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Napoleonic Naval Armaments 1792–1815
Artists' note

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ISBN 1 84176 635 6

Editor: Simone Drinkwater
Design: Melissa Ormon Swain
Index by Alison Worthington
Originated by The Electronic Page Company, Cambren, UK
Printed in China through World Print Ltd.

04 05 06 07 08 10 9 8 7 6 5 4 3 2 1

For a catalogue of all books published by Osprey Military and Aviation please contact:

Osprey Direct UK, PO Box 145, Wellingborough, Northants, NN8 2FA, UK
E-mail: info@ospreydirect.co.uk

Osprey Direct USA, c/o MB Publishing, P.O. Box 1, 729 Prospect Ave, Ocoee, FL 34761, USA
E-mail: info@ospreypublishing.com

www.ospreypublishing.com

NAPOLEONIC NAVAL ARMAMENTS
1792-1815

INTRODUCTION

The Napoleonic era has often been considered as the high point in the development of the art of warfare at sea during the age of sail. It featured complex time-consuming manoeuvres designed to bring line-of-battle fleets together, culminating in a duel of ship-smashing broadsides that disabled enemy vessels and brought about their capture or surrender. The commonly perceived view of Nelson's heyday has been that British gunnery doctrine required ships to get as close as possible to their enemies and smash their opponents' vessels with sheer weight of metal. According to this version of events the British routinely aimed for the enemy ships' hulls, while French tactics were to destroy their enemies' rigging.

This established view of naval gunnery from the Napoleonic era does not take into account the many other forms of naval warfare used by differing countries, from the use of frigates and similar vessels in commerce raiding or protection, to the activities of gunboats in amphibious assaults and sieges. However, what they all did have in common was that the key weapon in the naval armoury was the smooth-bore muzzle-loading gun. Nevertheless, each nation considered the use and upkeep of its weapons differently. Technology was beginning to change and the design of the heavy gun was being outstripped and new and radical thinking, often developed by the commanders themselves without assistance from the administrations ashore or established tactical doctrines. This was an age of individual lateral thinking rather than collective improvement.

A 32-pdr carronade. This example was brought from the wreck of HMS Pomone, a frigate that sank just off the Needles in 1811. The carronade has suffered some damage from the sea but still retains its breeching loop. (Museum of Naval Firepower, Gosport)
Although at first glance it might seem that the technology of smooth-bore weapons was very similar across nations, in fact, a gradual refinement took place, principally the introduction of the carronade, along with improvements in methods of loading and firing. The carronade itself went through many transitions that led it to become more similar to the traditional type of gun it was initially intended to replace.

There were several factors that affected the ability of the gun to perform its work. Firstly the gun was, unlike land artillery, always moving – the swell of the sea always affected the aiming of a naval gun. Secondly, other than in shore bombardments, the target was always wood and therefore was unlikely to sink by gunfire alone, so the structure of an enemy ship hull was not always the best target to hit. Causing casualties to the enemy crew was important, as was destroying the machinery enabling them to sail their vessel, namely the masts, rigging and steering gear. Tactically, the main aim of gunnery was not to destroy an enemy ship but to disable it and capture it.

BRITISH GUNS AND GUNNERY

**TYPES OF NAVAL GUNS IN BRITISH SERVICE**

<table>
<thead>
<tr>
<th>Type</th>
<th>Calibre</th>
<th>Length</th>
<th>Weight (cwt/lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>42-pdr</td>
<td>70.18in.</td>
<td>10ft</td>
<td>67 0 0</td>
</tr>
<tr>
<td>32-pdr</td>
<td>6.41in.</td>
<td>9ft 6in.</td>
<td>56 0 0</td>
</tr>
<tr>
<td>24-pdr</td>
<td>5.82in.</td>
<td>10ft</td>
<td>52 0 0</td>
</tr>
<tr>
<td>18-pdr</td>
<td>5.29/5.18in.</td>
<td>9ft 6in.</td>
<td>42 0 0</td>
</tr>
<tr>
<td>12-pdr</td>
<td>4.62in.</td>
<td>9ft 6in.</td>
<td>34 0 0</td>
</tr>
<tr>
<td>9-pdr</td>
<td>4.2in.</td>
<td>7ft 6in.</td>
<td>29 1 0</td>
</tr>
<tr>
<td>6-pdr</td>
<td>3.66in.</td>
<td>8ft</td>
<td>22 0 0</td>
</tr>
<tr>
<td>4-pdr</td>
<td>2.91in.</td>
<td>6ft</td>
<td>16 2 0</td>
</tr>
<tr>
<td>3-pdr</td>
<td>2.91in.</td>
<td>5ft 6in.</td>
<td>12 1 0</td>
</tr>
</tbody>
</table>

**GUNS**

<table>
<thead>
<tr>
<th>Nature</th>
<th>Weight</th>
<th>Length</th>
<th>Calibre</th>
<th>Charge</th>
<th>Max. range * (in yards)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32-pdr</td>
<td>56cwt</td>
<td>9ft 6in.</td>
<td>6.41</td>
<td>8lb</td>
<td>2,483</td>
</tr>
<tr>
<td>24-pdr</td>
<td>50cwt</td>
<td>9ft 6in.</td>
<td>5.823</td>
<td>8lb</td>
<td>2,630</td>
</tr>
<tr>
<td>18-pdr</td>
<td>42cwt</td>
<td>9ft</td>
<td>5.292</td>
<td>8lb</td>
<td>2,130</td>
</tr>
</tbody>
</table>

* These ranges were taken from an exercise conducted on HMS Excellent with the guns fired at 10 degrees elevation in 1839. These are some of the earliest recorded experiments with scientific methods and although they post-date the wars they show the range of British heavy guns at sea.

During the Napoleonic period the main ship weapon was the smooth-bore gun; rifling was not really adopted until the 1860s. Smooth-bore guns generally fired a solid projectile, or projectiles, although there had been some experimentation with the use of explosive shell. Guns were named according to the weight of solid shot they were designed to fire. Anonymous laboratory notes in the Royal Artillery library indicate that mortar shells were prepared for 6, 12- and 24-pdr guns on occasion the corresponding sizes being hand grenades, 4 1/2-in. and 5.5-in. shell (Caruana, p.282).

The main broadside armament of the heavy-gun ships-of-the-line was typically the 32-pdr of approximately 6.4-in. calibre, although similar smaller weapons featured on the gun decks of most ships of war ranging down in size to 3-pdrs of approximately 2.91-in. calibre. The allocation of guns to each deck and the layout of each gun deck had to be carefully worked out so that the ship remained stable and so generally the heavier guns were placed on the lower decks. On a ship-of-the-line such as one of 74 guns the lower deck held the 32-pdrs, the upper deck 18-pdrs or 24-pdrs and the quarterdeck 9-pdrs. Note that ships were classified by the number of 'great guns' aboard but this often did not take account of additional armament, such as carronades, which may have been fitted subsequently. The number of smaller weapons like swivel guns also very rarely gets a mention. Counting all weapons, ships listed as 'seventy-fours' would in fact usually have carried more than 74 guns, though smaller guns and carronades are not included in the accompanying table which sets out typical armaments.

A small bronze swivel gun of the period on a wrought-iron yoke. The yoke is interesting in that it is only designed to be depressed. The gun cannot be elevated above the horizontal and it is therefore probable that this piece was used in a fighting top or fired from a height.

(Author's collection)
The larger broadside guns were normally of cast iron but could on occasion be made of bronze. In the 17th century iron guns had become cheap and reliable although they had the disadvantage of being heavier than those of bronze. British iron guns of the Napoleonic period were mainly of the Blomefield pattern, so called because the Inspector of the Artillery Thomas Blomefield designed them in the latter part of the 18th century. Blomefield had taken up the post at the age of 36 but by the end of his career built up a reputation as an expert on gunnery. His guns are distinctive because they are very plain in design and have a breeching loop cast into the casable. This appointment of a ‘land’ artilleryman to design naval guns reflects the fact that the Board of Ordnance was responsible for supplying arms and munitions both to the Army and Navy.

Blomefield's designs were introduced into the Navy, however, in an attempt to standardise gun patterns. Blomefield's designs first made an appearance in 1786 when they were proofed at Woolwich. In fact his designs became so standardised that after the Napoleonic Wars they were quoted in Mould's Observations on a course of instruction in Artillery of 1825 as

---

**TYPES OF GUNS IN VARIOUS SHIP CLASSES**

<table>
<thead>
<tr>
<th>Type of ship</th>
<th>Calibre of gun</th>
<th>Deck</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>32-pdr</td>
<td>never standardised</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>24-pdr</td>
<td>never standardised</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>12-pdr</td>
<td>never standardised</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>6-pdr</td>
<td>never standardised</td>
<td>12 (HMS Victory c.1805)</td>
</tr>
<tr>
<td>74</td>
<td>32-pdr</td>
<td>Lower</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>18-pdr</td>
<td>Upper</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>9-pdr</td>
<td>Quarter</td>
<td>14</td>
</tr>
<tr>
<td>44</td>
<td>18-pdr</td>
<td>Lower</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>12-pdr</td>
<td>Upper</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>6-pdr</td>
<td>Fore'sle</td>
<td>4</td>
</tr>
<tr>
<td>20</td>
<td>9-pdr</td>
<td>Upper</td>
<td>20</td>
</tr>
<tr>
<td>14</td>
<td>6-pdr</td>
<td>Upper</td>
<td>14</td>
</tr>
</tbody>
</table>

* Guns were removed and modified over a ship's life and therefore these complements were by no means standardised. They represent a theoretical armament.

---

An early photograph of HMS Victory showing the guns on the quarterdeck. (Author's collection)

An early pattern of carronade, probably from the 1780s. The early form of carronade was very similar in shape to the howitzer. This example has trunnions and a square cascable button to which a wrought-iron tiller would have been fitted to aim or elevate the piece. It has a dispart sight on the muzzle for aiming the piece. This seems to have been common on many carronades. (National Museums of Scotland)

used for ‘Upper Deck 74 Gun Ships, Garrison and Battering trains’. Although there was therefore a set of standard official designs, nearly all of the iron guns cast during this period were manufactured by civilian contractors, such as Samuel Walker of Rotherham, the Carron Company of Falkirk, and the Low Moor Ironworks of Bradford. However, the Board of Ordnance kept a great degree of control over the tolerances required for the supply of government guns and many companies were to fall foul of their strict rules, not least the Carron company itself.

The Blomefield guns themselves incorporated a number of novelties which, it was thought, would improve them over the old patterns. Firstly the metal of the gun was redistributed so that the greatest thickness was around the breech where the greatest strain was during the explosion of the propellant charge. The cascable area was manufactured without decoration and the metal was evenly distributed around it so there were no weak spots and the guns were provided with a breeching loop moulded into the cascable for containment of the breeching rope (whose function is explained later). In comparison with the earlier Armstrong system, Blomefield reduced the muzzle swell from 17.7in. to 16.97in. and reduced the neck diameter from 13.8in. to 13.2in.

Although Blomefield's guns predominated, that is not to say that other types were not in use. Old guns did find their way onto Royal Navy ships and full standardisation was never achieved. It was not unusual to have a
GUNS OF BLOMEFIELD'S SYSTEM

<table>
<thead>
<tr>
<th>Calibre</th>
<th>Weight in hundredweight &amp; quarters</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>32-pdr</td>
<td>96cwt</td>
<td>9ft 6in.</td>
</tr>
<tr>
<td>48-50cwt</td>
<td>9ft</td>
<td>8ft</td>
</tr>
<tr>
<td>46cwt</td>
<td>9ft</td>
<td>8ft</td>
</tr>
<tr>
<td>44cwt</td>
<td></td>
<td>8ft</td>
</tr>
<tr>
<td>39cwt</td>
<td>9ft 6in</td>
<td>7ft 6in.</td>
</tr>
<tr>
<td>24-pdr</td>
<td>9ft 6in</td>
<td>7ft</td>
</tr>
<tr>
<td>50cwt</td>
<td>9ft 6in</td>
<td>7ft</td>
</tr>
<tr>
<td>48cwt</td>
<td>9ft 6in</td>
<td>7ft</td>
</tr>
<tr>
<td>18-pdr</td>
<td>37cwt 3qtr</td>
<td>8ft</td>
</tr>
<tr>
<td>12-pdr</td>
<td>34cwt 3qtr</td>
<td>8ft</td>
</tr>
<tr>
<td>9-pdr</td>
<td>31cwt 2qtr</td>
<td>8ft</td>
</tr>
<tr>
<td>6-pdr</td>
<td>29cwt 1qtr</td>
<td>8ft</td>
</tr>
<tr>
<td></td>
<td>26cwt 2qtr</td>
<td>7ft</td>
</tr>
<tr>
<td></td>
<td>25cwt 1qtr</td>
<td>7ft</td>
</tr>
<tr>
<td></td>
<td>22cwt 1qtr</td>
<td>7ft</td>
</tr>
<tr>
<td></td>
<td>21cwt 2qtr</td>
<td>7ft</td>
</tr>
<tr>
<td></td>
<td>20cwt 2qtr</td>
<td>7ft</td>
</tr>
<tr>
<td></td>
<td>18cwt 2qtr</td>
<td>6ft 6in.</td>
</tr>
<tr>
<td></td>
<td>17cwt 3qtr</td>
<td>6ft</td>
</tr>
</tbody>
</table>

* This list is the most common form of the system used and does not include some of the land service guns.

A mix of earlier Armstrong/Frederick pattern guns with Blomefield guns, carronades and other such weapons.

It is more difficult to generalise about the smaller types of guns, such as swivel guns and bow chasers on small vessels, because there were very many of them in service. Some were very old and some had been introduced during the wars. Weapons of 3- and 4-pdr calibre existed but were not standardised. These weapons were really the armament of the smallest vessels and were often also used as guns for the ship's boats or launches carried by larger warships.

RANGES OF VARIOUS SIZES OF GUNS

<table>
<thead>
<tr>
<th>Size</th>
<th>Point blank (yards)</th>
<th>Oust angle (yards)</th>
<th>Utmost range (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>563</td>
<td>2,915</td>
<td>1½</td>
</tr>
<tr>
<td>32</td>
<td>633</td>
<td>3,165</td>
<td>1½</td>
</tr>
<tr>
<td>24</td>
<td>650</td>
<td>3,050</td>
<td>1½</td>
</tr>
<tr>
<td>18</td>
<td>615</td>
<td>3,080</td>
<td>1½</td>
</tr>
<tr>
<td>12</td>
<td>733</td>
<td>3,665</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>716</td>
<td>3,580</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>666</td>
<td>3,330</td>
<td>1½</td>
</tr>
<tr>
<td>4</td>
<td>500</td>
<td>2,500</td>
<td>1½</td>
</tr>
<tr>
<td>3</td>
<td>400</td>
<td>2,000</td>
<td>1½</td>
</tr>
</tbody>
</table>

*As transcribed from the notebook of William Rivers of HMS Victory.

Because iron corrodes easily at sea great efforts were made to ensure that this did not happen. Gun maintenance was an import activity and the gunner was responsible for supervising it. If the bore of the gun became rusty it was possible it could cause a firing accident. Guns were normally painted and the recipe was as follows:

Six ounces of lamp black, three prits of spirits of turpentine, and three ounces of litharge are to be put in after the turpentine and black are well mixed, add one ounce of umber to give it a gloss and one gallon of bright varnish.

There were also other methods of using anti-corrosive coatings but these varied depending on the author. All of these recipes represented a way of sealing the gun against the corrosion inevitable in a salt-water environment.

We know from the inventories of the frigate Inconstant that the paint allowed was:

- Downs black 44 gallons
- White 44 gallons
- Red 44 gallons
- Yellow nil
- Oil 5.2 gallons turps
- 1 quart brushes 1 2
- 1

Specifically for a 32-pdr the following quantities were allowed for each gun:

- gun 1lb 5oz
- carriage 3lb 9oz

In his notebook William Rivers considered that 'guns are to be sealed before load'd [onboard the ship] at sea. I don't approve of sealing on account of damp in the gun.' Rivers also remarked:

'Precautions to be taken when guns are put down in the hold. They are to be painted over with a thick coat of tar and tallow. Well washed inside the bore with fresh water and a good wash dapped in the mixture and put in the muzzle.'

British gun carriages

The gun carriage itself was of a type known as a truck carriage after the small wheels or trucks that it was mounted upon. The original design for a gun carriage in the Napoleonic period was set out in 1782. It was a truck-mounted, stepped cheek design. The design introduced in 1791 was exactly the same except that its cheeks had bevelled edges that were angled at 45 degrees.

A drawing of a standard gun carriage pattern from the notebook of William Rivers, gunner on HMS Victory. River's notes contain few drawings but this image is remarkably clear and gives the proportions of all the natures of gun carriage. The locations of the various eye bolts seem to be at variance with other drawings of the period, particularly positions B and E. (Courtesy Royal Naval Museum)
The 1795 pattern carriage had an additional piece added to the front transom but no clear images of this type are known. It was called the ‘breast ended preventer cleat carriage’ and this suggests that it had an additional fitting for the breast transom, probably to act as a spacer between the side of the ship and the gun carriage and assisting traversing.

Generally the carriage was of a relatively simple design mounted upon two sturdy wooden axles. The typical sea-service carriage has been called the 1791 pattern carriage, but it can be seen in the same form in early drawings of weapons in the Royal Artillery library from the middle of the 18th century at least. Each side cheek was stepped so that leverage could be applied through handspikes onto the bottom or rear of the breech. The carriage was not fitted with an elevating screw during this period, so the elevation of the gun relied purely on the quoin (a sliding wooden wedge placed underneath the breech end of the gun). As we shall see, adjusting the quoin was the preserve of the gun captain during action.

In 1795, changes were made to the sea-service carriage which reflected the introduction of the Blomefield pattern system. In fact the carriage’s simplicity was deceptive – the type had been developed from early gun carriages that had been introduced during the period just before the Spanish Armada campaign. Gradual refinements had taken place to create a carriage that was relatively small but strong enough to carry the weight of a gun of up to 3 tons. The carriage had to cope with the violent recoil of the gun in an enclosed space and be trained left and right for aiming. This meant that the ropes controlling it had to be long enough to allow manoeuvre but also set up to restrict the recoil of the gun and allow it to be run in for loading and out for firing, no matter how the deck was rising and falling and tilting with the motion of the ship. The gun had to be run out and fired and reloaded in any kind of weather. The method of doing this was to use ropes and tackles known as side and training tackles. It needed a crew of up to a dozen men to run the gun out using this pulley system. In addition a very large rope passing through, or around, the cascalable loop would ensure that the gun would be controlled on recoil.

The two tackles were attached to the carriage through ring bolts and also attached to the ship’s side in the same way. The tackle ropes used were normally about 3in. in diameter. They were run through a single block at the side of the ship and a double block on the gun. If one looks at the side loops on the gun carriage they are designed to take a block and not as is sometimes supposed to pass a rope through.

In a rough sea, and when not in use, the guns had to be restrained from moving around the deck. There was a train tackle fastened to the end of the gun carriage and a ring bolt in the centre of the deck. This stopped the gun from moving toward the gun port when the ship was heeling. The gun tackles could also be used to stop the gun from moving, safely lashing it to the side of the ship. This process was called housing the gun. It involved removing the quoin and lashing the gun against the side. There were many ways to do this and normally the muzzle was roped to the side of the ship and smaller ropes or lashings were used to keep the connections tight.
Another carronade of the period, but this time a commercial example fitted with trunnions. The weapon has a breeching loop and this is the sort of weapon sold by commercial companies such as Bailey Pegg and Carron to fit out armed merchantmen. (Museum of Naval Firepower, Gosport)

Carronades and new designs

The great invention of this period was the introduction of the carronade, so called after the Carron Ironworks where many of the type were made and where it is speculated that it may have originated. However, it has often been argued that this weapon was the brainchild of Sir Charles Gascoigne, the manager of the Carron Ironworks and it was possible that it could have been called the Gasconade after Sir Charles. There are several contenders for the honour, including Sir Charles, Lieutenant-General Robert Melville, and the Carron Company, all of whom have a claim to be the real inventor. Unfortunately it has never been proven who the true originator really was. The first carronades appear about 1778 and were very different to that which was eventually accepted into the Royal Navy.

The carronade was a much lighter, thinner-walled piece than a conventional shipboard gun. It had a small powder chamber instead of a continuous bore and usually had no trunnions. Instead it was fixed to its mounting by a cast iron loop underneath the barrel and had a horizontal cast loop at the rear of the gun to take an elevating screw. The carronade had fittings for sights at the reinforce, and a muzzle ring cast into the iron body of the weapon.

<table>
<thead>
<tr>
<th>RANGES OF CARRONADES (IN YARDS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calibre</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>42-pdr</td>
</tr>
<tr>
<td>32-pdr</td>
</tr>
<tr>
<td>24-pdr</td>
</tr>
<tr>
<td>18-pdr</td>
</tr>
<tr>
<td>12-pdr</td>
</tr>
</tbody>
</table>

One of the most notable features of carronades was that they were designed to have a greatly lessened windage. Windage was the name given to the gap between the side of the round shot and the wall of the bore. The reduced windage meant that more energy was projected onto the shot because less air escaped around its sides. The shot were cast in a spherical mould of the same diameter as the bore of the carronade. In a normal gun an allowance would be made for windage. The windage for the carronade was achieved by the shot shrinking after it had cooled down. For a greatly reduced powder charge the same velocity could be achieved at short range. So a very heavy shot could be fired from a light gun, though only at comparatively short range. The nickname of the carronade - the smashers - literally described its function. Carronades were made in calibres from the 6-pdr up to the 68-pdr monsters that were mounted on HMS Victory, though, as with the 42-pdr long gun, it is thought that the ammunition for these weapons was simply too heavy for practical service at sea.

From the beginning of its life, however, the carronade became widely accepted as a powerful weapon with lethal capacity at close range. Some ships were even exclusively armed with carronades, like the Glutton, present during Nelson’s victory at Copenhagen, and famous as having Captain Bligh as its commander.

A further page from the notebook of William Rivers detailing experiments made with carronades in 1779. It concerns the ability of the carronade to pierce two large balks of wood 2ft 3in. thick at 160 yards range. After destroying both pieces the shot buried itself in a bank of earth up to 4ft. (Courtesy Royal Naval Museum)

The reduced windage combined with a short barrel meant that the process of placing the ammunition into the muzzle was difficult so a small recess was cast into the muzzle face to allow the loader’s fingers to manipulate the shot. Carronades were not generally mounted on truck carriages since their design precluded this; instead they were mounted on slides. These consisted of two parts. The upper mounting was a wooden frame upon which the carronade was fitted. The lower mount of the carriage consisted of a long flat wooden board slotted along its length, through which a central pintle passed to attach it to the upper carriage. The lower carriage was attached to the gunport at the muzzle end and the breech end rested on two iron trucks which allowed the mounting to be traversed laterally inside the ship. This whole arrangement meant that the gun could be moved up and down the slide and across the face of the gun port. The upper carriage could also be angled, giving a theoretical traverse both on the main and upper carriage.

One of the most innovative features of this mounting was the use of an elevating screw. This method of elevating a gun had never really caught on in the Navy but in land service it was
widely used. The carronade, however, as well as a breeching loop, had a flat casable ring, cast in the horizontal plane, and threaded to take a long pin turned with a coarse screw thread. Fixed to this was a handle with four protrusions that could be used to turn the screw, thus moving the breech end of the carronade up and down. Contemporary drawings show that the design was such that, on firing, this screw and the loop underneath the barrel would take most of the recoil strain and, although there was a very sturdy breeching rope, the screw must have been damaged by continuous firing. The viciousness of the recoil of carronades was legendary, and was all the more apparent because they were mounted in such a peculiar way. The mountings could easily be damaged by repeated firings.

The carronade was not always mounted upon a slide and sometimes the weapon was even cast with trunnions (horizontal projections used to elevate the gun) and given a truck carriage in the bow or stern of the ship. These, however, were commercially produced guns that did not conform to Admiralty patterns, although some of them undoubtedly found their way onto ships of the Royal Navy.

Once the carronade had been invented, tried and tested, other forms of gun came to the fore. William Congreve, the great artillery and designer, applied his knowledge of gunnery to what he saw as the naval problem and produced many new designs (it was common for serving officers to produce new designs as a way of drawing attention to their skills). Congreve and another gentleman called John Gover presented their ideas to the Admiralty with mixed results.

Congreve's guns appear to have been an attempt to marry the carronade to the conventional long gun and did not really come into any use until just after the Napoleonic wars. Nevertheless, Congreve also invented a highly unusual system of mounting guns - their trunnions were mounted on a tiny-wheeled trolley - which would have considerably reduced the space needed for gun carriages aboard ship. Although he produced a pamphlet detailing these ideas, no real changes were implemented by the Admiralty.

Gover's 24-pdr gun was accepted by the Admiralty and was used to equip some older ships-of-the-line as a uniform armament. It was a move away from the traditional idea of a gun mounting and included a fairly radical gun carriage design. According to A. Caruana the system was tested aboard HMS Kent in 1799 and was adopted by the Admiralty. It consisted of a two-part carriage fixed at one end to the ship's side and with a ratched elevating post at the other. The carriage was traversed by ropes attached on either side of the mount. A top carriage held the gun. Looking at contemporary images of the system it would seem that the whole of the mounting would take up considerable space on a man of war. It is perhaps for this reason that the system was not widely adopted in the Navy and was used only on gunboats and bow mounts.

When firing a gun at another ship, two key movements of the barrel are involved, traverse, in other words the horizontal movement of the gun from right to left, and elevation, the raising or lowering of the breech in order to increase or decrease range. The difficulty was increased with the need to fire when the vessel itself was inclined or moving violently. Take such inhibiting factors as smoke, wounded comrades and splinters flying in all directions and one can see that keeping one's head in action was far from easy. Firing quickly and accurately could only be done through endless drill. The only standard sights available to the naval gunner were the quarter sights engraved on the breech ring and muzzle of a gun. Aligning them and aiming along them was a very imprecise way of pointing the gun, though British doctrine traditionally required that ships should manoeuvre to such close range that it was rapidity of fire and not precision of aim which determined the outcome.

In the Napoleonic Wars the only way of elevating and aiming a long gun along its upper surface was by the use of the tangent scale. Of course, fighting by the British was expected to be at close range and therefore theoretically devices to improve long-range gunnery were not required. However, in gun handling just as in gun design, there was a degree of
innovation, and as stated previously it was normally carried out by captains on an individual basis. Captain Philip Broke was such a man and is best known as the captain of HMS Shannon, the frigate that famously captured the USS Chesapeake during the War of 1812. His obsession with gunnery refinements was such that he had all of his ship’s guns fitted with disparate sights (a raised sight at the muzzle). The guns also had tangent sights (the tangent sight was a raised sight fixed at the rear of the breech which allowed the gun to be elevated and aimed at the same time) made out of wood. These were drawn by Broke in his notebook (Broke papers HA95 877/16). The gun-decks on the Shannon were also marked with pre-determined angles to which the guns could be traversed so that they could be pointed and elevated uniformly and as ordered even when their crews could not see the target. It is also said that Broke’s gun carriages had been altered so that they lay horizontally despite the sheer of the deck. Contrary to common belief this commander and others like him proved that gunnery innovation did exist during this period. Unfortunately there were no real attempts at standardising these innovations, so gunnery practices varied throughout the Navy.

Other innovations also helped guns to fire at the right moment in conditions of limited vision. As was usual it was the experimentation of captains at sea that led to these innovations. One method was to fix a pendulum placed in a hatchway to indicate the angle of inclination of the ship. (If the guns on both sides of a ship were being used in an action it was usually necessary, since the ship was nearly always heeled over one way or another, to depress the guns on one broadside and elevate those on the other side. This would be done by a general order from the captain.)

**Drill and organisation**

The guns of a man of war were numbered from bow to stern on each side. The first port gun was known as Port No. 1 and the starboard as Starboard No. 1. The odd numbered guns on the port side and the even numbered guns on the starboard side were known as the right guns and the others as the left guns. Guns on the various decks were organised into divisions and each was either as foremost quarter or an after quarter. The officer commanding a division was known as the officer of the quarter. The gun captain was the seaman petty officer in charge of a gun. In larger ships a lieutenant would command half the guns on a deck and smaller groups of three or four guns would be under the nominal control of a midshipman. These officers and petty officers, and the guns’ crews themselves, were not in any sense gunnery specialists; they had numerous other duties in the ship. Ships did have specialist gunnery personnel, headed by the ship’s gunner, a warrant officer appointed to the ship by the Ordnance Board. His role and duties, and those of his subordinates, will be explained shortly.

In all there were typically 13 men and one boy allocated to each 32-pdr gun on a 74-gun ship. This did not mean that as many were always available to man the gun in action and training often included practice in crewing a gun with fewer men. Men could be called away for sail handling or similar duties, or could be drawn off to serve the guns on the other side of the ship, though it was uncommon for guns on both sides to be in action simultaneously. The men in a gun crew were allocated numbers and each had specific tasks to perform.

As an example, following the command ‘clear for action’, their main duties were as follows:

3, 4, 5, 6, 7, 8 Prepare to cast loose the gun, but never to cast it loose without orders.

9 has charge of the sponge rammer and... staff towards the ship’s side.

10 fetches swab and two handspikes one placed at the gun in the manner of 9.

2 Sees that a match and tub is at hand. Fetches a fire bucket and lanthorn with a number of vent plugs.

11 Holds priming cartridge, fetches powder horn, priming iron, tube box and casts loose the apron.

12 Provides shot and wads, trains tackle... and to see that spare breechings with seizings are stopped up near the gun.

1 The Captain of the gun fixes the lock, clears the vent, supplies flints, has a spare lanyard and examines the condition of flints in the lock.

13 Powderman is to fetch the cartridge from the magazine, in a salt box after which he is only to fetch one at a time in a cartridge case, as there may be one, but not more than one in the area.

In the drill manual, *Instructions for the exercise of the great guns 1818*, the carronade drill is slightly different. Here the crew is reduced to seven men largely because the carronade was normally mounted on a slide (as previously described) and did not need as much manpower to run the gun in and out.
1 Captain primes, points, elevates, trains slide.
2 Second captain stops vent and trains slide.
3 Loads
4 Sponges
5, 6, 2 run out
5 Supplies cartridge and wad to 3
7 Keeps cartridges supplied.

Prior to the establishment of HMS Excellent on Whale Island in Portsmouth in the 1840s the Navy had no training organisation for gunnery. Therefore a great deal of the knowledge that crews had to acquire in the handling of guns was given by instruction on board ship by the ship's gunner. Much knowledge was gained empirically and handed down orally.

The gunner of any ship was a key member of the crew. He was an officer of the ship but, as noted above, his authority derived from his warrant issued by the Ordnance Board. He thus had a dual responsibility, in part to the Board and in part, like any other member of the crew, to the ship's captain. His responsibilities were very varied but he was undoubtedly the ship's senior ordnance expert. He needed to be knowledgeable in maintaining the guns and their related equipment, in handling and preparing ammunition, and in training men to use the weapons in action. In action the gunner would normally work in the magazine, supervising the handling and distribution of ammunition to the guns; he would usually not be directly involved with the operation of the guns themselves. In small vessels with few officers the gunner might also serve as one of the officers of the watch, in addition to his particular tasks.

It is interesting to note the captain's instructions to his gunner on HMS Sybille during this period, which lay down specific duties such as the time the gunner is to get up and his responsibilities towards ammunition supply. He had to be up at five o'clock in the morning and:

'He is to see that all the guns are clean'd wash'ed and dried, that they are well secured and ready for service, that their vents and tomplons are well in and no shot loose in the guns. He and his mates to inspect the guns regularly during the day and night.'

He was expected to keep 25 lb of powder cartridges filled ready for use and loading and handling of powder was his responsibility, although he was never to open the magazine unless at the orders of the commanding officer. In order to keep the crew trained he was instructed to exercise two guns daily, except on Sundays and Thursdays.

To achieve this the gunner was assisted by various mates and others such as a Quarter-Gunner (an assistant to the gunner who maintained the guns and filled powder charges etc.). There was one quarter-gunner to every gun. According to the notebook of William Rivers, the gunner of HMS Victory, the following could be conceived as the specialist weapons personnel of a 100-gun first-rate or 98-gun second-rate ship-of-the-line:

<table>
<thead>
<tr>
<th>Rank</th>
<th>First Rate</th>
<th>Second Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Gunner's] Mates</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2nd class gunners</td>
<td>25</td>
<td>23</td>
</tr>
<tr>
<td>Armourer</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Armourer's mates</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Gunsmith</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Gunner's Taylor</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

It is not clear whether this information is given solely in reference to Rivers' ship only or relates to all HMS ships-of-the-line but clearly there were quite a few gunnery specialists on board ship. It is also clear that they were not only expected to be experts in their field but also worked the ship when required and were regarded as elite seamen by other sailors.

**Tools and equipment**

Many pieces of equipment were required to fire a gun and maintain it. There were the general tools such as the rammer, sponge, limstock, worm, handspike, apron of lead, gunlock and buckets. The handspike was a stout bar used to lever the gun carriage or barrel on the ship's deck. A worm or wadhook was used to scour the inside of the barrel to remove burning embers or blockages. It consisted of a wooden staff with a spiral iron hook on its end. The sponge was a staff with a large sheepskin head used for damping down burning embers and cleaning the gun barrel. The rammer was a long staff with a cylindrical wooden head usually slightly smaller than the bore, used to ram home the powder and cartridge. A flexible sponge and rammer could also be used; this had the same head as the rammer described above but mounted on a length of sturdy rope. This meant that the rammer could be bent to the muzzle of the gun and rammed from the side without having to run in the gun fully. A priming iron was a tool for clearing the vent and piercing the cartridge case. This was normally a non-
ferrous metal spike. The vent needed to be kept dry
in heavy seas so a lid or vent cover (a small piece
of twine or even a wooden peg) was placed in the vent
when not in use. There might also be an apron—a
lead cover to prevent damp entering the vent. This
was often placed over the lid.
Powder handling also required a great number of
tools and apart from cartridge cases, leather
buckets, bags and other such items there were
some specialist pieces of equipment used in the
magazines. Much of what we know about naval
gunnery comes from information gleaned from
archives and documents. However, recently
gunnery implements have been recovered from
many shipwrecks and studied by underwater
archaeologists. One of the finest finds in recent
years has been the wreck of the 

Invisible which
was found complete with gunners' stores. The ship sank in 1758, which
is obviously before the period under investigation, but it appears that many
of the implements and tools were of exactly the same pattern as those in
use during the Napoleonic Wars.
Navy guns of the Napoleonic period were fired by flintlock
mechanisms, though there has been some debate in historical circles as
to exactly when the gunlock was generally introduced. It is clear from
letters written by the Admiralty in 1755 that gunlocks were to be fitted
for use on HM ships. These locks were fixed to the side of the vent field
on the gun and were used in conjunction with tin priming tubes. These
tubes carried the gunpowder and the exploding composition, which meant that the
whole process of priming the gun became far more efficient than before.
To prime the gun the charge bag was pierced with a priming iron. Then
a priming tube was placed in the vent and the gunlock cocked. Previous to
this the vent had to be filled with loose gunpowder, which was time
consuming and dangerous with burning embers around. However, this
cosy view of the efficient gunlock is not wholly realistic as we know that
lubbers were also kept on hand and that the gunflints themselves
frequently broke or the locks misfired. What they did do, when they were
functioning correctly, was speed up the firing process.

Tactical doctrine

We are lucky to have a variety of sources that help us understand sea-service
gunnery. Since at least the 17th century, sea-service gunnery was singled
out as a special discipline and although specific manuals relating to
gunnery only appear at the end of this period, general works such as
Falconer's *Marine Dictionary* deal with aspects of gunnery. Apart from these
sources there are other documents that span the period of the Napoleon
Wars but also refer to later practice. One of the best is that written by
General Sir Howard Douglas whose father was Admiral Sir Charles Douglas
of the *Duc* (Charles Douglas was a major innovator in the Navy, intro-
ducing gun locks and sights for his guns. Unfortunately most of his ideas
were not adopted until after the wars but like Broke he used them with
success. Although a landlubber, Howard Douglas was extremely interested
in naval guns and wrote his famous treatise *Naval Gunnery* in 1820 after the

Napoleonic Wars but based on all the occurrences of those
years. It was reissued four times between 1820 and 1860 and has
many interesting observations on naval gunnery during the
smooth-bore period.

There were many different techniques for fighting the
guns at sea. The basic tactic was for ships to be formed in a
line of battle, with each ship following behind the one
ahead. This allowed all of the guns along the sides of
the ship to fire with a clear field of view. It is often not
appreciated just how slow a Napoleonic naval battle could
be since the ships were at the mercy of the wind and
might have to manoeuvre for hours to get into position.
But once within range of one another the battle would
become vicious and terrifying.

Douglas had this to say about it:

'*.. naval actions are subject to such sudden and unforeseen
mutations in the positions of the contending ships, and are liable
to such great alterations in the distances of the ships, that until the
affair becomes close and the struggle is near its termination, no
two rounds can be fired exactly under the same circumstances.'

This insistence on action at close range is somewhat contradicted by
the existence of other forms of gunnery attack. For example the use of
ricochet fire suggests subtle differences in the type of gunnery duels
carried out. Ricochet fire had been known in naval gunnery since the
16th century and basically used the same technique as a child who throws
a flat stone to skip across the surface of the water. This technique was
well developed by the Napoleonic era. A gun could be made to extend
its range, even if it lost its velocity, by bouncing the projectile off the
water and if the technique was employed correctly the shot would hit the
target at the right velocity to cause maximum damage, especially if more than
one ship were moored, one behind the other. This phenomenon was
considered by Falconer to create more disorder by going much more slowly
than if thrown from the piece by greater force (Falconer, p.251). In 1829
Beachant, when investigating this phenomenon, said that a charge of ¼
the weight of the shot from a 24-pdr of 9ft 6in. and at 1-degree elevation
would achieve a range of 2,500 yards by ricochet
fire. It was thought that the technique was
particularly successful against groups of small
vessels when one ball could damage several
vessels.

At this point it would be interesting to
consider the range at which vessels opened
fire. A gun such as the 24-pdr would have a
point-blank range of around 250 yards. That
is the shot would first make contact with the
water when the gun was level at 250 yards.
The gun was most powerful at this range and
had to be elevated by degrees to get more
range. The modern author Tunstall stated
that one of the most damaging attacks was to
use reduced charges and alternately depress and elevate the guns at close range causing the maximum number of splinters. Battles could often start at a range of 1,000 yards but ranges between 150-250 yards were much more likely if a vessel was to be severely damaged. Raking the ship meant firing along its length from stern or prow so that the shot scoured the whole length of the deck. It was seen as one of the most effective forms of tactical firing.

Carronades had their own tactical peculiarities. They may have had a destructive effect at short range but it was soon found that vessels armed with the weapons were at a serious disadvantage when faced with ships with longer guns, as was demonstrated in the War of 1812. Sir James Yeo, who commanded the British squadron opposing the Americans on Lake Erie, found that with only six guns in the fleet that would reach the enemy (who obviously kept out of range) not a carronade was fired. So it became obvious that a mixed weapon complement was required. When the range was closed the carronade came into its own.

**Small-bore artillery and swivel guns**

The use of large numbers of anti-personnel weapons on board the warships of the period is often overlooked by historians in favour of concentrating on the phenomenal effect of the big guns. Many smaller weapons were mounted on the bulwarks and in the fighting tops of larger ships as well as forming significant parts of the armament of the smaller vessels or being carried in ships' boats. Small guns were often mounted in the bow or stern to provide additional firepower to the front and rear of the vessel that the broadside could not reach. Disabling or killing enemy crews was obviously a high priority and the number of small guns was prodigious in all navies. These weapons could produce a withering storm of small projectiles that would be devastating at short range.

Apart from the guns that were mounted on carriages all over the ships, there were also a large variety of guns mounted on the bulwarks on reinforced stanchions. These typically were of 1-in. to 2-in. calibre. These guns, which we shall call collectively swivel guns, were true cannon rather than small arms. They could be made of brass or iron and were mounted upon wrought iron yokes affixed to pintles that would be located in holes on the ship's rail or on stanchions. The cascades could have specially added iron or wooden handles called tillers, which were used to aim the guns.

It might seem at first glance that the swivel was just fitted to a socket on the rail but this does not take into account the recoil of the gun. Hence a knee behind the mounting often reinforced the stanchion and the upper head of the stanchion could be reinforced with an iron band. These guns were not solely used for combat purposes and it was quite common for them to be used as signal guns when the need arose.

It was usual for these guns to be mounted on the higher points of the ship such as the quarterdeck. They were kept loaded and spare charges were kept in a budge barrel near the gun. A budge barrel was a wooden barrel with a leather insert into which charges were put. It could be tied shut thus protecting the charges from any flying sparks. Swivels could fire a ¾-pound ball or a collection of small shot known as partridge shot. The charge was around 4 ounces of powder per gun.

A French variation on this theme was known as the espingole and was a completely brass weapon with a straight barrel terminating in a flat muzzle ring. The weapon was cast with trunnions and the rear part of the gun, instead of having a cradle, had an extended bronze handle, which had become the tiller. It was fitted with a firing lock actuated by a lanyard so no trigger furniture was evident. The bore of the espingole was around 2½in.

Only the French really tried to introduce some kind of standardisation of larger bore swivel guns, with the pattern of 1786 being the commonest. As has been stated, the gun could be fired by a firing lock but in the larger models it was usually fired by applying a match to the vent by means of a linstock.

**Howitzers**

Howitzers of the period are generally known as short-barrelled weapons with a small powder chamber firing explosive shells. Some commentators have considered the carronade as a form of howitzer but its primary role was to fire solid shot at short range. It is true that the carronade could be employed to fire common shell but in reality this was not done often. Indeed weapons firing explosive shell were not normally used in ship-to-ship engagements, but were often employed in bombardments of shore targets. The British tended not to use howitzers at sea and relied on mortars for close-in siege work. Hence the 13-in. sea-service mortar was normally used when explosive shells were needed. William Congreve designed a 10-in. sea-service howitzer to carry out the same role as the mortar but it never caught on.

Other countries, particularly in Scandinavia, did use the howitzer to great effect against the British especially from small vessels. Because of their defeat at Copenhagen in 1807, the Danes found themselves with very few large warships. Therefore they adopted many of their gunboats and some flat-bottomed vessels for use in the Baltic. The following is a description from James's Naval History describing their exploits against the British:
'On the 4 June 1808, during a calm in the Great Belt, the Tickler gun-brig commanded by Lieutenant Skinner, was attacked by 4 Danish gun-boats, and after a conflict of four hours in which the commander was killed, she was obliged to surrender. A few days afterwards, the bomb vessel Thunderer Captain Cadfield, and the gun brig Turbulent Lieutenant Wood, with a convoy of 70 vessels, were attacked by 25 Danish gun boats, when the Turbulent was captured. With 10 or twelve of the merchant ships: and on the 2nd of August, the gun brig Tigress Lieutenant Greensward was taken by 16 Danish gunboats.'

Clearly in their own waters, the Danes had begun to use the gunboat as offensively as a large vessel and they were able to manoeuvre with great skill. A report from Wyborg, Jutland, August 26 1812, 'The Captain of the Attack was himself attacked by a Danish flotilla of gunboats', published in Naval Chronicle, August 1812, explains:

'When the force opposing us is considered, 14 gun-vessels each mounting two 24-pdr’s and two howitzers and four row boats containing swivels and howitzers. Then commenced the action with a heavy fire of round, grape and grenades (this is the old-fashioned term for common explosive shell used with howitzers) within pistol shot. Until twenty past three, when it being still quite calm, the brig was a complete wreck quite unmanageable and in a sinking state.'

The implication was that small-bore howitzers could inundate larger British vessels with explosive shells that were extremely damaging and lethal to the crew. So what were these gunboats like? They were obviously heavily armed and their armament appears to have been a mixture of long guns and mortars. It may be that the mention of mortars indicates howitzers and not mortars, which would be extremely difficult to aim from such a vessel. A typical weapon of the Danish Navy can be seen in the Royal Armouries collection XIX.181 dated 1771. This weapon has a 3.4-in. calibre and a length of just 1ft 8in. The howitzer is cast with trunnions and was used from the bow of a gunboat.

The Swedes, Russians and Danes all employed some form of rowed warship and the Swedes had specific designs dating from the 1770s by the
B: The Congreve rocket system at sea

C: Light guns

1

3

4

5

6

7
E: French and Spanish weapons

1. Cannon
2. Cannon with wheels

F: Small arms

1. Musket
2. Flintlock musket
3. Pistol

1. Musket
2. Flintlock musket
3. Pistol
A very fine flintlock musketeon manufactured by the London gunmaker Mortimer in 1799. The musketeon was often used to augment the small arms fire of the ship’s petit artillerie. This example was made for the East India Company, but was presented by the Defence Ordnance Safety Group, Bath, to the Museum of Naval Firepower, Gosport. (Explosion, Museum of Naval Firepower)

naval architect Frederick Henrik Chapman. These vessels were thought to be of 60 tons displacement and could carry two 24-pdr guns, which were substantial weapons and even more destructive when such gunboats were massed in large numbers. A smaller version of this vessel existed with only one gun that could fire aft. The guns were mounted on carriages in turn mounted on rails along the bottom of the vessel. They were manned by crews of 60 and 25 men respectively. The gunboats that fought with British vessels in the Baltic may have been built along similar lines to these Swedish ones and indeed it is thought that these vessels, whether Danish, Swedish or Russian, were very similar in design throughout the Baltic.

If, as we believe, these boats were armed in some measure with howitzers then the explosive shells that were fired must have been devastating in the extreme. The Scandinavians certainly used the howitzer and it is thought that they were occasionally used to damage the rigging and masts of larger vessels. Carronades, too, came to be used by the Scandinavians since a great deal of firepower could be contained in a much smaller weapon that could be mounted on a gunboat.

To counter them, the British also built armed gunboats. Contemporary models show that they were often armed with a carronade on an unusual slide mount that ran on a wooden race giving 360 degrees of traverse. Nearly all of the gun mounts used in these boats were stepped carriages mounted on rails that allowed them to fire forward or aft only. This did not present much of a problem because oars could manoeuvre the vessel.

**Small arms**

Although not specifically part of a ship’s armament, it is worth mentioning the musket, the standard flintlock smooth-bore weapon of the period of about 3/4 in. calibre. A number of these would be carried by each ship as part of its armament. Muskets could be used by just about any seaman to repel boarders or clear the decks of an enemy ship from the fighting tops or the quarterdeck. They were an essential part of the naval armament of the Napoleonic Wars. In British service they were normally flintlock weapons similar to those used by the Army, but with a barrel 37 in. long and including a number of features that distinguished them from land-service weapons. One obvious pointer is the flat butt plate presumed designed for storage purposes aboard ship. Other indicators were the simple fittings and a flatter lock plate and cock. They were made at the Tower Armouries or at private manufacturers in London or Birmingham. Sea-service weapons were generally shorter than land-service weapons and this again is probably because of the confined areas aboard ship. The French favoured a longer weapon at 66.5in. overall but they, too, had cut-down versions of 62in. In fact, a lot of the weapons that found their way onto French ships did so because the
muskets were considered to be out of date for land use. In total there were probably 120 muskets and 30 musketeons carried on a large French ship-of-the-line.

The musketeon was a close-quarter shotgun-style weapon for repelling boarders and clearing decks. It certainly was not intended for accuracy. One contemporary chronicler described the manner of firing as holding the weapon at waist height and off the hip. When the gun was fired, the firer kept his grip on it but let himself be swung partly around by the recoil. It was obviously aimed in the general direction of the target and no more than that. The stock would have been for storage and nothing more since lining up the weapon and aiming it from the stock would probably have dislocated the shoulder of the firer. British musketeons could have a barrel of brass or iron, normally about 16in. long, and had a calibre of about 1 inch, although they were often slightly larger. A musketeon fired a group of small shot and was effectively a flintlock shotgun. There were many types of this weapon and very few were standardised.

Ammunition

Ammunition was very similar in all navies of the period reflecting the limitations of smooth-bore weapons at the time. It can be broadly put into three categories: round shot, anti-personnel shot and anti-rigging shot. Round shot was a simple solid cast-iron projectile designed to smash a ship's side or cause splinters to fly around on the inside of a ship. The destructive effect of round shot was enormous and it could generate showers of lethal wooden splinters even if it did not penetrate the ship's side. Experiments were carried out by HMS Excellent in 1838 with an 18-pdr against the hulk of the Prince George. At 1,200 yards and 6 pounds of powder the shot penetrated 21–38in. into the wood to see how much damage a round shot would do to a wooden but with wooden stanchions supporting it. A 32-pdr shot was then tried:

William Congreve the Elder's unusual design for a 32-pdr. At 7ft 6in. it was a much smaller gun than the standard 9ft 6in. The original idea was to create a much lighter gun (40oz) that would still be strong enough to fire double-shotted. (Museum of Naval Firepower)

Two examples of bar shot. These have been recovered from the seabed and show the two main types, one with a hemispherical cast-iron end and the other with a flattened cylinder-end. The bar clearly shows the construction of wrought iron, which has been worn away by the sea. (Museum of Naval Firepower)

‘Two 32 pounder shot were fired singly with charges of 10lbs 11 oz of powder they entered at the same place which made it impossible to distinguish their effects, together after penetrating the ships side in firm wood they shattered a sound wooden keel: they then passed along the deck, cutting down a wooden stanchion 6 feet long and 8in. square under the beam; this they shattered into pieces, causing many splinters six of which were very large. And one of them swept the deck as far as the pumps. One of the two shot penetrated its own depth in the sound wood on the other side of the ship and there it stuck.’

Anti-rigging shot included all sorts of strange and unusual contraptions. At its simplest, the bar shot was a plain bar connecting two hemispherical end pieces. It was wrapped with rag to make it uniform in the bore of the gun when fired. Chain shot consisted of two balls connected by a length of chain. Star shot was formed of a central hub and four or five arms, which flew out to form a star shape after leaving the muzzle of the gun. All of these latter projectiles were meant to cut cables, rip sails and smash spars and yards.

Finally there were the anti-personnel rounds. Grape shot was composed of a number of iron balls about 1.5in. in diameter clustered around a central spindle and mounted on a base, the whole then being sewn into a bag. Canister shot was a similar idea but consisted of small正常text

All of these weapons needed a propellant and gunpowder was the source of the explosion. It was sewn into paper or serge bags and kept in a leather carrying case near the gun. Only a small number of charges were kept near the gun because of the danger from premature explosions. It was the gunner’s job to check and maintain the magazines that could be in various parts of the ship.

William Rivers of the Victory makes a distinction between two different types of gunpowder. Large Grain for long distance (Red). Large Grain for close engagement for salutes etc. (white). Whether the colours indicated the colour of the containers or their markings is not clear. The difference was about the potency. The weaker mixture or white was obviously expendable. Saluting guns only required enough power to make an audible noise and short-range work relied on the weight of the shot to do the damage.
Powder was brought to the great ships of war by small vessels called powder boys. For the Portsmouth base, for example, the magazines were at Tippnor or Priddy’s Hard in Gosport. A magazine was erected at Priddy’s Hard in 1777 and there are records of HMS Victory being supplied from there in the Ordnance reports for 1793. In the returns for that year William Rivers recorded that the following were transported to Victory:

- 600 x 32lb round shot
- 400 x 24lb round shot
- 1,260 x 12lb round shot

The barrels of powder came from Priddy’s Hard as well, arranged by a William Beach:

- Corned powder
  - 79 x 90lb
  - 205 x 45lb
- 316 x 25lb
- 315 x copper hoops for full barrels
- 824 x copper hoops for half barrels

Cartridge cases were an integral part of the ammunition of any ship. When first introduced all cartridges had been made of paper or parchment, but this created problems for the gunner because, on firing, not all of the paper burned away and the residue either blocked the vent or continued to burn inside the bore of the gun and was difficult to sponge out. Cartridges made from a material such as flannel were less likely to break when being carried and tended to be consumed almost completely on firing. Long after field artillery had moved on to the use of flannel cartridges, however, the Navy retained paper cartridges. There appears to have been a certain amount of crossover as the Navy experimented with, and did use, paper cartridges with flannel bottoms in the latter part of the 18th century.

In order to make the material stiff, whether paper or flannel, cartridges were boiled in alum and then in alum and size. It was also common to tie them in several places with worsted string. This method continued into the 19th century. Cartridges were made to a pattern. They were marked out on the material to be cut and then rolled onto a former (something like a lathing pin) that corresponded to the size and shape that the cartridge was to be. The cartridge could either be glued or sewn depending on the material. Obviously glue would be used on paper whilst flannel was sewn. When the charges were tied up they were sewn over the top to retain their hoops by several stitches and choked off. Each one was marked with the type of gun it was to serve, what type of charge it was, and with the amount of powder, all painted in black.

**Rockets**

It seems fitting in a book on naval armament to have a look at one of the great innovations of the Napoleonic period, namely that of the war rocket. As usual we can rely on the Congreve family to elucidate the story. William Congreve junior was the great proponent of the war rocket and certainly the Navy was not slow to recognise the potential of this weapon. Congreve was not a soldier but he developed a system of war rockets that would greatly influence military thinking in the future. War rockets were not new; the Chinese and Indians had had them for centuries and the Fire Master at the Royal Laboratory in Woolwich, General Desaguliers, had experimented with them. Congreve, however, refined a system of weapons that could be, and were, used in battle by the Navy and Army. The only difference between land and sea weapons was the way in which they were launched.

The rocket system itself consisted of two main types of rocket, the carcase and the shell rocket. The former was a metal case with a pointed cone mounted on top. It consisted of an explosive charge and a propellant charge tightly packed into the cylinder. The shell rocket was actually a common iron shell filled with an exploding charge and mounted on the propellant charge. When the shell exploded it showered metal fragments down upon the target.

The first time they were employed in a naval context was in an attack on Boulogne in 1805. The weapons used were 6- and 8-pdr rockets fired from 112 small boats. Each vessel had 48 rockets and the rockets were launched from a ladder-like construction tied to the mast of the boat. The operation was carried out by the Royal Marines. The angle the rocket was fired at affected its range and it could be adjusted to suit. Each rocket was just like a modern firework in that it was stabilised by a large unguainly stick. On 18 November a flotilla of these vessels and their escorts attacked Boulogne at a range of about three miles. The weather severely affected the launching and the whole attack was a bit of a damp squib after all the effort. Nevertheless, Congreve did not give up and in 1806 his rockets were used to attack Boulogne again, but this time he used metal-cased 32-pdr rockets with cut-down staves about 15 feet in length. Some 18 launches were used in this attack and about 200 rockets were fired. The British claimed the attack as a success but in reality the Congreve rocket could only really be used as a siege weapon at sea. Even so, attacks on shipping in harbour could be lethal, though rockets were very difficult to aim because they...
seldom followed a straight flight path. They could only be used in calm weather and they were unpredictable.

Further rocket attacks followed, particularly on Copenhagen, which was said to be a particularly successful engagement. In rocket's favor, they were a terror weapon. They had not been used before and civilian populations must have been shocked to be on the receiving end of these weapons. Any anchored fleet could now be at risk from a long-range weapon, though in fact the maximum range of the Congreve rocket was a relatively modest 3,000 yards. Two small sloops were converted specifically to fire the rockets — the Etrus and the Golgotha, of which a model still exists at the Royal Artillery Museum in Woolwich. The Etrus was used to bombard Washington during the War of 1812. These ships basically had small open ports through which the rockets were placed at an angle, with their sticks resting in the deck of the hold. They were fired in broadsides and were indiscriminate.

**GUNNERY IN THE FRENCH NAVY**

Much has been made of the supposed deficiency of French gunnery during the Napoleonic Wars. It does seem that their large warships suffered from changes in administration and command regimes which seriously affected their gunnery, but there are many examples of French guns "giving as good as they got". In terms of smaller ships' actions and the guerre de course, or commerce raiding, the French were a force to be reckoned with.

Cast-iron guns for the French Navy were normally cast at special foundries based at Rouelle near Angoulême, Indret and Bigonne. The various types were laid down in the regulations of 1767 and were designed by the Inspecteur Général de l'artillerie Monsan. However, there were many variations to these designs, not least those imposed by the various revolutionary committees. In general, the sizes were 36-pdr's on the lower decks, 18-pdr's on the upper decks and 8-pdr's on the fo'c'sle and quarterdeck.

**PENETRATION OF ROUND SHOT AS DETERMINED BY THE FRENCH NAVY WITH VARIOUS TYPES OF ORDNANCE**

<table>
<thead>
<tr>
<th>Gun Charge</th>
<th>100</th>
<th>219</th>
<th>438</th>
<th>656</th>
<th>875</th>
<th>1094</th>
</tr>
</thead>
<tbody>
<tr>
<td>36-pdr</td>
<td>109</td>
<td>219</td>
<td>438</td>
<td>656</td>
<td>875</td>
<td>1094</td>
</tr>
<tr>
<td>30-pdr</td>
<td>109</td>
<td>219</td>
<td>438</td>
<td>656</td>
<td>875</td>
<td>1094</td>
</tr>
<tr>
<td>24-pdr</td>
<td>109</td>
<td>219</td>
<td>438</td>
<td>656</td>
<td>875</td>
<td>1094</td>
</tr>
<tr>
<td>18-pdr</td>
<td>109</td>
<td>219</td>
<td>438</td>
<td>656</td>
<td>875</td>
<td>1094</td>
</tr>
</tbody>
</table>

*This table comes from the French Aide Mémoire Navale and refers to experiments carried out after the Napoleonic Wars on oak targets. The power of powder changed very little in the first half of the 19th century and therefore the table presents an accurate estimate of the penetrating power of solid shot in the earlier period.*

At this time the French were not generally using bronze guns at sea. There were, however, exceptions to the rule. In 1780 60 brass 18-pdr's were cast and a heavy 48-pdr design was in existence. These last weapons were specifically used to arm two ships. The *Majeure* and the *Royal Louise* (later renamed *Republican*, sank 1794) were both armed with bronze 48-pdr's on the lower deck and were intended to be 110-gun ships. It is not clear whether the 18-pdr's were destined for either.

There were also attempts to emulate the carronade in French service. The *canon obscur* was a notable early attempt to produce a short weapon with a large bore and small charge. It is likely that the French were experimenting with similar ideas to the British but were never fully able to come to the right combination, so that in their latter period they actually adopted the carronade as a sea-service weapon in virtually the same format as the British weapon.

**French gun carriages**

As with British sea-service carriages, the French made their carriages in proportion to the size of gun they were going to mount. Compared to British carriages, the 36-pdr was squat and had several different features. The 36-pdr trucks were normally made of oak or elm. These would be mounted on square axletrees that had a turned end to fit the truck onto; each truck was held fast by a Lynch pin of iron. In this case, the size of the axle was the same as the calibre of the gun and all gun carriage parts were calculated by their relationship to the calibre of the gun. The two cheeks or brackets were mounted on top of the axletrees and were fitted with bolts passing from top to bottom through the axletrees and with others passing between the two cheeks. Rings were also fitted at the rear step and in the sides to take training tackle. The key difference in the French design was that there were holes in the brackets to take the breeching ropes so that it was the carriage and not the gun barrel that took the strain on recoil. These brackets were normally made of more than one piece of timber (elm again). According to one authority it was thought that elm was less likely to splinter if hit by a round shot. French carriages and guns were painted and normally the calibre of the gun was painted on the side of the carriage.

As in British service the carriage also required a significant amount of equipment to control and train it. The rigging consisted of: one breeching rope, one breech stop, one muzzle lashing, one seizing to seize the breeching rope, two running out tackles, one training tackle (this latter was not meant to move the gun laterally but was meant to control it on recoil and run out, hence it was at the rear of the gun), one train sling so that the gun could be hooked to it, one tampion and two port ropes, one tie and one port tackle for the lids.

**French ammunition**

French guns were loaded with similar ammunition to the British weapons. Powder charges were made of parchment and consisted of:

- 36-pdr gun 12lb powder
- 18-pdr gun 6lb powder
- 8-pdr gun 3lb powder

These charges could be reduced depending on the type of action required or to save on stores. Typically there were 72 cartridges issued per gun but only a proportion of these would be available at the gun for
safety purposes. In terms of roundshot, an allocation of 60 per gun was made but only ten were held near the gun, with the remainder held elsewhere on the ship. Other rounds included: 10 rounds of grape shot and 10 rounds of bar shot. There were 120 wads per gun. Other more unusual anti-rigging rounds were issued as needed but were stored elsewhere in the ship.

**French drill and organisation**

The gunner complement of a French 74 differed somewhat from that of a British 74. There was a Master Gunner and, as would be expected, he was one of the most important men on the ship. The rest of the gunnery specialists were known as gunner’s mates, second gunner’s mates and quarter-gunner’s mates. They were all drawn from the Company of Bombardiers or the Company of Apprentice Gunners. Typically, a 74-gun ship would have three gunner’s mates, three second gunner’s mates and 37 quarter gunners. The whole complement would be reduced in peacetime. To become a gunner on a French ship one had to work one’s way up from the apprentice level to the highest level.

Drill was carried out in a similar manner to the British. An extremely rare and interesting document has come to light concerning gun drill in the Revolutionary Navy that details the numbers and activities of the gunners in 1795. This gives the crew of a 36-pdr as one gun captain plus ordinary crewmen numbered from 1 to 7 in pairs, making 15 men in all. It also states that an 18-pdr should have a crew of 11 men and an 8-pdr 7 men, although it does not specify whether these allocations served both sides of the ship.

There were 13 commands in the firing sequence:
1. Captains and crewman your guns.
2. Take out the tampon. Cast off the tackles and breechings.
3. Run in.
4. Stop the touch hole. Sponge the gun and handle the cartridge.
5. Handle the rammer.
6. Handle the cartridge.
7. Ram home the wad and cartridge.
8. Ram home wad and shot.
9. Ram home.
10. Run out the gun.
11. Prick the cartridge, prime.
12. Point the gun.
13. Take your match, arm your locks.

This drill was taken from the École de Vaisseaux reprinted at Ostende.

**GUNNERY IN THE SPANISH NAVY**

During the reign of Charles III (1759–88) the Spanish Navy was heavily developed in a more scientific manner than before. More ships were built than under the previous King Ferdinand VI and: Charles III thus laid the foundations for the Spanish Navy that would fight in the Napoleonic Wars. At first, under Director de Construcción Navales Jorge Juan, ship construction was based heavily on British design and construction techniques. But in 1769 a French officer, François Gautier, became responsible for arming and fitting Spanish ships and their designs and guns thereafter relied very heavily on French systems.

Possibly the most famous vessel of the Spanish Navy during this period was the Sanissima Trinidad which was one of the largest vessels in the world, intended to mount 130 guns. She was built in Havana in 1769 but it was found that some of her design factors forced her gun complement to be reduced. We know that when she was built she had:

- 32 x 36-pdr
- 33 x 24-pdr
- 36 x 12-pdr
- 18 x 8-pdr
- 10 x 24-pdr howitzers (these were actually something like the French canon obusier shown in Plate E)
- 6 x light swivel guns

In all then she was armed with 136 guns.

As with other nations the Spaniards favoured the 74-gun ship as the main ship-of-the-line, but their vessels were often much more heavily gunned than their British counterparts. The following list gives the main armament of several vessels:

<table>
<thead>
<tr>
<th>Ship</th>
<th>Number of guns</th>
<th>Where constructed</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Santo Domingo</td>
<td>68</td>
<td>El Ferrol</td>
<td>1784</td>
</tr>
<tr>
<td>San Anton</td>
<td>112</td>
<td>El Ferrol</td>
<td>1784</td>
</tr>
<tr>
<td>San Felipe</td>
<td>112</td>
<td>El Ferrol</td>
<td>1784</td>
</tr>
<tr>
<td>San José</td>
<td>112</td>
<td>El Ferrol</td>
<td>1784</td>
</tr>
<tr>
<td>San Ldefonso</td>
<td>74</td>
<td>Cartagena</td>
<td>1785</td>
</tr>
<tr>
<td>Conde Regla</td>
<td>112</td>
<td>Havana</td>
<td>1786</td>
</tr>
<tr>
<td>Mexicano</td>
<td>112</td>
<td>Havana</td>
<td>1786</td>
</tr>
<tr>
<td>Real Carlos</td>
<td>112</td>
<td>Havana</td>
<td>1787</td>
</tr>
<tr>
<td>San Juan Nepomuceno</td>
<td>74</td>
<td>Guarmizlo</td>
<td>1788</td>
</tr>
</tbody>
</table>
*As transcribed from Ruiz and Juanola.

There were at least seven Spanish ships with over 110 guns in the 1780s. Most of the guns made for the Spanish Navy were cast in Seville and there were three great foundries for them in El Ferrol, Cartagena and in La Carraca. In the Americas Havana was the great Spanish naval base. Spanish naval cannon were mainly of cast iron but many more bronze guns were available to ships than in other European navies. The quality was variable and sometimes ships had some of their guns removed to arm garrisons.

One of the newer naval designs that came about in the 1750s was the xebec, or jabeque in Spanish, and many of these lateen-rigged craft were in service in the Napoleonic period, typically armed with 24 guns.

Spanish guns were mounted on a double bracket carriage not dissimilar to the British types but with some design differences. The trucks were slightly smaller and each carriage was made up of two brackets or cheeks on a base plate. The plate was solid, unlike in British carriages, and iron bands bound the axletrees to it. These were led around the lower part of the front axletree and fitted to the outer sides of each bracket. Each cheek was pinned to the base with two large bolts that passed from top to bottom and
at the rear through the rear axle. There was a transverse bolt going through the two cheeks which it is assumed the stool bed rested upon. It is believed that the gun was restrained on recoil by passing the breeching rope through the two cheeks by means of a hole in each. The guns themselves were not provided with a breeching loop - it seems that only the British Navy followed this practice. Tools and equipment were very similar to those used in the Royal Navy and we need not dwell on them here. On Spanish ships the following dimensions were given for each gun:

<table>
<thead>
<tr>
<th>Projectile weight</th>
<th>Gunport size</th>
<th>Size of gun position and area of manoeuvre</th>
</tr>
</thead>
<tbody>
<tr>
<td>42-pdr</td>
<td>1.066m</td>
<td>2.51m</td>
</tr>
<tr>
<td>36-pdr</td>
<td>1.041m</td>
<td>2.08m</td>
</tr>
<tr>
<td>24-pdr</td>
<td>0.99m</td>
<td>2.05m</td>
</tr>
<tr>
<td>18-pdr</td>
<td>0.769m</td>
<td>1.88-2m</td>
</tr>
<tr>
<td>12-pdr</td>
<td>0.85m</td>
<td>2.05m</td>
</tr>
<tr>
<td>9-pdr</td>
<td>0.68m</td>
<td>2.5-2.10m</td>
</tr>
<tr>
<td>6-pdr</td>
<td>0.68m</td>
<td>2.05-2.10m</td>
</tr>
<tr>
<td>3-pdr</td>
<td>0.68m</td>
<td>2.05-2.10m</td>
</tr>
</tbody>
</table>

**CONCLUSION**

The similarity in British, French and Spanish naval guns and gunnery is remarkable. Their gun crew numbers were very similar, as were their gun sizes and allocations of the number of guns aboard ship. So what was it that allowed the British to dominate their European contemporaries at sea? The answer must lie in the way the crews handled their guns and the advantages that new inventions gave in rapidity of fire on British ships. These two factors, tied to the Royal Navy's tactical doctrine, led the British Navy to become so powerful. Compared with American crews in single-ship actions in the War of 1812, it was clear that similarly motivated crews could inflict defeats on the British. Those countries that were defeated by Britain had the added incentive to develop new methods and technology to counter Britain's naval power. Hence the French were first to demonstrate the use of the shell gun, as advocated by Paixhans in 1822, and the first to introduce an ironclad, steam-powered warship in the guise of the Clovis as proposed by Napoleon III in 1854.

**GLOSSARY**

**Apron of lead** – Lead cover to prevent damp entering the vent. This was often placed over the **fid**.

**Breeching rope** – A large diameter rope used to control the recoil of the gun by passing it through the breeching loop or tying it around the casable button of the gun. The rope was secured to the ship's side by iron loops.

**Fid or vent plug** – A small piece of twine or even a wooden peg placed in the vent when not in use.

**Flexible rammer** – As the rammer, but the staff was sturdy rope. This meant that the rammer could be bent to the muzzle of the gun and rammed from the side without having to run in the gun fully.

**Handspike** – A stout bar used to lever the gun carriage or barrel into position.

**Lynch pin** – Iron pin that passed through the axletree and secured the truck on the axle.

**Priming iron** – Tool for clearing the vent and piercing the cartridge case. This was normally a non-ferrous metal spike.

**Quoin** – Wedge of wood placed under the breech of a gun to elevate and depress it.

**Quarter-Gunner** – An assistant to the gunner who maintained the guns and filled powder charges etc. There was one quarter gunner to every gun.

**Rammer** – A long staff with a cylindrical wooden head usually slightly smaller than the bore, used to ram home the powder charge, wads and shot.

**Seizing** – A small rope used to tie two lines, or a pair together.

**Side tackles** – Ropes and pulleys that were attached to the side of the ship and the side loops of the gun carriage which were used to traverse the gun.

**Sponge** – A staff with a large sheepskin head used for damping down burning embers and cleaning the gun barrel.

**Stool bed** – The flat wooden plate upon which the *quoin* and therefore the breech of the gun rested.

**Truck** – The name used for the small wheels fitted to a service gun carriage.

**Worm or wadhook** – A tool used to scour the inside of the barrel to remove burning embers or blockages. It consisted of a wooden staff with a spiral iron hook on its end.

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COLOUR PLATE COMMENTARY

A: CARROONADE MOUNTING
The slide mounting was a move away from the independent ship's gun mounted on a truck carriage. The slide mount was part of the ship's furniture and could not be removed for other purposes as it was fixed to the side of the ship. The many images in existence of the carroonade mounting show slight variations in the way in which it was traversed or fixed to the ship.

A1: Two examples of carroonades on slide mounts
The upper image shows a slide carriage that has been fixed to a pintle outside the ship's side and the lower image shows an alternative mounting with the gun on a truck carriage. The front of the carriage is again attached to a pintle or ring bolt and it would appear that the trucks were intended to move the carroonade when it was not attached to the ship's side.

A2: Early pattern carroonade
This form of carroonade with trunnions was in existence from the late 18th century but was often referred to as a howitzer. The weapon is mounted on a slide that extends outside the gun port and therefore reduces the chance of setting fire to the fittings of the ship on firings. Because of the short length of the carroonade barrel this was one of the biggest complaints that captains had concerning carroonades.

A3: 68-pdr carroonade, 1805 pattern
The 68-pdr was the heaviest carroonade in service and required a shot of 8ln. in diameter. It was used at sea for a time but was soon relegated to coastal defence work due to difficulties with its recoil and handling the weight of shot. It is interesting to note that the carroonade was cast with a disparity sight whereas long guns were not.

B: THE CONGREVE ROCKET SYSTEM AT SEA
The sea-service rocket frame was the same unit as used for land service and was usually fitted to ships' boats. The use of rockets on the decks of ships had been recorded although this practice was not favoured due to the high risk of fire caused by the rockets. The launch frame was suspended from the mast by a halyard by which it was raised and lowered to provide elevation. In all but the very calmest weather the frame was lowered to enable the rockets to be placed in the chambers. The rockets were carried and prepared in another boat, known as the tender, which withdrew when the rockets were fired.

B1: 32-pdr carcass rocket c. 1813
This is a sectioned version of the rocket showing the warhead and rocket motors.

B2: 12-pdr shell rocket
This rocket had an explosive common shell attached to the end of the rocket.

B3: 12-pdr case rocket
This is essentially a grape shot version of the rocket that expelled a charge of shot on explosion.

C: LIGHT GUNS

C1: The French 1786 pattern swivel gun
This was one of the few smaller bore weapons in the French Navy to be designed on a specific standard pattern.

C2: The English Blunderbuss or Musketoon

C3: The Espingole
The espingole was completely cast from bronze and included a tiller in the design. The yoke was made of iron as was the pintle and a firing lock was fixed to the body by screws. This simple construction made its manufacture simple and thousands were made by French ships.

C4: Bronze swivel gun
This illustration is based on an example in the Royal Armouries collection. Note the supporting bar leading off from the underside of the yoke.

C5: A small cast iron swivel gun
The weight of such small weapons was rarely greater than 1cw.

C6: Another example of a bronze swivel gun
These guns were extremely common and were often made by specialist manufacturers such as Richard Gilpin of Southwark; most of the weapons produced by him were of small calibre such as this example.

C7: An orque or multi-barrelled gun in the Musée de la Marine in Paris
It dated about 1800 and is a very simple design. The tiller has been formed into a ring and each barrel would have been fired at the same time as the lock is centred above a central firing pan.

D1: 32-PDR ON THE LOWER DECK
The 32-pdr was the heaviest gun on most British ships-of-the-line. There was a 42-pdr gun in existence but it was very rare. This example is seen here with part of the crew readying for fire. The gun is a Blomefield pattern weapon with a flintlock firing mechanism. Blomefield's refinements led to a gun that was well balanced, had a less violent recoil and was unlikely to burst. It became the most popular gun in the Royal Navy. At 55.5ct or nearly three tons, the gun could be a great danger if its carriage broke loose as was sometimes the case in battle, hence the massive breeching rope to keep it in check. A complex system of rope and training tackles was used to hold the gun inboard, train it and lash it to the hull in stormy seas. The gun and crew were worked in very cramped circumstances and if the crew were hit by opposing fire the effect could be devastating. One contemporary account states, 'A man called Aldrich had one of his hands cut off by a shot and almost at the same moment he received another shot which tore open his bowels in a terrible manner. As he fell two or three men caught him in their arms, and as he could not live threw him overboard.' One of the keys to the superior gunnery usually exhibited by the Royal Navy was the speed with which the gun could be reloaded. It was thought that a very well trained crew could reload in just over one minute, given the right circumstances. Clearly this rate of fire could not be kept up for long periods of time but the ability to fire so quickly had a devastating effect at close range and victory was often a case of superior morale and training over technology.

D2: FRENCH 36-PDR IN ACTION
The French weapon described as a 36-pdr was considered equivalent to the British 32-pdr because French pounds were not equal to British ones. This gun weighed 70ct and had a length of 9ft 8ln. In comparison with British ships the crews were well trained and were normally part of a unit of trained gunners who were part of the Compagnie des Bombardiers. First-hand accounts of the French in action seem to suggest that they were every bit as capable as the British in handling their guns but their rate of fire was slower. The gun carriage itself was designed so that each feature was beneficial to the gun's handling. The carriage was low to keep the centre of gravity low and the cheeks were bound in iron at each side to prevent them from splintering under the strain of firing. The cascate of the gun sat directly over the point of traverse to make the gun easy to move. When Wads and wad formers for the 12-pdr and 32-pdr gun. The wad was made from oakum and bound with twine. It was then forced into shape by pushing it into a wooden block as shown here. During firing there would normally be a wad inserted between the wad charger bag and the shot and one in front of the shot. (Museum of Naval Firepower)
traversing it is thought that hand spikes were placed on small blocks of wood to give extra leverage.

E: FRENCH AND SPANISH WEAPONS
E1: French canon obusier
This weapon was sometimes called a sea howitzer; a chambered weapon similar to the British carronade, but not as popular in service. It was introduced in 1787 but was found to be wanting. Hence the French eventually copied the British weapon and fitted it to their ships. This drawing is based on the 36-pdr example in the Musee de la Marine in Paris.

E2: A Spanish 24-pdr naval gun and equipment
Spanish guns were made in bronze and iron and the 36-pdr (Spanish pounda) was a huge gun. The carriage design was low and squat but lacked some of the refinements of the British designs. Much depended on the height of the gunport which was often non-standard. This plate has been drawn without the stool bed and breech support shown to illustrate the box-like structure of the gun carriage.

F: SMALL ARMS
This plate shows principal naval small arms of both the French and British Navies. They are as follows:

F1: French sea-service musket
Its length overall was 66.5in.

F2: French sling sea-service musket

F3: French sea-service pistol

F4: French sea-service blunderbuss
All fittings were brass, as was the barrel. The overall length was 30.75in.

F5: British black sea-service musket, c. 1805

F6: British sea-service pistol
It is often forgotten that one of the greatest assets of a ship in close-quarter combat was its allocation of the small arms. At close range they could present a withering fire to anyone on the enemy deck. Muskets were used from every vantage point on the ship so that no member of an attacking crew was protected behind a solid piece of timber.

F7: British naval volley gun by Henry Nock
The Nock volley gun has been immortalised in many books but it was as a naval weapon that the weapon was to have an effective life.

G: NAVAL AMMUNITION
Although solid round shot was the commonest form of projectile, this plate shows details of the more unusual naval projectiles. Grape shot was also very common, therefore due to the nature of the plate it has not been illustrated here. The majority of the weapons below were meant to disable the rigging and masts of an enemy ship.

G1: Link shot
Many types of linked shot were available to the naval gunner and this example is little more than a weighted chain.

G2: Chain shot
was a common form of dismasting ammunition. Once fired it was common for the two spheres to fly outward causing the shot to spin one around the other.

G3 and 4: Linked bar shot,
These could be similar to a dumbbell in shape but were also formed by two hemispheres connected by a wrought iron bar of square section. They varied according to the size of gun firing them.

G5: Marby's life saving shot.
This was an unusual design of ammunition used to fire a lifeline to a ship in distress. It was first used in 1808 to rescue crew from the brig Elizabeth. The hooks on the bottom of the projectile were intended to catch on the wood of the stricken ship.

G6: Shown here is another version of the expanding shot, which was loaded as a complete sphere in the gun but expanded on leaving the muzzle.

G7: Knife-bladed shot, such as that shown here, acted on the principle that when the arms expanded during flight they would damage rigging and masts.

G8: This image shows the typical cartridge carrier with charge and wad inserted.

G9: Shown here is the internal bore of a smooth-bore gun with a wad on either side of the shot and a vent pricker in place in the vent showing how the bag was pierced.

A close-up view of the vent on the same gun and the weight inscription above it in hundredweight, quarters and pounds. (Museum of Naval Firepower)

BELOW: An early pattern Armstrong Frederick gun, in this case a 12-pdr. The trunnion on this weapon is marked with the letter B indicating that it was cast by William Benge. The carriages are reproductions. (Museum of Naval Firepower)
The design, development, operation and history of the machinery of warfare through the ages

Napoleonic Naval Armaments
1792–1815

There were many elements to British Napoleonic naval success but one of the key factors was gunnery. Other countries developed different naval weapons to fit their maritime strategies. The French and Spanish systems developed on similar lines, while those of the Baltic navies tended to rely on smaller craft and weapons. Holland, during this period, was part of the French sphere of influence and this had an effect on the development of its naval weapons. This title describes the systems of all these countries as well as the fledgling navy of America, whose gunnery skills embarrassed the Royal Navy at the height of their dominance.