# THE BIRTH OF ARMOURED SHIPS

BY THE LATE
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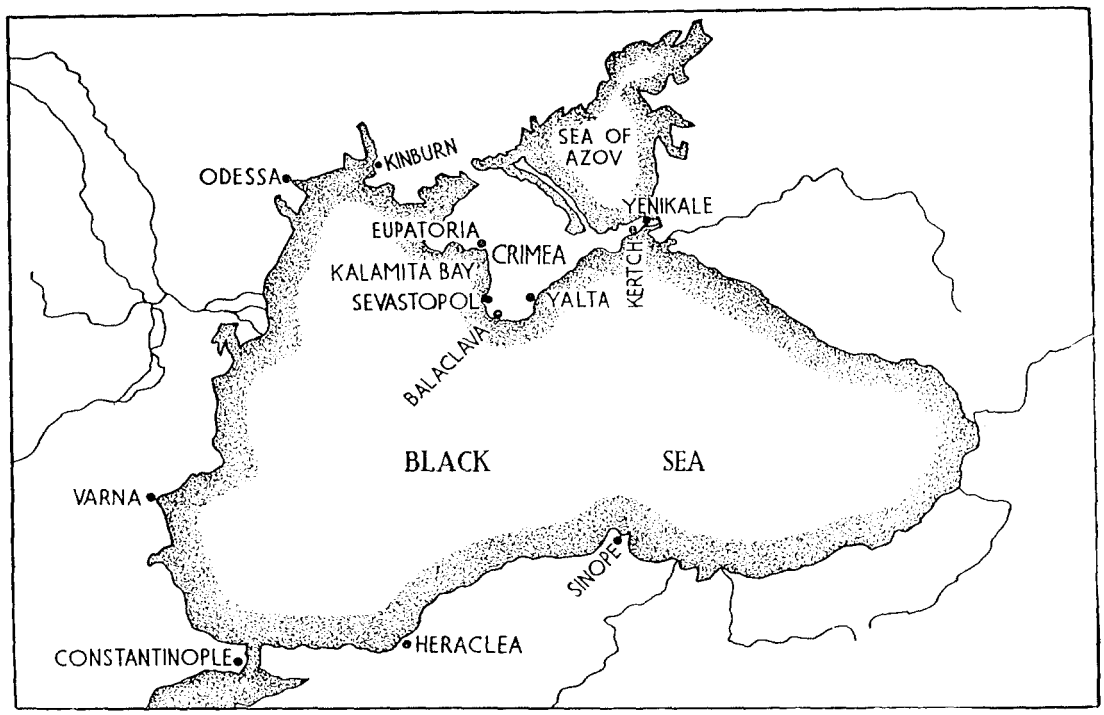
To some readers the days of the wooden warship and of the pioneers of armoured ships may seem very remote, but when I joined the Chatham Reserve in 1895 I messed in one wooden ship, slept in a second and got my orders from an office in a third, alongside which lay the ' floating factory ' *Chasseur*, while Crimean gunboats plied on the Medway. In 1900 I served under Admiral Seymour in North China and two years later was appointed an instructor at Dartmouth, where for three years I spent much of my time in the 120-gun ship *Britannia*, launched as the *Prince of Wales*, and in the 78-gun ship *Hindostan*, much of the oak and teak of which is incorporated in the London ' Tudor ' shop of Messrs Liberty. After attending in August, 1905, the last prize-giving in the famous old training ship, I was sent to Bermuda and there, in the shelter of Ireland Island, was the *Terror* with the shipbreakers aboard. She had crossed the Atlantic in 1859, presumably under tow, and had long served as a depot ship. In 1905 the shipbreakers were removing the armour, the wrought iron for which had been made in puddling furnaces and the plates fashioned under steam hammers 50 years before.

The Russo-Turkish War, generally referred to as the Crimean War, in which France and Britain joined forces against Russia to preserve the integrity of the Ottoman Empire, lasted from the spring of 1854 to that of 1856. The first great war since the days of Napoleon, it was entered upon without due preparation and, in the words of Sir George Trevelyan, exposed the utter incompetence of the higher command, the lack of organization and staff work, and the deficiency of commissariat and medical provision, forming a remarkable contrast to our commercial and industrial efficiency.

Fortunately the Navy was somewhat better prepared than the Army, but there were many lessons to be learnt and the experiences of those two years brought about a complete revolution in naval tactics and naval architecture. In spite of the progress made in steam navigation, hitherto the majority of naval officers and master shipwrights had never pictured the supersession of the great wooden three-decker as the principal fighting unit, but the war sounded the knell of both sailing and wooden ships for war. From the naval point of view the war was unusual in that the Russian Black Sea Fleet which, in November, 1853, had destroyed the Turkish ships in Sinope, withdrew to the shelter of the harbour of Sevastopol, while the Russian ships in the Baltic never challenged the British and French fleets.

The tasks of the combined navies were therefore not those of fighting at sea and maintaining the command of the oceans, but those of protecting transports, conveying troops, covering landing parties and bombarding fortifications. Just as many a regiment bears among its battle honours the names of Alma, Inkerman and Balaclava, so the battle honours of ships include the names of Odessa, Sevastopol, Kertch, Kinburn, Bomarsund and Sveaborg. Besides the campaigns in the Black Sea and Baltic there was also considerable activity in the White Sea and the North Pacific. At that time Alaska was still a Russian province.




THE BLACK SEA WHERE NAVAL OPERATIONS A HUNDRED YEARS AGO FORCED THE DEVELOPMENT OF NAVAL ARCHITECTURE.

## ARMOURED FLOATING BATTERIES

Some idea of the growth of our naval forces owing to the war can be gleaned by recalling two reviews held at Spithead by Queen Victoria. In March, 1854, the Queen and Prince Albert inspected and watched the departure for the Baltic of the squadrons under the command of the veteran Admiral Sir Charles Napier (1786-1860), consisting of fifteen vessels all fitted with steam engines. Two years later Her Majesty held another review. This time there were no fewer than 240 vessels present. There were wooden sailing ships, wooden auxiliary-screw ships, wooden paddle-wheel frigates and corvettes, iron troop-ships, an ammunition ship, a hospital ship, a floating factory, numerous mortar vessels, some of which were self-propelled, over a hundred shallow-draught iron gunboats and also four armoured floating batteries. Here was something entirely novel, for these included the *Erebus*, built on the Clyde by Robert Napier, and the *Terror*, built on the Tyne by Charles Palmer. These ships had iron hulls and iron armour 4½ in thick. They were 186 ft long, 48½ ft wide, had a displacement of about 1,900 tons, engines developing about 400 h.p., and each carried 16 guns. Of some similar craft it was said that ' they will neither sail, steam nor steer ', but the *Erebus* and *Terror* were the forerunners of Ericsson's *Monitor* and our own mastless *Devastation*.

At the beginning of 1854, our Mediterranean Fleet included eight sailing line-of-battleships mounting a total of about 800 guns, two 50-gun sailing frigates, the 90-gun screw-ship *Agamemnon*, the 70-gun screw-ship *Sans Pareil*, and some 15 steam frigates and sloops, the finest of which was the *Terrible*, a paddle-wheel vessel of 3,000 tons and 2,000 h.p. with 16 guns. The Commander-in-Chief, who flew his flag in the 120-gun ship *Britannia*, was Vice-Admiral James W. D. Dundas (1785-1862), while the Second-in-Command was Rear-Admiral Sir Edmund (afterwards Lord) Lyons (1790-1858), whose flag was flown in the *Agamemnon*. Both in this ship and in the 121-gun screw-ship *Royal Albert* to which the flag was transferred in February, 1855, Lyons

had as his flag captain the progressive and capable Captain (afterwards Admiral Sir) William Robert Mends, and it is in his ' Life ', by his son, that the reader will find a full account of the work of the Navy in the Black Sea. Mends was born in 1812 and died in 1897. As a flag lieutenant at Malta he studied steam under Thomas Hamshaw, who for 37 years was chief engineer of Malta Yard, and he was singularly free from the prejudices of many of his contemporaries.

The first serious naval action in the Black Sea after the declaration of war was the bombardment of the busy port of Odessa on April 22nd. The action began about 6.30 a.m. and lasted till 4 p.m., the British paddle-wheel frigates *Sampson*, *Retribution*, *Tiger*, *Furious* and *Terrible*, and the French steam ships *Mogador*, *Vauban* and *Descartes* playing the leading part. 'A pretty episode resembling olden days ', wrote Seymour, ' took place on the *Arethusa*, a 50-gun sailing frigate, standing in under sail and engaging the outer batteries, this being I believe, the last time that an English man-of-war was ever in action under sail.' On this occasion Mends was temporarily in command of the *Arethusa*. A few weeks later the *Tiger* had the misfortune to run aground under the Russian batteries and became a total loss. '

### 50,000 MEN LANDED

While these things were happening, the allied armies were assembling on the shores of Turkey and Bulgaria and early in September some 50,000 British, French and Turkish troops were taken aboard and were successfully landed at Eupatoria and Kalamita Bay to the north of Sevastopol, over 400 vessels being employed. The battle of the Alma was won on September 20th. Six days later our ships took possession of the harbour of Balaclava, and on October 17th the first great bombardment of Sevastopol took place. A sketch of the plan of attack given in the *Life of Mends* shows six Russian ships sunk across the mouth of the harbour and the allied fleets disposed in an arc outside, with 17 British ships to the north and 13 French and Turkish ships to the south. It was on this occasion that our sailing line-of-battleships were towed into action by steam vessels lashed alongside, a practice long advocated but never before put put to the test. With their superior manoeuvring power the *Agamemnon* and *Sans Pareil* were able to engage the forts at short range, but both suffered severely. The log of the *Agamemnon* shows that she began firing about 1 p.m. and withdrew about 5.30 p.m. She had four men killed and 25 wounded, much of her rigging had been shot away, her sides and decks were ripped up by shell fire, she had twice been on fire and had 40 shots sticking in her sides. In a letter dated October 18th, Mends began :' The plan of attack was as ill-contrived as could be,' and towards the end wrote, ' Thus ended the naval attack upon Sevastopol for the present, nor do I think another will be tried, so futile are the efforts of ships against batteries, unless they can get very close to them . . ' It was nearly a year before the fortress fell to the allied armies.

Severely as some of our ships had suffered from fire from the forts, on November 14th-16th the Fleet passed through the ordeal of a hurricane during which some forty vessels were lost ; these including the French ship-of-the-line *Henri Quatre*, a Turkish ship-of-the-line and the new P. &. O. *Prince*, a fine new iron steamer. In the *Terrible* the water flooded the stokehold, putting out some of the fires, but the situation was saved by the Chief Engineer, Andrew Douglas, lifting the stokehold plates so that the water could flow into the bilges, whence it was pumped by the air pumps of the main engines, which, like all engines at that time, had jet condensers. Describing his experiences in the *Agamemnon*, Mends wrote that ' I soon had a third anchor down and kept the engines going to ease the cables which, thanks to James Watt, enabled the good ship *Agamemnon* to ride easily.'

## SUBMARINE TELEGRAPH CABLE

During the year 1855 the war proceeded with fluctuating fortunes, but there was always great activity around the coasts of the Crimea. The new mortar boats and shallow-draught gunboats began to arrive and there was an endless stream of transports and store ships. In January, Admiral Lyons succeeded Admiral Dundas as Commander-in-Chief and in February, with his staff, took up his quarters in the *Royal Albert*. In April, Mends records the laying by Captain (afterwards Vice-Admiral) T. A. Spratt (1811-88) of the *Spitfire*, of 300 miles of submarine cable which brought London and Balacalva into direct telegraphic communication. Spratt, who was the principal surveying officer in the Fleet, was afterwards elected a Fellow of the Royal Society.

The month of May saw the expedition to the Sea of Azov, when Kertch and Yenikale were captured with much machinery and some 12,000 tons of coal. Our shallow-draught gunboats then destroyed all Russian shipping in the inland sea, thus cutting off supplies for Sevastopol. The great fortress itself fell in September and then followed the allied attack on the forts at Kinburn at the mouth of the River Dneiper. Some 50 steam warships were engaged in this attack, including the three French wooden-hulled iron-armoured 'floating batteries' *Tonnante*, *Lave* and *Devastation*. 'They were,' wrote Clowes, 'the earliest armoured steam ships and their appearance in action marks the first beginning of perhaps the greatest revolution which has ever been experienced in the science of naval warfare.' The forts at Kinburn were easily destroyed and after the action Mends wrote, 'The French floating batteries are perfect ; the shot struck against them in many places, but simply indented the iron a trifle and shell broke against them as glass. It has been a good experiment ; now Cronstadt and Sveaborg are doomed ; nothing can save them.' In this action, the French for the first time in naval warfare, used searchlights with parabolic mirrors, the current for which was supplied by primary batteries.

While the memoirs of Mends and Seymour give an insight into the work of the Navy in the Black Sea, the *Life and Letters of Admiral Sir B. J. Sulivan* (1810-90) contains much about the ships in the Baltic. In 1854 Sulivan was in command of the little *Lightning*, the first steam vessel commissioned in the Navy. She was then employed on surveying but was sent to the Baltic. On reporting himself to Admiral Napier he was met with the remark that he 'did not know what he had come out for, or what was the use of a surveying ship, unless to make a fire ship of.' Napier was then 68 years of age and had lost the vigour of the days when he stormed at the Admiralty for their ignorance of the benefits of steam power, but the *Lightning* proved of great service and one of the illustrations in the *Life of Sulivan* shows her leading the *Edinburgh*, *Hogue*, *Amphion*, *Blenheim* and *Ajax* through the channels of the Aland Islands for the assault on Bomarsund, which was captured on August 15th, 1854. In his letters, Sulivan refers to the coal question, the merits and demerits of ships, the health of the crews, and he emphasizes the importance of a supply of fresh water. Another officer, Admiral Moresby, records how the aged Napier went aboard the *Driver* to make a reconnaisance but fell asleep in one of the chairs thoughtfully provided and that the engines were equally thoughtfully stopped till he awoke ; no doubt a unique episode in naval engineering history. When next spring our ships again left for the Baltic they were under the command of Rear Admiral Richard Saunders Dundas (1802-61).

## MAINTENANCE OF MACHINERY

The employment of numerous steam vessels of various types in warfare raised many problems, among which was the maintenance of the machinery of both warships and transports. There were no dockyards available in the Black Sea

and Baltic and this led to the appointment as Inspector of Machinery on Admiral Lyons's staff of Thomas Baker, whose whole career had been passed in the Service and who for a long time had been chief engineer of the Royal Yacht *Victoria and Albert*. From evidence Baker gave before a committee in 1858 it is learnt that workshops were erected at Kazatch Creek, to the west of Sevastopol, that lathes and forges were landed from ships ; boilers, engines and tools obtained from Kertch ; mechanics sent out from Woolwich and Portsmouth ; and another workshop set up at Constantinople.

At Baker's suggestion the Admiral applied for a ' floating workshop ', but though nothing came of this the War Office sent out the converted collier *Chasseur*, equipped with tools and in charge of the youthful but vigorous Robert Samuel Fraser (1829-83), The *Chasseur* reached Balaclava in September, 1855, and proved of great value to both the Army and Navy. After the war her name appeared in the Navy List. While Baker was busy with repairs in the Black Sea, Chief Engineer John Ward was similarly employed in the Baltic, to which our first repair ship was sent. Ward's evidence in 1858 shows that he had to deal with various defects such as broken pistons and slides, bent rods and defective shafts.

### STERN-GLAND WEAR

In many screw-ships, especially those with lifting propellers, a common defect was the rapid wear of the stern shaft and propeller bearings, a defect which it was beyond the capacity of any repair ship to remedy, and one which sometimes restricted the use of the engines. Naval vessels had their iron stern shafts fitted with brass sleeves which ran on brass bearings. The rapid wear of these bearings combined with the vibration of the screw and the working of the ship's timber in a seaway occasionally led to serious trouble. A remarkable example of this was seen in the *Royal Albert* when on passage from the Black Sea to Malta in December, 1855, when, through the rapid wear at the stern, water poured into the ship through the stern gland. To save her she was beached bow first on an island in the Aegean while the carpenters built a cofferdam inside the ship. For four days she lay beached, the main engine, like the *Terrible's*, being used to keep the water down. A model of this cofferdam was preserved at Greenwich. It was John Penn who, in 1854, solved the problem of the stern-tube bearing by the use of lignum vitae as we have it today, one of the first ships fitted being H.M.S. *Himalaya*, the finest iron steamer afloat, which had been built for the P. & O. and taken over by the Admiralty as a transport.

Another problem of the day, when consumption per horse-power was high and stowage small, was the supply of coal. At the beginning of the Crimean War coal at Constaninople was 65s. a ton, but through a visit of the officers of the *Spitfire* to mines at Heraclea in Asia Minor, arrangements were made for coal to be carried by mule to the coast at about 20s. a ton. Baltic ships, with the exception of the flagship *Duke of Wellington*, used North Country coal, the smoke from which while ships were in action or passing through narrow channels proved intolerable. The flagship however was supplied with Welsh coal and so were some of the French ships, and the gradual replacement of North Country coal by Welsh coal was largely due to the efforts of John Nixon (1815-99), the pioneer of the Welsh coal industry. It was he who persuaded the French Navy to use it and for many years engine-room registers in the Royal Navy contained the words ' Nixon's Navigation '.

### ROYAL DOCKYARDS

There was great activity in the British yards during the war. In 1854 there were no fewer than 40 wooden vessels, great and small, under construction in the seven Royal Dockyards, Pembroke alone having 12 in hand. Equally great

was the activity in the marine engineering shops at Lambeth, Greenwich, Deptford and Millwall. The Thameside works had almost a monopoly of naval engineering work. Penn's beautiful oscillating paddle-wheel engines and horizontal trunk engines were admired by all but were rivalled by Maudslay's ' Siamese ' engines, as seen on the *Terrible*, and their horizontal return connecting-rod engines. The *Duke of Wellington* was one of the few ships not engined on the Thames. Of 6,000 tons and 2,500 h.p., her engines were built by Robert Napier. These had two horizontal cylinders, nearly 8 ft in diameter, $4\frac{1}{2}$-ft stroke, driving a spur wheel $10\frac{1}{2}$ ft in diameter which geared into a wooden-toothed pinion $4\frac{1}{2}$ ft in diameter and nearly $4\frac{1}{2}$ ft wide on the propeller shaft. At this time boiler pressures were seldom over 20 lb/sq in.

## STANDARDIZATION AND MASS PRODUCTION

The capacity of both yards and shops was put to the test when it was decided to build mortar boats, floating batteries and more than a 100 shallow-draught gunboats. The last were given high-pressure non-condensing engines. Penn, being consulted as to the supply of machinery, adopted the methods of standardization and mass production, distributing patterns of the various parts of the engines to different firms and assembled the engines at Greenwich. Much the same was done by Maudslay's at Lambeth, who during 1854-56 supplied the Navy with about 90 sets of machinery. Penn's list ran to 120 sets. Other well-known marine engineers on the Thames were Miller and Ravenhill, Seaward and Capel, J. and G. Rennie, and Edward Humphrys, the founder of Humphrys and Tennant of Deptford.

Though the war had shown the unsuitability of sailing and wooden ships, it was not to be expected that old and established practices would be readily abandoned, and for at least five years after the war, the British Admiralty, and for a long period the French Authorities, continued to construct wooden ships, some of which, however, were armour-plated. In any case, whatever was done the work of the Navy could not be carried on with craft like the *Erebus* and *Terror*, and naval architects had to work out designs for seagoing iron ships. Then, too, by no wave of a wand could sawyers and shipwrights be turned into platers and riveters. So it came about that our largest wooden ship, H.M.S. *Victoria*, was not launched until 1859. With a displacement of about 7,000 tons she had engines of 4,200 h.p., carried 121 guns and a complement of 1,120 officers and men. In her and her sister ships, said Sir William White, ' was embodied not merely the accumulated experience of centuries in hulls, rigging equipment and armament, but that of nearly half a century of marine engineering.'

Obsolescent when completed, the *Victoria* yet served as flagship in the Mediterranean from 1864 to 1867. By that time Napier had built the iron-hulled iron-armoured frigate *Black Prince* of 6,000 tons and 5,000 h.p., her sister ship the *Warrior* had been built at the Thames Iron Works, and with the laying of the keel of the *Achilles* (6,000 tons) at Chatham, in 1861, iron-shipbuilding was begun in the Royal Dockyards. Moreover, by the sixties, John Brown had shown how armour plates could be rolled instead of hammered; Krupp, Armstrong, Whitworth and others were revolutionizing the making of guns ; marine engineers were talking of high-pressure boilers, compound engines and surface condensers ; and in his inaugural address to the Institution of Naval Architects, Dr. Woolley said that 'it was essential for naval architects to drink deeply of the well of scientific truth and to be imbued largely with the spirit of philosophical enquiry.' The effect of the war on technical advances was far-reaching and partly to its influence can be traced the foundation of the Institution of Naval Architects in 1860, and that of the Royal School of Naval Architecture and Marine Engineering at South Kensington, London, in 1864.