tory Island	264	444	82	176	—	966
Malin Head	358	404	72	215	2	1,051
Inishtrahull	No	returns	yet.			
Rathlin	466	182	222	49	5	904
Tor Point	600	931	275	246	52	2,104
Burr Point	737	1,927	271	812	223	3,970

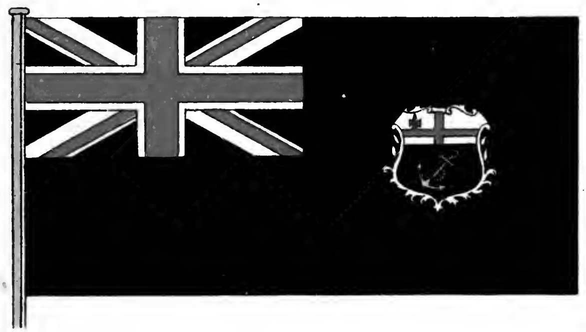
LLOYD'S BURGEE FOR BOATS.

(SANCTIONED BY ADMIRALTY.)

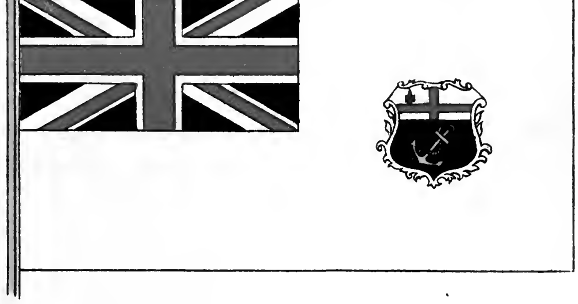


LLOYD'S FLAG FOR BOATS

(SANCTIONED BY ADMIRALTY WARRANT.)



LLOYD'S FLAG FOR SIGNAL STATIONS.



Besides the benefits of this institution in the protection of the interests of merchants and of shipowners from the accidents and the losses of navigation, the public spirit which on a great variety of occasions has been displayed by Lloyd's in rewards and honours to brave sailors who have risked their lives in saving others, and in the event of their death while so engaged in charitable relief to their unfortunate widows and orphans, entitles this unrivalled association to rank among the greatest monuments of British philanthropy, as well as those of commercial enterprise and honour.

Lloyd's Register of British and Foreign Shipping.

Lloyd's Register of British and Foreign Shipping is a society entirely distinct from Lloyd's, although an offshoot from that institution, voluntarily maintained by the shipping community, having its headquarters at White Lion Court, Cornhill, London. It was established in 1834, by the amalgamation of "The Register of Shipping," founded in 1760, with "The New Register Book of Shipping," founded in 1799. Its principal functions are, first, the surveying and classification of merchant vessels, yachts, etc., both new and old; secondly, the annual publication of a Register Book and a Yacht Register; thirdly, the supervision of the testing of anchors and chains under the provisions of the Chain Cables and Anchors Acts; fourthly, the supervision of the testing at the manufactories of the steel intended for use in the construction of ships and boilers; also of large ship and engine forgings and castings; and fifthly, the assignment of freeboard to vessels of all types under the Merchant Shipping Act of 1894. The Register Book contains very full particulars of all vessels classed by the society, and also particulars of all other sea-going vessels of every country of the world, of 100 tons and upwards. This Register is in all respects a most remarkable publication. Designed mainly to meet the demands of the shipping and mercantile communities throughout the world, and thus to serve all the purposes of an International Register and Directory of Shipping combined, it necessarily partakes largely of the character of a business book of reference. It gives particulars of vessels which in the aggregate represent over twenty-six million tons of shipping. No country is too insignificant, none too distant to be passed over, a small state like Costa Rica appearing, with its one steamer of 592 tons, side by side with the United States of America, with her 780 steamers, and 2370 sailing-ships, representing in all 2,448,677 tons.

When, in the "Register of Shipping" of 1760, the classification of ships was first attempted, the vowels, A, E, I, O, and U, were employed to denote the relative quality of the hulls, and the letters G, M, and B (meaning Good, Middling and Bad) to denote the quality of the equipment. Later, the figures 1, 2, 3 and 4 were used in reference to the equipment, the well-known symbol A1 indicating a first-rate vessel with a first-rate equipment, first appearing in the Register for 1775–76. When a ship had so far deteriorated as not to be admissible in any class, she was said to be "off the letter." This Register continued until 1799 to be the only record of the age, burthen, build, quality, and condition of British vessels, and its authority in great measure governed the shipper and the underwriter in the freighting of goods, or in the matter of insurance; and it also largely regulated the value of the ships themselves.

About the time that the underwriters of Lloyd's shifted their quarters from Lombard Street to Pope's Head Alley an alteration was made in the system of classification of ships which caused much dissatisfaction, and eventually led to the establishment by shipowners of a rival Register. The existence of two competing associations was found, however, to be fraught with much inconvenience, and both were ultimately threatened with a financial collapse. Still the two Registers remained in concurrent circulation until 1834, when they were at last merged in "Lloyd's Register" on its present basis. Even the new society in its early years was not exempt from financial trouble. Within two years from its establishment the number of subscribers dwindled from 721 to 615, and in 1836, when Christmas came round, the then chairman, Mr. Thomas Chapman, who held that position for close upon fifty years, had to put his hand in his pocket to provide the salaries of the staff. This, however, was the "darkest hour before the dawn," for prosperity soon after attended the Committee's efforts, and such a state of things never recurred.

At the present time wooden ships of the highest grade are classed A for a term of years, subject to occasional, or annual surveys when practicable, also to *half-time or intermediate* special surveys. They are eligible for continuation or restoration of their character for further periods upon special surveys described in the rules of the society. Of course, the construction of wooden vessels has now been practically abandoned in the United Kingdom.

Wooden ships which have passed the period assigned on the A character on original survey, or on continuation or restoration surveys, or which did not have an original character, may be classed A in red. These are subject to annual survey and to the half-time survey prescribed in the Rules. A lower class is denoted by the symbol Æ. Vessels so classed are considered to be fit for the conveyance of dry and perishable goods on *shorter voyages* than the higher classed vessels. They must be submitted to annual survey and to special survey within periods not exceeding *four* years.

Steel and iron ships are classed by the society A with a numeral prefixed, thus: 100A, 95A, 90A, and so on; also A without a numeral *for special trades.* These numerals are for comparative purposes only, and do not denote terms of years. Under former regulations many vessels still in existence were classed ✱$\frac{\text{A}}{\text{A}}$, $\frac{\text{A}}{\text{A}}$, $\frac{\text{A}}{\text{B}}$, and $\frac{\text{A}}{\text{C}}$, and in such cases these old symbols have been maintained. Vessels retain their characters so long as, on careful annual surveys and periodical special surveys, they are found to be in a fit and efficient condition to carry dry and perishable cargoes.

To carry out the work of these surveys Lloyd's Register employs a very large staff of surveyors, not only in London, but at all the outports in the United Kingdom, and at all the principal ports of foreign countries and the colonies; the number in the United Kingdom alone being 156. With two or three exceptions at certain minor ports, all these surveyors in the United Kingdom, as well as many of those at the more important foreign ports, are exclusively the officers of the society, and are not permitted to engage in any other business or employment whatsoever. Their duties may be briefly defined as follows:—

1. To carry out and report to the Committee all surveys (during the construction and afterwards) required on the vessels, or their engines and boilers, under the society's rules; and upon these reports is based the classification of the ship.

2. In cases of damage to vessels to hold special surveys to ascertain the extent of the damage, and to recommend the necessary repairs.

3. To carry out tests of steel, large forgings and castings, etc., at manufactories.

4. To make measurements and surveys required in order to enable the Committee to assign freeboard under the Load Line Act of 1890, which is now embodied in the Merchant Shipping Act of 1894.* Nearly 10,000 such freeboards have been assigned by the Committee.

The Committee of Lloyd's Register when first appointed, in 1834, numbered 26 members, who were all drawn from London alone; now the Committee numbers 58 members, composed of merchants, shipowners, and underwriters, representative of all the principal shipping ports of the country, and thus apportioned:—London, 26; Liverpool, 8; Glasgow, 6; the Tyne, 3; the Wear, 2; Hartlepool, 2; Cardiff, 2; Leith, 1; Greenock, 1; Hull, 1; Bristol, 1; Aberdeen, 1; Belfast, 1; Dundee, 1; Newport and Swansea, 1; and the Tees Ports and Whitby, 1.

The Classification Committee of Lloyd's Register meets twice a week, and deals in the course of the year with something like sixteen thousand cases of vessels arising upon reports of surveys from the society surveyors in all parts of the world. Most of the shipping now under construction in the United Kingdom, as well as a large amount of tonnage in progress abroad, is being built under the direct supervision of the society's surveyors, with a view to classification by the Committee.

* Merchant Shipping Act, 1894, section 443.—"The Board of Trade shall appoint the Committee of Lloyd's Register of British and Foreign Shipping . . . to approve and certify on their behalf from time to time the position of any disc indicating the load-line, and any alteration thereof, etc."

At the present time, when all, or nearly all, vessels are constructed of either steel or iron, it is interesting to note that only twelve years ago the publication of Lloyd's Register contained notices of no less than five wooden vessels built in the last century, and which were then still afloat and in use; the oldest of these being the British barque *Truelove*, of 285 tons, which was built at Philadelphia, U.S.A., as far back as the year 1764. Such instances of the longevity of wooden ships are, however, quite exceptional.

Besides British ships a very large amount of foreign shipping is included in Lloyd's Register; but in addition to Lloyd's Register there are eight other societies which perform the same duties and carry out the same functions in foreign countries as Lloyd's Register does in the United Kingdom. None of these societies, however, do anything like the amount of business that is conducted by Lloyd's Register, as may be seen from the following table for the year 1898:—

Name of classification society.	Sailing-vessels.	Steamers.	Total number of vessels classed in each Register.
Lloyd's Register *	2411	6507	8918
British Corporation...	145	361	506
Bureau Veritas (France)	3674	1514	5188
Germanischer Lloyd (Germany) ...	747	759	1506
Nederlandsche Vereeniging van Assuradeuren (Holland) ...	40	51	91
Norske Veritas (Norway)	1717	495	2212
Record of American and Foreign Shipping (United States) ...	1153	192	1345
Registro Italiano	690	200	890
Veritas Austro-Ungarico (Austria)	1017	94	1111

* These figures exclude vessels classed in the society's Yacht Register.

[illegible]

INDEX

(*The names of vessels are printed in Italics.*)

THE END

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