

THE ROYAL NAVY IN THE CRIMEAN WAR

TECHNOLOGICAL ADVANCES

BY

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ABSTRACT

The Crimean war for the navies was one of technical innovation with the first use of whole fleets of steam ships, shell-firing guns, rifled guns, armour and mines. Both the French and British built numbers of specialized coastal attack craft. This article outlines the operational history and emphasize the technical aspects.

Introduction

The Crimean War takes its name from the main theatre of fighting on land. For the navies it was a world war with the main effort in the Baltic and smaller squadrons in the White Sea and Pacific. It was a war, typical of the 19th Century and of today, in which the flexibility of sea power was used against the land.

The war brought the two largest fleets (those of Britain and France) into conflict with the third (that of Russia). Overall, the Allied strength seemed overwhelming (TABLE I). Since the Allied fleets were deployed far from their home base, their local superiority in numbers was much less than the numbers suggest. On the other hand, the Allies had the only steam battle fleet which, it was soon appreciated, had made sailing fleets obsolete.

TABLE I—*The Fleets in 1850*

	<i>Britain</i>	<i>France</i>	<i>Total Allied</i>	<i>Russia</i>
Line of battle	86	45	131	43
Frigates	104	56	160	48

The Outbreak of War

The main cause of the war was Russia's old dream of direct access to the Mediterranean. The weak state of Turkey seemed to provide an opportunity, and excuses were contrived from alleged persecution of minorities in the Turkish Empire¹. After a number of unsuccessful diplomatic exchanges, the Russian Army invaded Moldavia (now partly in Bulgaria and partly in USSR) on 2 July 1853 and, after more negotiations, Turkey declared war on 5 October.

The British and French response was cautious. The British fleet had moved towards the Dardanelles in June but not until October did the combined Allied fleet arrive at Constantinople. A few ships went into the Bosphorus but did not enter the Black Sea.

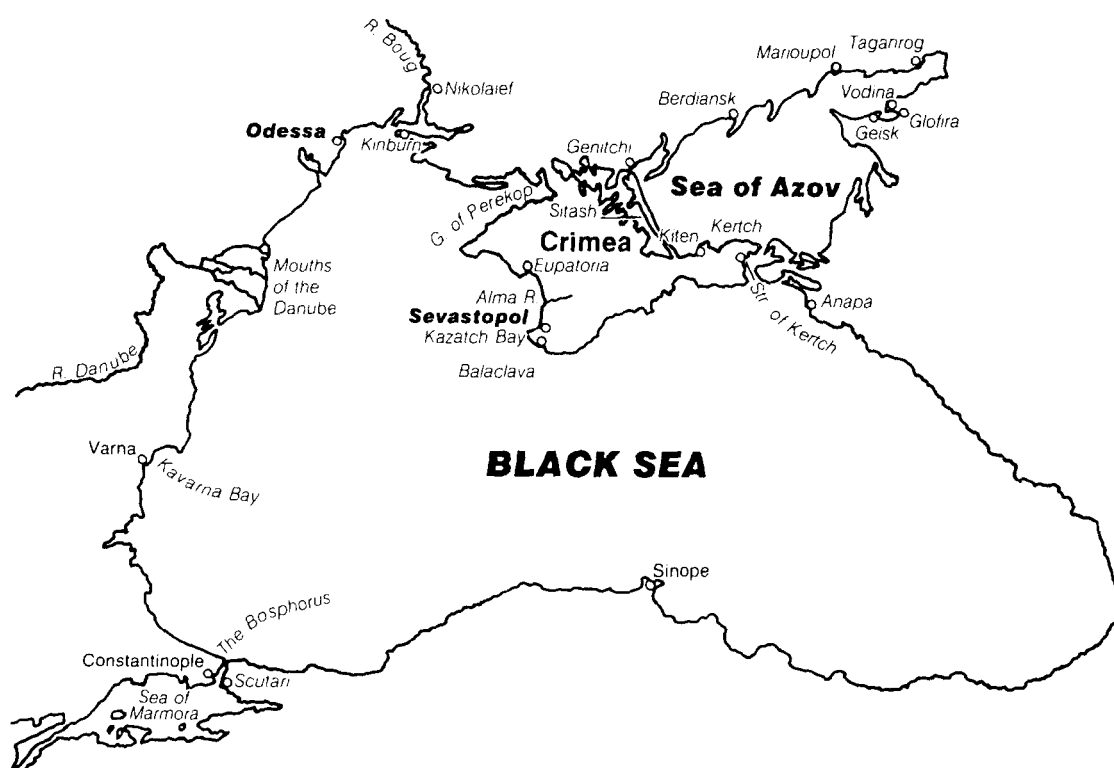


FIG. 1—THE BLACK SEA

Sinope

The fighting between Russia and Turkey appeared to be limited to Moldavia and there was a tacit truce elsewhere. The Turkish Admiral cannot have expected to fight when he anchored his frigate squadron off Sinope on the southern coast of the Black Sea (FIG. 1) in early November. He had 6 frigates, with his flag in the 60 gun *Avni Allah*, 3 corvettes and two small paddle steamers. His largest guns were 24 pounders and it would seem that the Turks were poorly trained and unready for war. The anchorage was protected by 84 guns, some possibly removed from the fleet².

Russian scouts located the Turkish squadron and Admiral Nakhimov decided to attack. His fleet was vastly superior in numbers, size and gunpower (TABLE II). Two of the 120 gun ships each carried fourteen 60 pounders (27 kg) shell firing guns and there were 10 more such guns in other ships.

TABLE II—*The Russian fleet at Sinope*

Line of battle (120 guns)	3
(84 guns)	3
Frigates	2
Steamers (small)	3

Nakhimov closed to attack at 1230 on 30 November with his liners in two columns. Firing began about 1330 and went on until nightfall when the Turkish ships were largely destroyed. They lost about 3000 killed and the only ship to escape was the steam paddler, *Taif*. The Russians lost 37 killed and 229 wounded. Naval and public opinion showed surprise, shock and horror at the casualties and the apparent effect of shells on wooden ships. Most critics were unaware of the British tests of shells against the *Prince George*³ and the similar French tests at Gavre⁴. The French reacted sensibly and commenced the design of armoured batteries for coastal attack. Conflict was now inevitable and Britain and France declared war on 27 March 1854, the news reaching the Baltic on 4 April and the Black Sea on the 9th.

The Baltic 1854

The British government feared that the Russian Baltic Fleet might make its way out and invade the United Kingdom. This fear, unjustified as it was, governed the first year's operation in the Baltic.

The problem facing the Royal Navy lay in men rather than ships. Admirals, promoted by seniority, were old, the selection falling on Sir Charles Napier, born in 1785. It was even more difficult to find seamen as pay and conditions were too poor to attract volunteers and conscription was not seen as possible. The Press Gang remained legal, but was unacceptable.

TABLE III—*The British fleet in 1854*

Steam line battleships	9
Steam blockships (old liners)	4
Screw frigates	4
Paddle frigates and smaller steamships	11
Sailing line of battle	6 or 7*

*accounts vary

Despite the problems, a strong fleet (TABLE III) was assembled by February 1854 and was led to sea by Queen Victoria on 11 March. A second squadron under Admiral Corry followed on the 16th.

Admiral Napier's instructions⁵ were to:

- Prevent any Russian ship leaving the Baltic.
- Reconnoitre and, perhaps, attack the Aaland Islands.
- Avoid getting involved with Denmark and Sweden.
- Look into Reval and other fortified towns.

These were amplified in a private letter from the First Sea Lord in which he said 'I rely on your prudence in not knocking your head against stonewalls prematurely, or without the prospect of a great success . . .'

Napier was at anchor near Copenhagen when news reached him of the declaration of war and he was joined there by his sailing squadron and by a French fleet under Vice-Admiral Parseval-Deschenes with one steam liner, 8 or 14 sail liners and 9 smaller ships. In the end the main elements of the opposing fleets were as shown in TABLE IV.

TABLE IV—*The Balance of Forces in the Baltic*

	<i>British</i>	<i>French</i>	<i>Total Allied</i>	<i>Russian</i>
Steam liners	13	1	14	—
Sailing liners	6 or 7*	8 or 14*	14-21*	27
Total			28-35*	27

*accounts vary

The Allied fleet then moved up the Baltic, blockading Riga and attacking coastal villages and shipping. These minor attacks achieved little of military value and alienated potentially friendly inhabitants. During these operations, much effort was put into training inexperienced officers and men in gunnery and sail handling, to such an extent that there was a shortage of powder and shot. The standard of seamanship was poor and there were both accidents and near collisions. Sullivan⁶ describes the sailing qualities of the steam battleships, praising *Duke of Wellington* and *St Jean D'Acre*. *Edinburgh* and *Hogue* were better than the other converted blockships though they had some problems in course keeping. He did not think highly of *Austerlitz*.

In June Captain Sullivan, as hydrographer, took *Lightning* (the first steam ship in the R.N.) to reconnoitre Bomarsund, which was bombarded by three paddle frigates later in the month. It was clear that shore guns now had an effective range of some 1500 metres and that the British 68 pounder (30 kg) could hit, occasionally, at 4000 metres.

The sailing ships were left to blockade Sveaborg whilst the steam fleet moved up to Kronstadt. Sullivan and others climbed up the Tolbukin lighthouse off the western end of the island to inspect the Russian fleet of 16 liners and a few frigates. These were protected by massive granite forts with 3 or 4 tiers of guns and there was then no possible way of attacking.

Bomarsund

There are some 280 islands in the Aaland group with the main fort of Bomarsund on Aaland itself. It was a granite structure with 80 guns commanding the sound and further guns on the inland faces. Fort Nottich to the north and Fort Tzee to the south, each with 22 guns, and a battery of 7 guns on Tranvik point provided support.

Captain Sullivan found an uncharted channel and led a squadron of four steam blockships and 2 screw frigates to attack from the rear. A French army of 9000 men with 4 guns and 4 mortars was landed together with a small British force and three 32 pounder (14.5 kg) guns. Fort Tzee surrendered to the French on the 13th August and Fort Nottich to the R.N. two days later. One of *Blenheim's* 10 inch (25 cm) guns was then landed and this gun, together with those of the fleet, opened fire on Bomarsund Fort on the 16th. No great damage was done, but the Russians surrendered. The operation demonstrated the value of the mobility of a steam fleet and the effect on morale of the concentrated fire of a fleet as well as the inability to cause material damage to a well-built fort.

The fort was then blown up with the exception of a line of seven casements left to test the effectiveness of ship's guns. *Edinburgh* fired 390 heavy shot and shell from 1000 metres causing little or no damage. She then closed to 400 metres and fired a further 250 rounds. A small breach, too small for an assault, was made in the wall and considerable damage caused to the embrasures.

The fleets left the Baltic during September and on returning to England, Admiral Napier was ungraciously dismissed even though he had fully achieved his objectives.

The Black Sea 1854

Opening Moves

The Allied fleets moved into the Black Sea in January 1854 with instructions to prevent any further Russian attacks on Turkish ships. The frigate *Retribution* was sent, under flag of truce, to Sevastopol to convey the warning, and, in fog, entered the harbour without being detected. The weather was thought to be too bad to maintain a sailing fleet in the winter and the allies soon withdrew. In April the declaration of war was conveyed to Odessa by the *Furious*. Her flag of truce was fired on and as a result it was decided to bombard military installations in the port.

A squadron of 5 British and 3 French steam frigates, together with the sailing frigate *Arethusa* opened fire at dawn on 22 April, firing at about 2000 metres whilst steaming in circles. Little damage was caused but *Vauban* was set on fire by red hot shot, an old weapon, which still seemed more effective than shells. The force then anchored and soon began to cause effective damage, setting fire to storehouses and ships. Several allied merchant ships escaped from Odessa in the confusion. It was the last time that a British ship fought in a major action under sail.

Various operations, mainly at the eastern end of the sea took place during May, the frigate *Tiger* (FIG. 2) being lost when she ran aground near Odessa in fog.

Preparations to Invade

The fleets were based at Kavarna (modern Bulgaria) where the bulk of the Allied armies (TABLE V) had concentrated. Planning the invasion was a formidable task. The British used 52 sailing transports and 27 steamers with 350 boats, whilst the French used 200 small sailing ships and put 1800 to 2000 men in each of their battle-

TABLE V—Allied land forces in the Black Sea, 1854

	British	French
Infantry	22 000	25 000
Cavalry	1 000	—
Engineers, etc.	3 000	2 800
Guns	60	68

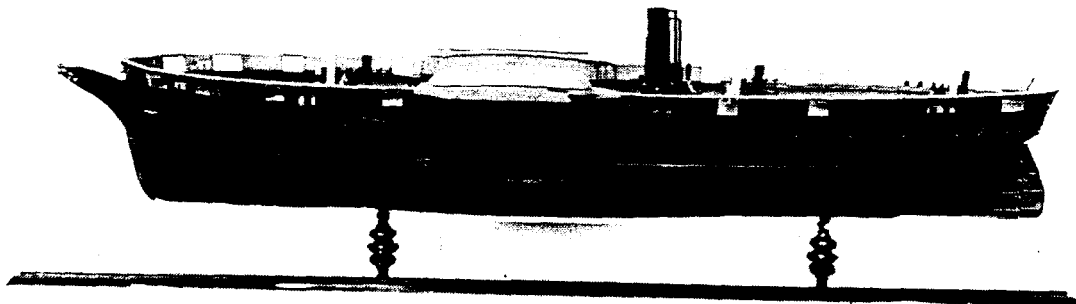


FIG. 2—H.M.S. 'TIGER', A PADDLE FRIGATE LOST NEAR ODESSA IN MAY 1854

ships. Since this left the French ships unable to fire their guns, the Russians had a temporary naval superiority of which they failed to take advantage.

Allied preparations were also affected by the cholera epidemic, particularly in the French ships. The military risk was perceived as the difficulty of maintaining such a large army, on an inhospitable coast, without proper ports in bad weather. However, the generals were confident that the war would be over before the autumn gales.

The French began to embark on 31 August, taking 3 days whilst the British transports were not ready until 7 September. The transports, with 52 000 troops, were in 6 divisions with each steamer towing two sailing ships. The escort force was 3 battleships, 2 frigates and 11 steamers. Planning had taken months and embarkation 3 to 7 days. Earlier British fears of a Napoleonic invasion, without warning, across the Channel may be seen as somewhat unrealistic.

When the fleet sailed, it was intended to land at the mouth of the Katcha but the generals saw this as too dangerous and chose to land close to Eupatoria despite its distance from Sevastopol. Most of the troops landed on 15 September and, within three days, all the supplies were ashore. The Allied armies moved off on the 19th to the Alma where they won a great victory the next day.

The generals decided to march round Sevastopol and attack from the south, using Balaclava (British) and Kamiesh and Kazatch bays (French) for supplies. They were the best available shelters but were to prove inadequate in winter. By the 21st, Sevastopol was besieged and the Russians scuttled 7 of their larger ships to block the harbour entrance.

Bombardment of Sevastopol

The Armies planned a grand assault on Sevastopol (FIG. 3) on 17 October and the fleets were asked to attack the coastal forts as a diversion⁷. The initial plan was to fire on the move, at fairly close range, but at General Canrobert's insistence, it was later decided to anchor and engage at some 1500 to 2000 metres. British boats had found a deep water channel some 750 metres from Fort Constantine and outlying batteries and a small inshore squadron was planned. There were also two Turkish ships stationed between the British and French squadrons.

Both fleets had landed men and guns to help the army and there had been losses from disease. Full crews were available for one broadside only, and in some ships the upper deck batteries were not manned which helped to reduce casualties. Firing began ashore at 0630 and continued until 0900 when the main French magazine ashore blew up, the attack being called off shortly afterwards.

Not knowing this, the fleets began to engage about 1230, with the French ships engaging the southern forts and the British, a little later, those to the north. The inshore squadron of two steam liners, together with sailing ships propelled by steamers sailed alongside, engaged Fort

Constantine and the Telegraph and Wasp batteries. Damage to the forts was slight though Fort Constantine had all but 5 of its 27 guns put out of action, mainly as a result of a magazine explosion caused by a shell from H.M.S. *Terrible*⁸. Many ships fired shell or hollow shot with reduced charges which could not be expected to damage stone forts, or indeed, the many guns mounted *en barbette* in earthworks.

This action is one of the very few in which wooden ships were exposed to shell fire and is of interest on that account. Apart from trials, the only evidence before the Crimean War came from the battle at Eckenfjorde on 5 April 1849. The Danish *Christian VIII* had been in action with shore batteries which were at first fairly ineffective using shell but later destroyed her with red hot shot. The only British ship at Sevastopol to receive serious damage was *Albion*. She was hit by four shells from Fort Constantine and suffered two fires, both of which were put out by her own crew. She had 11 men killed and had to be towed out of action by the *Firebrand*. *Arethusa* was damaged by the Telegraph battery and had to withdraw. These were the only two ships which were not ready for action the next day and had to go to Malta for repair. *Agamemnon* was hit 214 times, including 3 shells and a rocket; *London* was on fire 3 times from shell hits, and *Queen* too was on fire. All were easily extinguished. On the French side, *Ville de Paris* was hit by 41 shot or shell and suffered considerable damage and casualties from a mortar shell under the poop. In later wars, one may note the wooden ship *Kaiser* at Lissa. She was hit 80 times, including a 300 lb shell, and she had rammed an Italian iron clad, but, despite nearly 100 casualties, was seaworthy and ready to fight later that day. After World War II the Royal Navy had

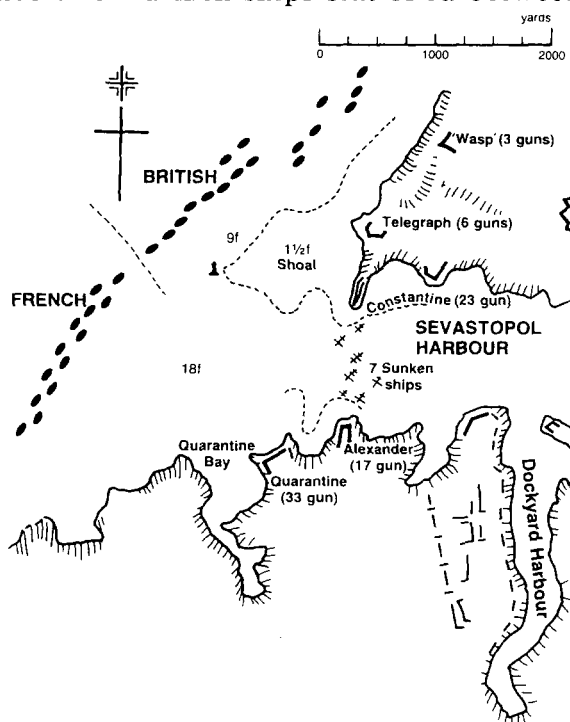


FIG. 3—SEVASTOPOL

great difficulty in sinking the old wooden ship *Implacable* by shell fire. The effect of shells on wooden ships has been much exaggerated.

The efforts of the Naval Brigade ashore were truly heroic but fall outside the scope of this article. About 5000 sailors and marines were landed in all, with 140 guns mostly larger than those available to the armies.

There were several small bombardments during October and November but the navies' chief task was to keep open the supply routes. On 14 November disaster struck. A very sudden and heavy storm caused many losses of transports—32 off Balaclava, 14 off Katcha and more off Eupatoria as well as the French warships *Henry IV* and *Pluton*. Several British warships were severely damaged. The loss of stores, particularly winter clothing, in the lost ships was grievous. It seems that many of the losses were caused by fracture of wrought iron chain anchor cables and, as a result standards of design and testing were improved.

The Steam Gunboat Programme

First Thoughts

Even before war was declared the Admiralty realized the need for shallow draft vessels with heavy guns to attack the great forts at Sveaborg, Sevastopol and Kronstadt. Most British small steamers had been designed whilst Symonds was Surveyor and his obsession with a sharp V-form and sailing qualities had made them unsuitable for inshore war.

In March 1852 the Admiralty invited tenders for six gun vessels to carry two 68 pounder Lancaster rifled guns on a maximum draught of 11 ft 8 ins (3.5 metres). These were built quickly on the Thames and in August the first one, *Arrow* (FIG. 4) carried out firing trials in the presence of the Queen. She was anchored 4000 metres from the target, but the sea was rough and none of the shells went near the target. Heavy guns can only be fired from small craft in very calm weather.

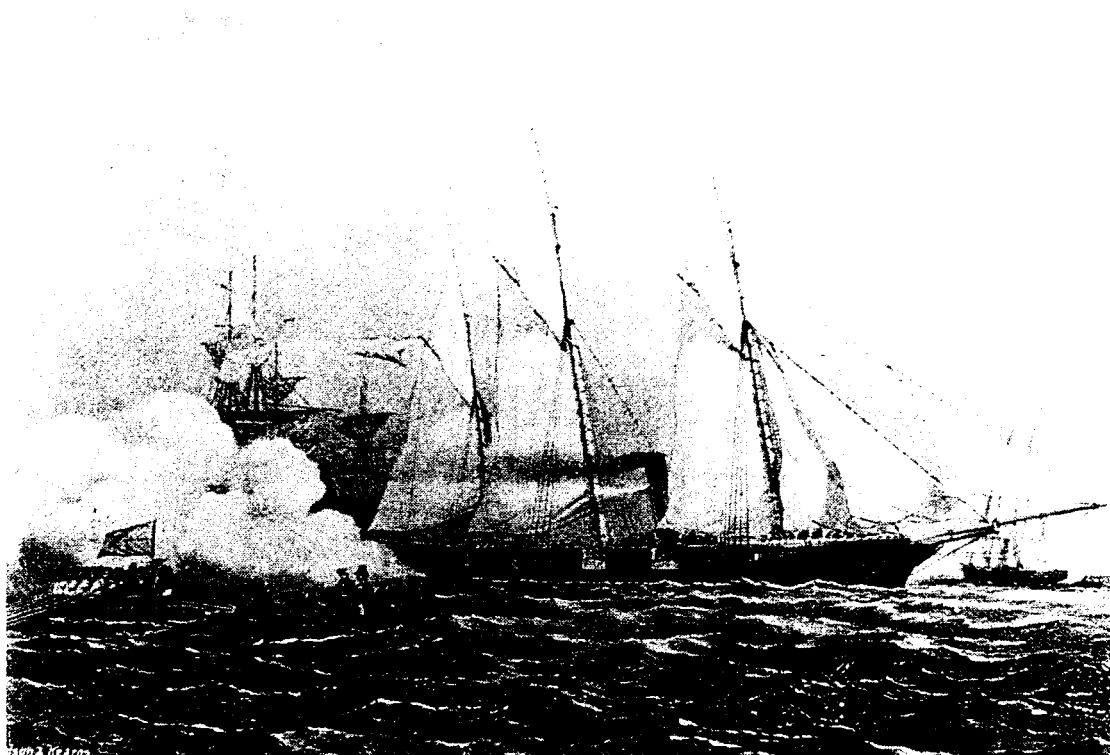


FIG. 4—H.M.S. 'ARROW', AN EARLY STEAM-DRIVEN GUN VESSEL WITH TWO 68 POUNDERS, OFF SEVASTOPOL

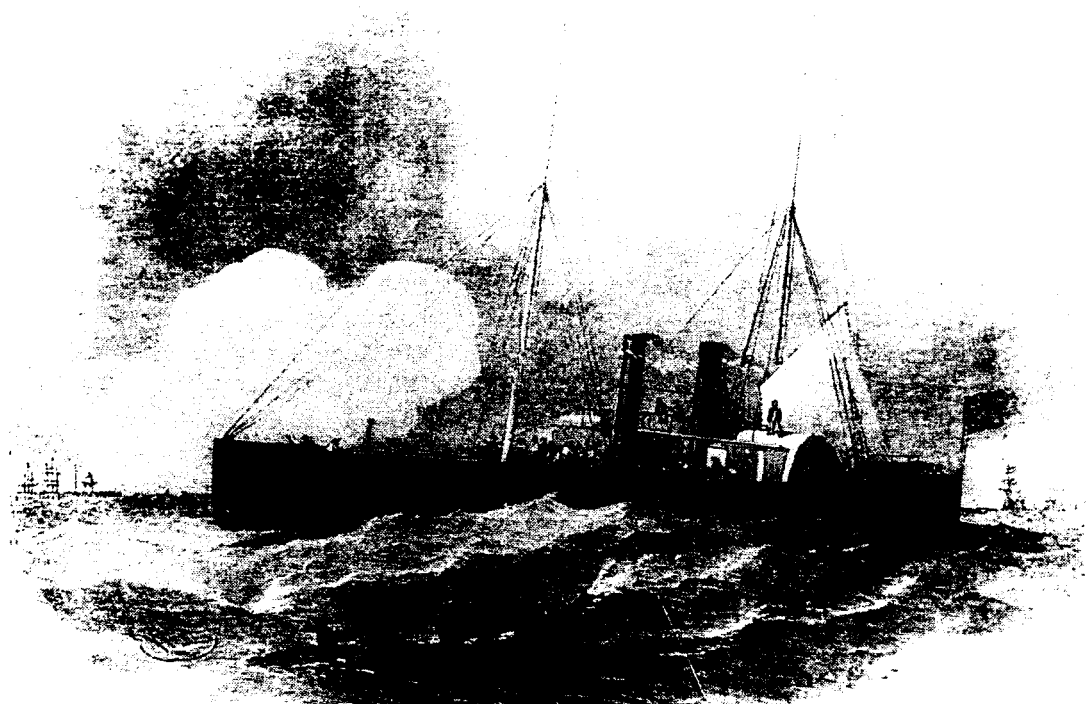


FIG. 5—H.M.S. 'RECRUIT', AN IRON PADDLE GUNBOAT, DESIGNED BY SCOTT RUSSELL FOR PRUSSIA AND PURCHASED BY THE R.N.

The ARROWS were a useful addition to the fleet as were four iron paddle gunboats built by Scott Russell (FIG. 5). The real answer came from W. H. Walker, a constructor in the Surveyor's department. His first design for the six GLEANER Class was followed by others, with 156 ships being built in all (TABLE VI). H.M.S. *Beacon* (FIG. 6) was one of the DAPPER Class.

TABLE VI—*British Gunboats*

<i>Class</i>	<i>Number Built</i>	<i>Tonnage b.m.*</i>	<i>Dimensions ft</i>	<i>Design Armament</i>	<i>Nominal Horse- power</i>
GLEANER	6	216	100×22 ×7	two 68 pdr	60
DAPPER	118	233	106×22 ×6'9	two 68 pdr	60
CHEERFUL	20	212	100×22'10×4'6	two 32 pdr	20
CLOWN	12	233	110×21'10×4	one 68 pdr	40

*b.m.: 'builder's measurement', akin to gross tonnage

Layout

The arrangement of all four classes was similar^{9, 10}, with a full bow and stern joined by a long parallel body. The bottom was flat except for a shallow false keel and vertical sides rose from a tight bilge. The upper deck was flush with a slight sheer forward. Machinery and coal bunkers took the middle half of the hull with a shell room forward and the magazine aft. There was just room for the crew of 30 to 36 forward, warmed by a stove which also served as the galley, and more generous space aft for the two officers.

Armament

The main guns in all the classes were carried on the centre line, forward and aft of the funnel. To bring them into action they were manoeuvred on iron tracks let into the deck using a pivot bolt at back and front of the carriage. There was a gun port right in the bows and both guns could be arranged on either side. A 68 pounder gun with carriage weighed some 6 tonnes and there was a considerable list (some 6° – 7°) when both guns were on the same side. The guns were frequently changed for particular operations—*Pincher* had three 68 pounders on one occasion. A common outfit for the DAPPERS was one 68 pounder, one 32 pounder and two 24 pounder howitzers (FIG. 6).

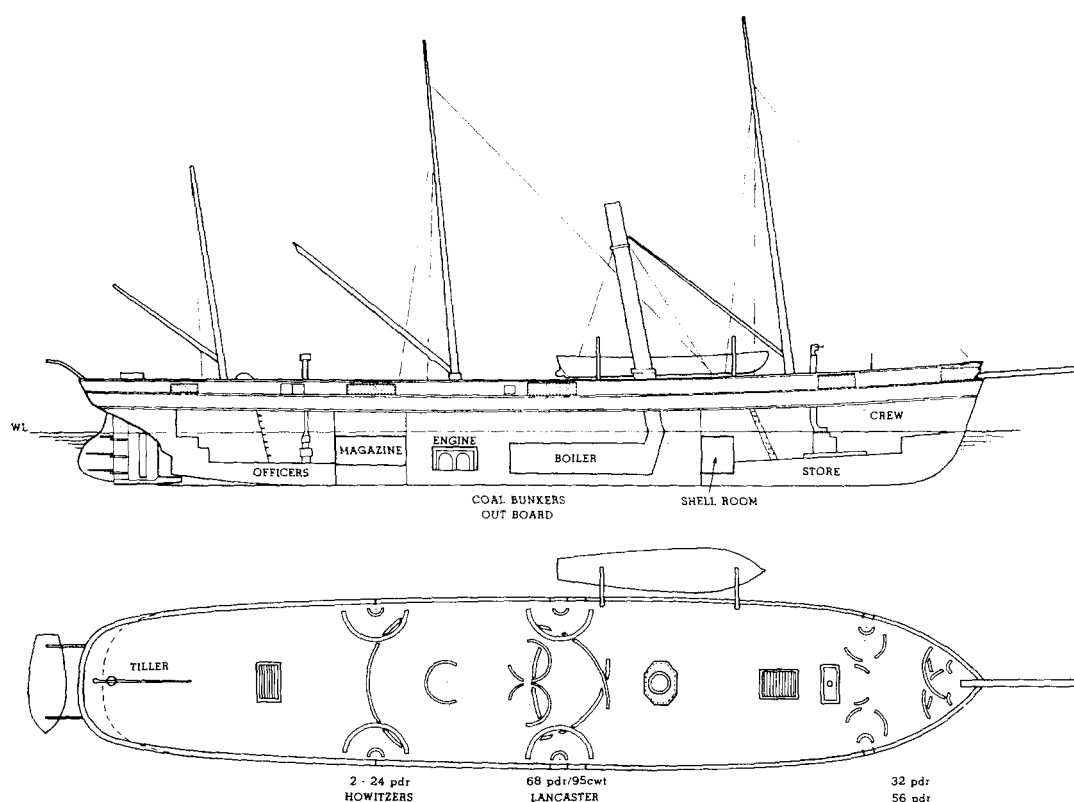


FIG. 6—H.M.S. 'BEACON', A GUNBOAT OF THE 'DAPPER' CLASS

Machinery

All the engines were ordered from Penn or Maudslay who seemed to have used sub-contractors to a considerable extent. For example, Thames Iron Works forged many of Penn's crankshafts. Steam pressures at 35 psi (2.4 bar) were high for ships of the day, though only about half that of railway practice. The boilers were cylindrical with fire tubes and worked with sea water which may account for the fairly rapid burning of the tube plates.

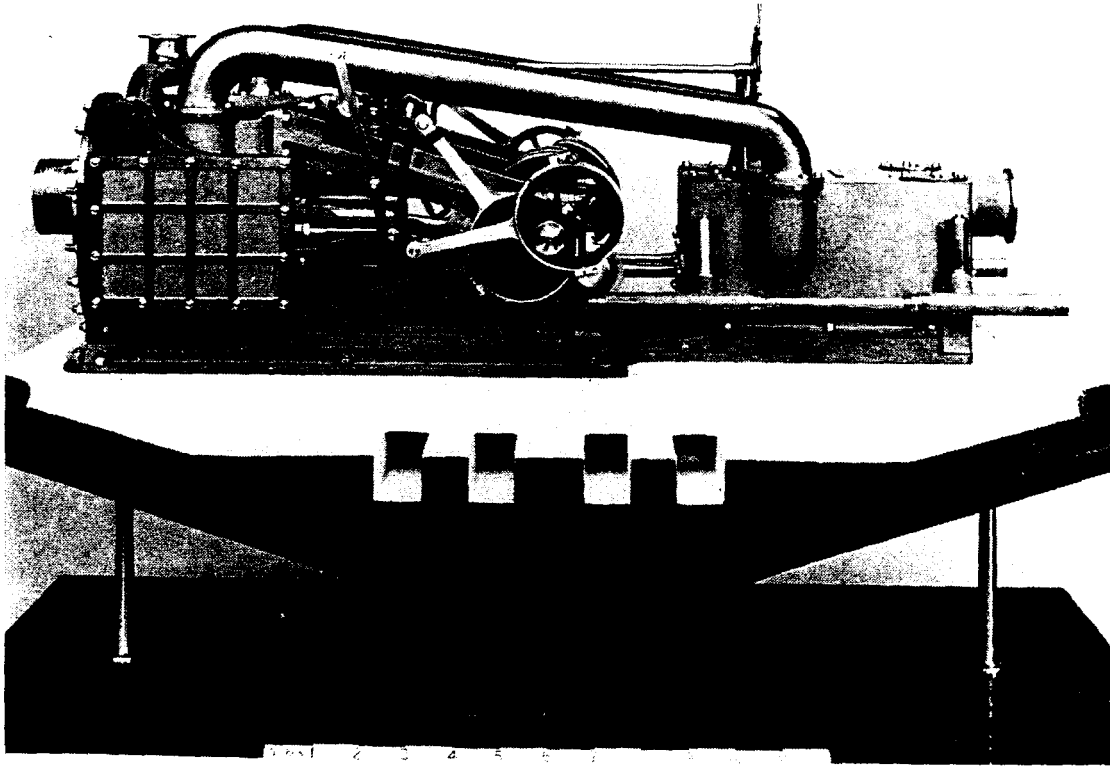


FIG. 7—A PENN TRUNK ENGINE FROM THE 1848 FRIGATE, H.M.S. 'ARROGANT'

The Penn engines were somewhat similar to the engines illustrated in Figs. 7 and 8, but were mounted vertically. They had a high rotational speed which caused lubrication problems leading to wear and overheated bearings. On the whole the machinery (TABLE VII) was simple, easy to operate, and lasted well.

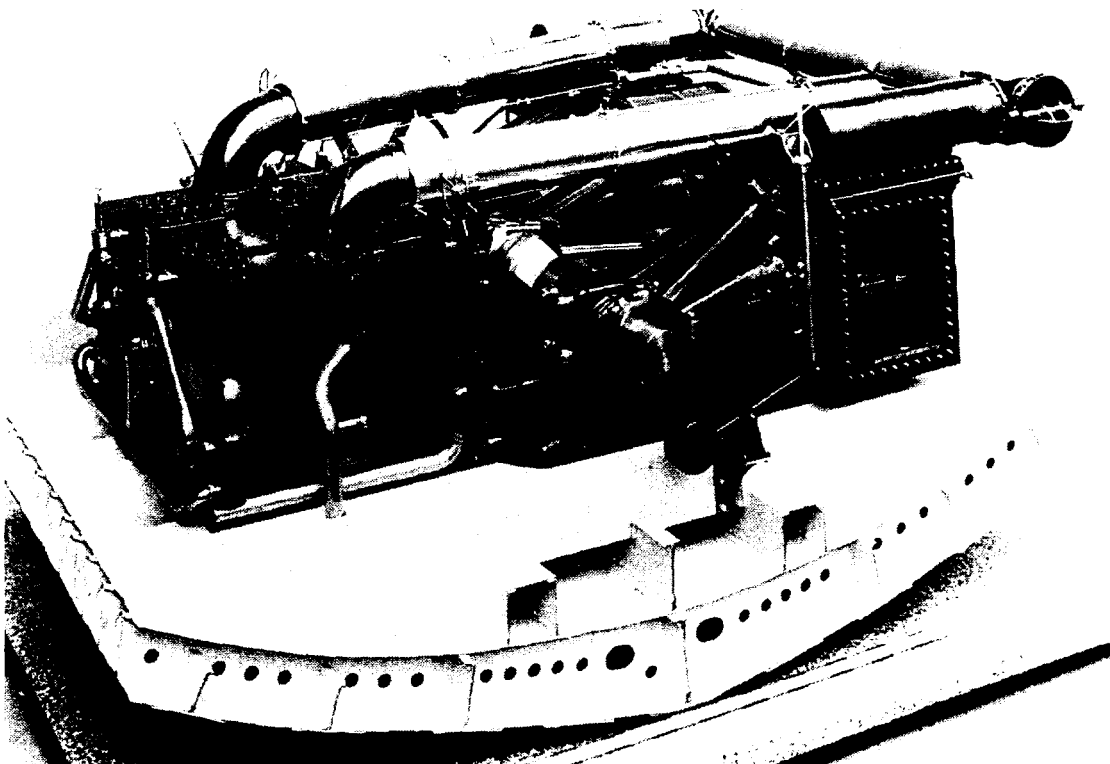


FIG. 8—A PENN TRUNK ENGINE FROM H.M.S. 'NORTHUMBERLAND', AN ARMOURD SHIP OF 1868

TABLE VII—*Gunboat Machinery*

<i>Nominal Horsepower</i>	<i>Indicated Horsepower</i>	<i>Number of Cylinders</i>	<i>Bore ins</i>	<i>Stroke ins</i>	<i>r.p.m.</i>	<i>Ship Speed kts</i>
20	92	1	15	12	225	6 $\frac{3}{4}$
40	145	1	21	12	220	8
60	270	2	21*	12*	190	7 $\frac{1}{2}$
			15 $\frac{1}{2}$ †	18†		

*Penn †Maudslay

The engines drove a single two-bladed propeller of 4 ft 6 ins (1.35 m) in the smaller ships and 6 ft (1.8 m) in the larger vessels.

Production

The most impressive aspect of the gunboat programme was the speed with which the ships were ordered and built¹¹ (TABLE VIII and FIG. 9). Orders were spread between some 20 builders (including 10 ships built in Royal Dockyards), but the majority were built in a few yards; Pitcher, for example

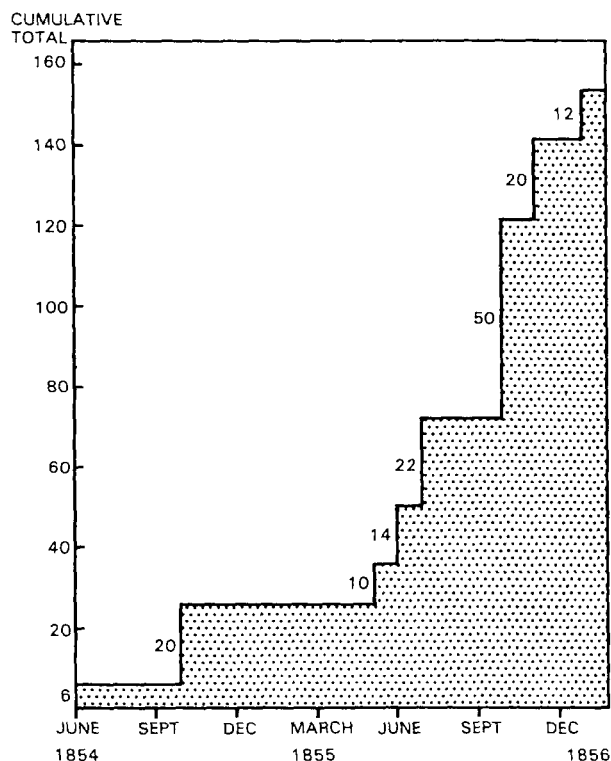


FIG. 9—ORDERS FOR GUNBOATS, 1854-1856

TABLE VIII—*Gunboat Production Schedule*

<i>Date</i>	<i>Number ordered</i>	<i>Class</i>	<i>Average Cost £</i>
1854 June	6	GLENER	8200
October	20	DAPPER	9500-10 000
1855 May	10	DAPPER	
June	14	DAPPER	7000
July	22	DAPPER	
October	52	DAPPER	
November	20	CHEERFUL	9500-10 000
1856 January	12	CLOWN	
	<u>156</u>		

built 56. The main contractor was responsible for the hull only; the engines were then installed by the engine contractor. This did not take long; Penn installed *Arrow's* engine in 54 hours, raised steam on the third day after launch and carried out trials the next day. The gunboat then went to a Dockyard or the specialized Gun Boat Yard at Haslar (FIG. 10) where the bottom was coppered, masts and rig fitted and the guns mounted. This too, did not take long, a record of 24 hours being claimed in one case.



FIG. 10—GUNBOAT SHEDS AT HASLAR. INSET: ONE OF THE 'ANT' CLASS, KNOWN AS 'FLAT-IRONS'

The programme caused serious problems for the shipbuilders since orders were placed at a fixed price whilst wage rates and material costs were rising rapidly. During the war wages rose from 7 shillings per day to 15 shillings, and labour became scarce. There was some indiscipline, lunch hours stretched, and theft, particularly of copper bolts, became common. There was also a shortage of seasoned timber and as a result some ships needed considerable amounts of 'green' wood which soon rotted. To meet the dates, night work was essential which in the severe winter of the war was unpleasant. Poor gas and oil lights made work difficult—and theft easy. As a result of their losses on these contracts Pitcher's and Mare's closed and other yards ran into severe financial difficulty. Unusually for the day, the Admiralty awarded some ex-gratia payments to offset inflation but these were insufficient.

All the ships ordered in 1854 were available for the campaigns of 1855 but few of the 1855 orders saw action. Most were complete for the victory review in 1856 and for many this was their only operation.

Gunboat Operations and the Black Sea, 1855

Naval activity in the Black Sea resumed in February 1855 with a series of operations at the eastern end round Anapa. From April onwards there were many single ship bombardments of Sevastopol by night, which must have had nuisance value. During one such raid the frigate *Valorous* was hit on a

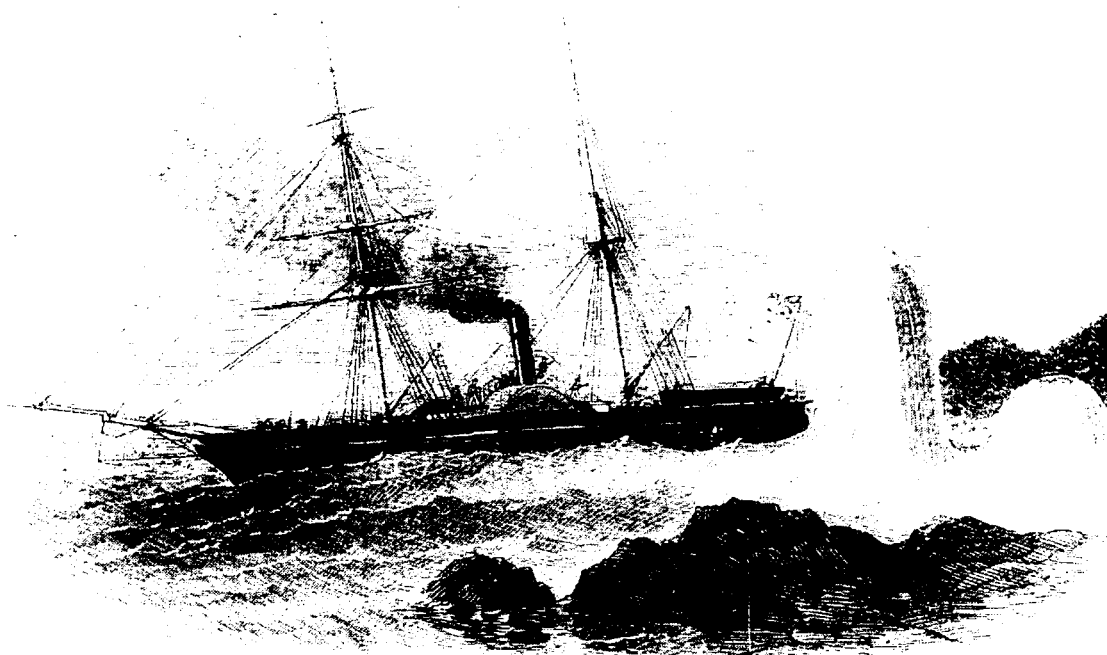
paddle wheel and, despite heavy vibration, was able to complete the operation; as in the French experience in the Parana expedition paddles were not a vulnerable feature.

The Russian armies in the Crimea depended for their food supplies on the rich farms surrounding the Sea of Azov. It is said¹² that 1500 waggons of stores left Kertch each day. The naval commanders had pressed for an attack on this area in 1854 but troops could not be made available. By April 1855, the Sardinian and Turkish reinforcements in the Crimea made it possible to spare men for Kertch. Winter gales had cleared the obstructions placed by the enemy to block the Straits but the water depth was only 18 ft (5.5 m) making it essential to use shallow draught ships such as the new gunboats.

The expedition sailed on 3 May 1855 with 1100 men, mainly French, in 40 ships, but it was recalled by the Emperor using the newly completed cable—the first such interference with operations by a home government. The delay was brief and a new expedition sailed on May 22 with 7000 French troops, 5000 Turks and 3500 British and Sardinian. They landed on the 24th near Kertch which surrendered as did Yenikale a few days later, giving the Allies 100 guns and 12000 tonnes of invaluable coal.

Williams¹² wrote 'The doorway of the Sea of Azov was now open to us and fourteen British steamers, aided by four or five French vessels poured into the almost unknown sea. It was like bursting into a vast treasure house . . .' Granaries were burnt, batteries destroyed and much general devastation and misery was caused. Like Sherman's famous ride through Georgia, opinions differ as to the military value of all this destruction. It must have made supply of the Russian army more difficult and contributed to a desire for peace. The new gunboats were invaluable and the Royal Navy was delighted with its new ships.

The fighting at Sevastopol came to an end in September, the few remaining Russian ships being destroyed in the final bombardment or sunk by their crews. Their Black Sea Fleet was totally destroyed.



ARMED MEN IN "THE MERLIN" SURVEYING SEABOARD—EXPLOSION OF INTERNAL MACHINES—SKETCHED BY J. W. CARMICHAEL (SEE PRECEDING PAGE)

FIG. 11—MINES EXPLODING CLOSE TO H.M.S. 'MERLIN' IN 1855

Mines and Mortar Vessels in the Baltic, 1855

The British squadrons, all steam ships, assembled in the Downs off Deal at the end of March and joined the French fleet near Revel in the Gulf of Finland in early May. The Admirals inspected Sveaborg from Sullivan's new ship, *Merlin*, on the 11th, noting that 60 new guns had been mounted in earthworks. By the end of May, the fleets were off Kronstadt where the defences had also been strengthened.

Mines

On 9 June *Merlin* exploded two contact mines (FIG. 11) and a third went off under *Firefly*. Other than to crockery, damage was slight. The plume of water from the explosion rose about one metre above the bulwark and *Merlin* was heavily shaken. Items fixed to the side were shaken or broken and a wooden diagonal was broken where it was joined to the iron frame. The bulkheads were torn from the skin of the ship⁵.

The mines (FIG. 12) were designed by M. H. von Jacobi, a Russian scientist of German descent, and consisted of a zinc cone about 2 ft deep and 15 inches wide at the top (0.6 m x 0.4 m). The charge was 8 lb (3.6 kg) gunpowder, increased to 35 lb (16 kg) in later models. If the top of the mine was disturbed, a tube of sulphuric acid broke on to a quantity of potassium chlorate which would detonate the main charge.

The mines were tricky to handle, as the Russians soon discovered when they lost 17 men due to explosions while being laid. As a result, many were laid with their safety caps still on. *Vulcan* hit a mine off Sveaborg on 20 June and the first minesweeping operation was put in hand. In 72 hours, 33 'infernal machines' were recovered, one of which went off in the arms of Admiral Seymour when he was inspecting it. He lost the sight of one eye and was disabled for two months.

The Russian introduction of mines had no significant effect on the war but should have been seen as a portent for the future. Both Britain and Russia were investigating submarine vessels, both to the design of W. Bauer, but only Russia completed such a boat and it was not completed till after the war was over.

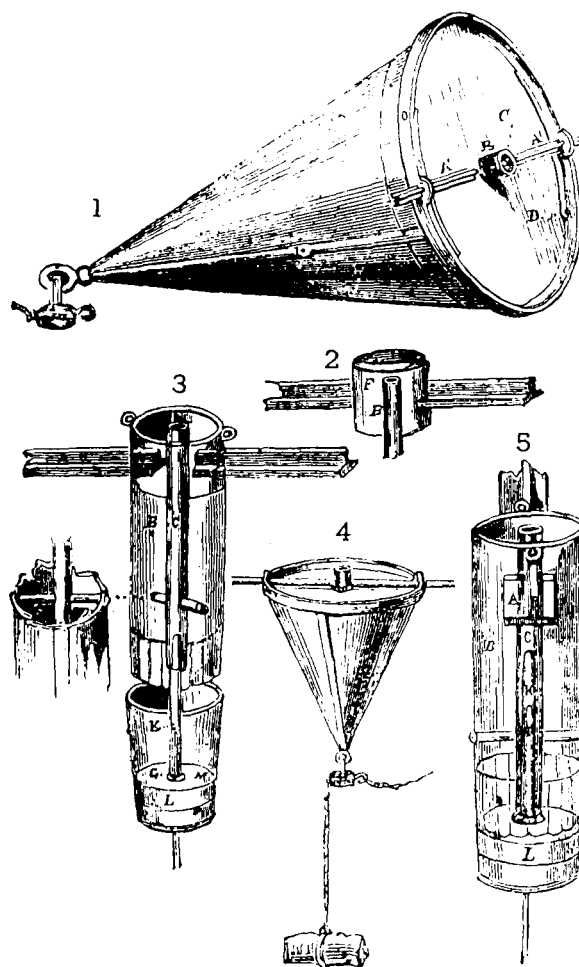


FIG. 12—MINES AS USED IN THE BALTIC IN 1855.

THE ORIGINAL KEY READS:

- 1 THE INFERNAL MACHINE SIDE AND END
- 2 CAP OR COVER
- 3 TUBE DISSECTED
- 4 THE MACHINE AS IT FLOATS THREE FEET BELOW THE SURFACE OF THE WATER
- 5 TUBE PUT TOGETHER

Mortar Vessels

Destruction of buildings using shells from mortars was seen as an important aspect of attacks on fortified towns such as Sveaborg and Kronstadt. The bomb vessels built for previous wars had all been broken up or lost and new designs were developed. Initially two dockyard lighters were converted in October 1854, each being given a 13 inch (32.5 cm) mortar. Trials were successful and 54 specially built wooden mortar vessels were ordered, in groups, by December. In addition, 50 iron-hulled mortar floats were ordered in November 1855¹³. They were 60 to 75 ft (about 18 to 20 m) in length, with a displacement of 100 to 170 tonnes.

These craft were without engines and were usually towed. They had two small masts, with sails, for occasional use. They were lighters, with flat bottoms, vertical sides and a square bilge. The mortar rested on circular iron rails amidships, set into an octagonal well about 4 ft 6 ins (1.5 m) deep. The space below the mortar was filled in with solid timber to take the recoil force. The shell room was below the mortar well, with the magazine just abaft.

The mortar fired at an elevation of 45°, range being varied by altering charge weight. Maximum range was 4200 yards (3900 m) with a charge of 20 lb (9 kg). The time of flight was 31 seconds, making these weapons of little value against moving targets. On land, accuracy was good with 50% of shells falling within a square of 50 yards (46 m) side, but from a lighter moving in a seaway the scatter was much greater.

Sveaborg

An attack on Sveaborg had been considered in 1854 but not pursued for lack of suitable vessels. With the new gunboats and mortar vessels it was possible to carry through an attack in 1855, partly to impress the public at home and partly as a rehearsal for a big attack on Kronstadt in 1855.

The fortress of Sveaborg consisted of a group of five islands separated by narrow channels and armed with about 800 guns. Some of the channels were blocked and others dominated by the guns of four battleships and smaller ships. Captain Sullivan⁶ carried out a meticulous survey in August 1855 and marked the positions for the attacking fleet. The main effort was to come from 13 British mortar vessels (one 13 inch) and 5 French (two 12 inch), together with a French battery of four 10 inch mortars on 'Abraham Holm' rock. Initially, the mortar vessels assembled at 3900 yards from the batteries and moved in to 3600 yards (3300 m). Four steam frigates acted as supply vessels for the mortar force.

A force of gunboats with additional heavy guns strengthened the bombardment force. Early on 9 August the mortar vessels moved into place and opened fire just after 0700. Two gunboats with Lancaster rifled guns fired on a battleship (the *Russia*) off Gustafsvard and hit her several times with 68 lb shell¹⁴. Her survival shows again the strength of the wooden battleships. Firing on both sides was intense, with little apparent effect until 1000 when a heavy explosion occurred on Vargen followed by another on Gustafsvard an hour later as magazines blew up. Fires gradually extended amongst the storehouses, particularly on Vargen.

The gunboats withdrew at sunset and were replaced by 30 ships' boats firing rockets in a 3 hour bombardment causing new fires. With daylight, on the 10th, the bombardment was renewed and continued through the next night. The attack was called off before dawn on the 12th as most of the mortars were cracked or burst. It is claimed that British ships used 100 tons of powder and fired 100 tons of projectiles. The French fired 2828 mortar shells together with 1322 from other ships. The damage caused remains uncertain. General Berg¹⁵ says that all dockyard buildings, workshops and

stores on Great East Svarto were destroyed, and lesser damage caused elsewhere. No forts or guns were put out of action. Russian losses were 55 killed and 199 wounded, though other accounts from nearby Helsinki suggest much higher figures. Seen in the context of a limited war, the bombardment was damaging to the enemy and gave the Allies much information for later attacks.

Sveaborg marked the end of the war in the Baltic. Winter, with its storms and ice was approaching and the fleets went home. A feature of the Baltic campaigns had been the extensive use of colliers and store ships to re-supply the fleet at sea. Today's replenishment at speed was not attempted; supply ships and warships would anchor in a quiet bay for transfer of Welsh coal, meat, etc.

British Armoured Batteries

After Sinope, the Emperor had initiated the development of armoured, steam propelled batteries for the French navy. The British Engineer-in-Chief, Thomas Lloyd made an important contribution when, while visiting Paris, he suggested plate armour instead of the boxes of shot previously envisaged. The Emperor wanted ten such ships for the start of the 1855 campaign but found that French yards could, at best, only complete five. It was proposed that five more be built in Great Britain.

The project was delayed by Sir James Graham, First Lord. He had memories of problems with the iron hulled, but unarmoured, frigates of the previous decade and confused these with the proposed wooden hulled, armoured batteries. Despite the Surveyor's assurances and the results of tests at Vincennes, Graham insisted on more tests at Portsmouth in September 1856. A target 9 ft (2.7 m) square was built from seven 4½ inch (11 cm) wrought iron plates, backed by 4 inch (10 cm) of fir planks and well supported.

In the first trial the target was hit by ten 32 pounder solid shot fired at 300 yards with a 10 lb (4.5 kg) charge with no significant damage. The target then resisted two 68 lb shot fired at long range, though one plate cracked. Two more 68 lb shot at 400 yards (360 m) seriously damaged the target and a further seven rounds drove bits of broken plate right through. Thinner plates were also tested; ½ inch plate would break hollow shot and ⅝ inch would stop shell.

Five British ships were ordered on 4 October 1854¹⁶ (TABLE IX). They had wooden hulls, straight flush sides and a flat bottom. Their 4 inch armour was not well made and was later found to be between a quarter and a half inch too thin. The plates were locked together with tongue and groove joints.

TABLE IX—Comparison of Armoured Batteries

	British			French	Confederate
	<i>Glatton</i> (class of 5)	<i>Aetna</i>	<i>Erebus</i> (class of 3)	<i>Lave</i>	<i>Virginia</i> (ex-Merrimac)
Hull	Wood	Wood	Iron	Wood	Wood
Length(m)	51.8	47.5	55.8	51.1	83.8
Beam(m)	13.4	13.2	14.6	13.1	11.7
Draught(m)	2.6	1.8	2.7	2.5	6.7
Armament	14 68 pdr	14 68 pdr	16 68 pdr	16 50 pdr	2 7 in, 2 6.4 in RML* 2 12 pdr, 6 9 in SB†
Speed (kts)	5½	c.5½	5½	3½	3-4?

* RML: rifled muzzle loader

†SB: Smooth bore

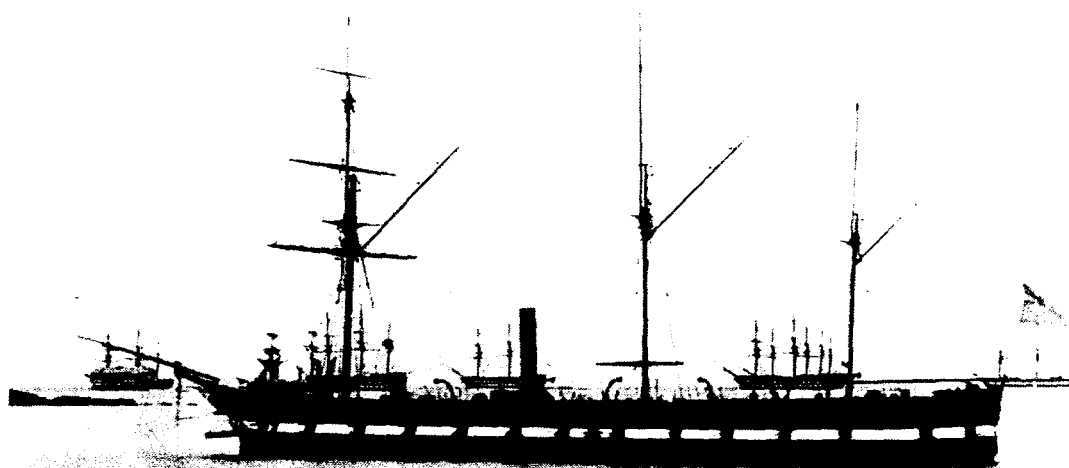


FIG. 13—H.M.S. 'TERROR', AN IRON HULLED ARMOURD BATTERY OF THE 'EREBUS' CLASS, WITH SIXTEEN 68 POUNDER GUNS AND A SPEED OF $5\frac{1}{2}$ KNOTS

Their armament was fourteen 68 pounder/95 cwt guns. One of the five, *Aetna*, was destroyed by fire before launch and replaced by a slightly different design built at Chatham. In December 1855 a further 3 ships were ordered with iron hulls (FIG. 13).

One of this class, *Meteor*, ran trials reaching 5.7 knots with a single propeller, absorbing 530 ihp. Only 12 days later she ran further trials with 3 propellers, reaching $5\frac{1}{4}$ knots. The method of driving the wing propellers is unknown but was probably by belts.

Virginia (ex-*Merrimac*), converted by the Confederates, has been added to the table for comparison. More famous and 6 years later, she was inferior in every respect to French and British ships. Of the British batteries, only *Glatton* and *Meteor* were ready in 1855, reaching the Black Sea too late for action. The effectiveness of the armoured batteries was demonstrated by the three French ships at the attack on Kinburn on 17 October 1855. A number of British ships, from battleship to gunboat, also took part in this action, the fire of the gunboats from behind the spit on which the fort was built being particularly effective.

The Peace Treaty was marked by a big naval review at Spithead in 1856 when Queen Victoria inspected 240 ships, mainly built during the war. They were all steam ships and, with a few exceptions, propeller-driven. 174 were specialized coastal attack vessels—batteries, gunboats and mortar vessels. Britain had a modern and effective navy.

General Considerations

Limited War

The naval aspects of the Crimean war have not been given much consideration in the past. There were no great sea battles and only rarely did one ship fire on another, hence the enthusiast for battle fleets finds little of interest. It was a war more familiar to the late 20th century, fought to contain a land power, for limited objectives.

Industry

None of the navies involved had shallow draft fighting vessels when the war broke out but all three nations built gunboats in considerable numbers, and the Allies also built armoured batteries and mortar vessels very rapidly. The power of modern industry was beginning to influence war.

The Planned Attack on Kronstadt

There was plenty of new thinking both operationally and technically. The plans to attack Kronstadt in 1856⁶, overtaken by the end of the war, were an impressive preview of a World War II assault. The island was to be attacked from the north where the water was very shallow and approach further impeded by concrete blocks built in the sea. These blocks were to be blown up by Captain Sullivan and his brother using canoes. Armoured batteries would move through the breach to destroy the light batteries on the coast. Gunboats would screen the force from attack by similar Russian craft whilst battleships would keep the nearest forts under fire. A large number of mortar vessels would move in and destroy the dockyard and Russian fleet by high angle fire over the island. Troops would have been available to occupy the island if resistance collapsed.

Ships versus Forts

The concentrated fire from large numbers of heavy guns in a fleet could subdue a fort and destroy the morale of its defenders even though physical damage was very small. Many actions of the American Civil War confirm this view. Passage past a fort could usually be assured and it was possible to capture the work if advantage was taken of the collapse of morale.

Damage to Wooden Ships

Contrary to widely held belief, then and now, the wooden ship with a trained and disciplined crew was not particularly vulnerable to shell fire. Fires could be put out and physical destruction usually limited. There was also further evidence that the paddle wheel could function even after considerable damage. The loss of speed when working with one wheel only is small.

Portents

The effectiveness of French armour at Kinburn showed the way for future battleships. Rifled, shell-firing guns began to show their authority. More insidious and less well recognized was the threat from mines.

Novelties

Lack of space has prevented mention of many new ideas tried or planned for the war, e.g.:

- (a) Captain Cole's gun raft *Lady Nancy* which led to his ideas for turrets.
- (b) Mortar frigate. *Horatio* carried a main armament of 13 inch mortars.
- (c) The Mallock mortar of 36 inch (90 cm) bore, intended for use from sea or land against Sevastopol and Kronstadt.
- (d) Poison gas.

As Preston has said 'The Crimean War was the last old-fashioned war for the Army and the first modern war for the Navy'.

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