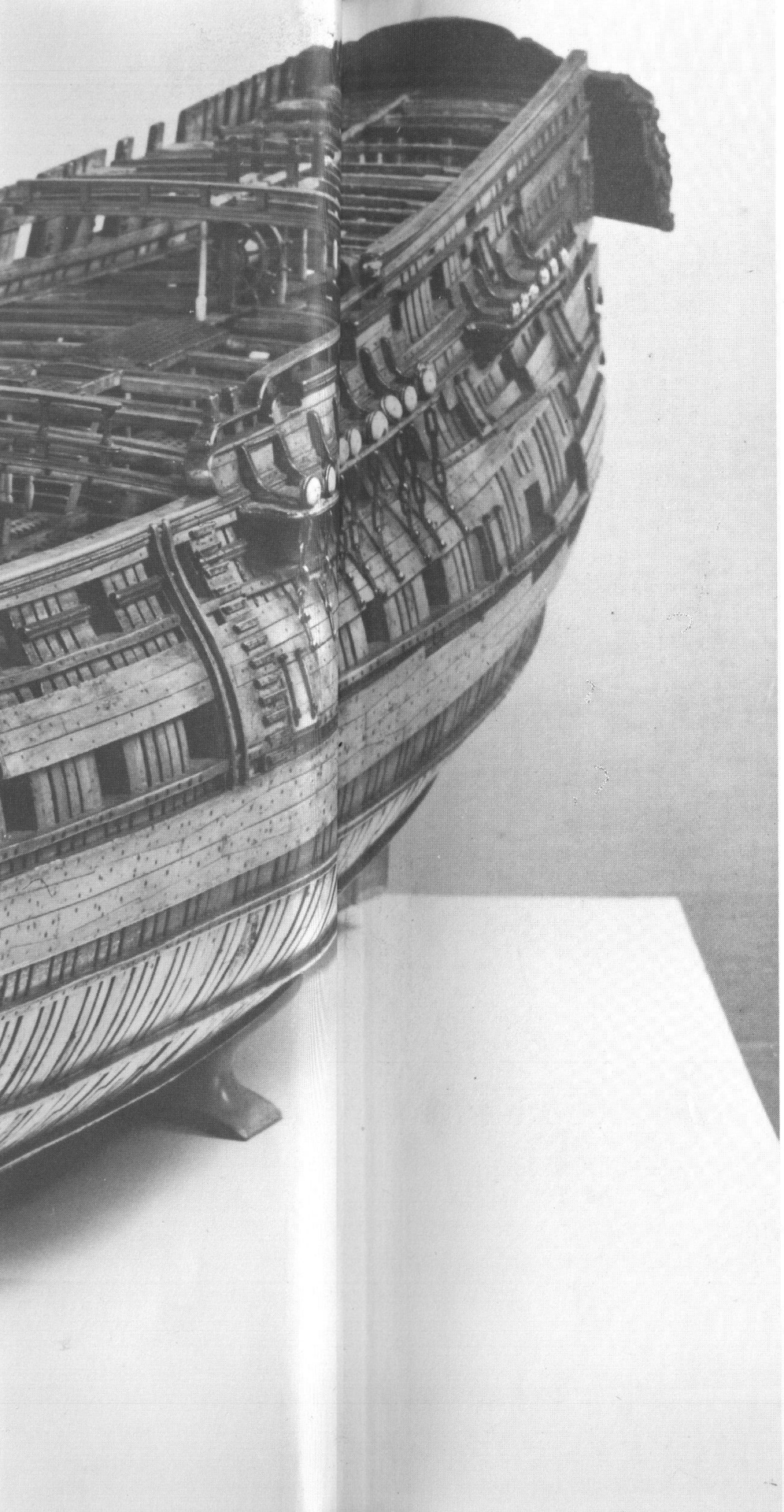
Anatomy
of the
Ship

The 74-gun ship
BELLONA



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The 74-gun ship
BELLONA

Brian Lavery

CONWAY

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Introduction

The 74-gun ship formed the backbone of the British battlefleet from the introduction of the type during the Seven Years War (1755–63) until after the Napoleonic Wars which ended in 1815. More than 200 served with the Royal Navy during these years, including those captured from other navies, and 74s took part in all the major battles in large numbers, and spent years in gruelling blockade service off such ports as Brest, Toulon, and Cadiz. The *Bellona* was one of the earliest of these ships, and one which served as a model for many others. She was also one of the longest lived, for she served from 1760, when the 74 was first being introduced to the British Navy, until 1814, when the technology which made them obsolete was already in existence. Her service began brilliantly, when she defeated the French *Courageux* in a famous single-ship engagement. After that it was a little disappointing, in that she missed two major actions, Copenhagen in 1801 and Strachan's action of 1805, through unfortunate circumstances. Nevertheless she saw much service during her 54 years, in the North Sea, Baltic, Atlantic and West Indies.

THE 74-GUN SHIP

During the first half of the eighteenth century British ship design had fallen behind that of the other European powers, especially France and Spain. The battlefleet had never really been tested during its last war, which ended in 1713, because the French had concentrated on commerce raiding ever since their defeat at Barfleur in 1692. During the 1720s and 1730s, the French and Spanish had begun to rebuild their navies, using talent and ideas from other countries, and had begun to approach the problems of ship design from new angles. They had concentrated mainly on the large two-decker, and the French evolved the 74-gun ship in the 1730s. It was about 170 feet long on the gundeck, while British two-deckers were little more than 150 feet; it carried 28 guns on the lower deck, and 30 on the upper deck, whereas British two-deckers had no more than 26 on any deck; its lower deck battery was of 36-pounders, while equivalent British ships carried only 24-pounders. The French ships had a low centre of gravity, low topsides, impressive gun power, and good sailing qualities.

The British navy, on the other hand, had cast its net very widely in an attempt to find an ideal vessel, and had come up with six different types for the line of battle, none of which was entirely satisfactory. The largest ships, the three-deckers of 90 and 100 guns, were expensive to build and difficult to man. Their gun power was enough to take on anything afloat at that time, but they were deep draughted, and their large sails and high topsides made them impossible to employ safely in strong winds and rough weather. The small three-deckers, of 80 guns, were a total failure, and only the blind conservatism of the naval administration kept them in service. They were notoriously unstable, and could rarely find seas calm enough for them to open their lower deck ports, and thus use their main armament, and their other sailing qualities were very poor.

The largest two-decked ships were the 70s, and these were the best ships of the line available. Their main drawback was simply that they were too small, and

could carry only 24-pounder guns against the French 36s. The other two classes, the 60s and 50s, were even smaller, and since the 1690s it had been questionable whether the 50s should be used in the line of battle at all.

War broke out with Spain in 1739, and with France in 1744. Various incidents showed the inferiority of British designs, and a few attempts were made to improve it. New 'Establishments of Dimensions' were put forward in 1741 and 1745, but these still kept on the old classes of ships, and left the British 70s much smaller than the French 74s. A few very small British 74s were built, largely by converting 80- and 90-gun ships, but these were unsuccessful. Several French 74s were captured at the two battles of Finisterre in 1747, and these inspired another attempt to build two British 74s, but they were cancelled when the war ended in 1748.

Change did not take place until the old generation of administrators and designers had died or retired. Sir Jacob Ackworth, who was Surveyor of the Navy from 1715 to 1749, was a particular barrier, and his successor, Sir Joseph Allin, was little better. Lord Anson, the victor of the first Battle of Finisterre, had been on the Admiralty Board since 1744, and was First Lord after 1751. He was strongly in favour of reform, but could do little without the support of the Navy Board. It was only in 1755, on the eve of the Seven Years War, that Allin was forced to retire through illness, and his place was taken by Thomas Slade and William Bately. Almost immediately Slade began the design of some new 74-gun ships, the *Dublin* class (though they were still listed as 70s for the first few months of their building). They were 165½ feet long, 5½ feet more than 70s of the 1745 Establishment. Three more ships, the *Hero, Hercules* and *Thunderer*, were ordered in 1756, with a further foot added to their gundecks. Finally, in December 1757, three more ships were ordered, with gundecks 168 feet long. These were eventually named *Bellona, Dragon* and *Superb*.

After that, the design stabilised, and remained almost unchanged for twenty years. The design of the *Bellona* class was never repeated precisely, but Slade experimented slightly with the lines, and the *Arrogant, Ramillies, Egmont,* and *Elizabeth* classes were almost identical in size, layout, and structure, and had only slight variations in the shape of the underwater hull. The *Culloden* class was also similar, but slightly larger. Thus over forty ships were near-sisters of the *Bellona*. After Slade's death in 1771 the new Surveyor, Sir John Williams, attempted to design his own classes of 74, with the *Royal Oak* and *Alfred* classes, but these were not very successful, and by the late 1770s Slade's draughts were being revived for many new ships, especially of the *Arrogant* class. It was not until 1789 that the last 74 built to a Slade draught, the *Illustrious*, was launched. After that there was a move towards larger ships (in response to a further increase in the size of French ships) culminating in the *Kent* and *Ajax* of 1798, which were 182 feet long on the gundeck. These ships were found to be too long to support their guns, and in the 1800s there was a return to slightly smaller 74s of about 176 feet gundeck length. These were largely based on French designs, though the designers had tampered with the lines without really understanding them, and they were not a great

TABLE 1: **SHIPS SIMILAR TO THE BELLONA**

Name	Builder	Laid Down	Launched	Tonnage	Fate
Bellona class (design dimensions: gundeck 168ft, keel 138ft, breadth 46ft 9in, depth in hold 19ft 9in, 1603 tons)					
Bellona	Chatham DY		19.2.1760	1615	Broken up 1814
Dragon	Deptford DY		14.3.1760	1614	Harbour service 1781; sold 1784
Superb	Deptford DY		27.10.1760	1612	Wrecked 1783
Arrogant class (design dimensions: as *Bellona* class)					
Arrogant	Barnard, Harwich		22.1.1761	1644	Sheer hulk 1801; broken up 1810
Cornwall	Wells, Deptford		19.5.1761	1634	Burnt 1780
Kent	Deptford DY		23.3.1762	1617	Sold 1784
Defence	Plymouth DY		31.3.1763	1603	Wrecked 1811
Edgar	Woolwich DY	26.8.1776	30.6.1779	1644	Prison ship 1813; broken up 1835
Goliath	Deptford DY	10.4.1779	19.10.1781	1604	Reduced to 58 guns 1812; broken up 1815
Zealous	Barnard, Deptford	12.1.1782	25.6.1785	1607	Broken up 1816
Audacious	Randall, Rotherhithe	8.1783	23.7.1785	1624	Broken up 1815
Elephant	Parsons, Bursledon	2.1783	24.8.1786	1617	Reduced to 58 guns 1818; broken up 1830
Bellerophon	Graves, Frindsbury	5.1783	6.10.1786	1643	Prison ship 1815; sold 1836
Saturn	Raymond, Northam	8.1782	22.11.1786	1646	Reduced to 58 guns 1813; harbour service 1825; broken up 1868
Vanguard	Deptford DY	16.10.1782	6.3.1787	1644	Prison ship 1812; broken up 1821
Excellent	Graham, Harwich	3.1781	27.11.1787	1645	Reduced to 58 guns 1820; training ship 1830; broken up 1835
Illustrious	Adams, Bucklers Hard	9.1784	7.7.1789	1616	Wrecked 1795
Ramillies class (design dimensions: as *Bellona* class)					
Terrible	Barnard, Harwich		4.9.1762	1644	Burnt 1781
Ramillies	Chatham DY		15.4.1763	1619	Burnt 1782
Robust	Barnard, Harwich		25.10.1764	1624	Harbour service 1812; broken up 1817
Russell	West, Deptford		10.11.1764	1642	Sold 1811
Invincible	Wells, Deptford		9.3.1765	1631	Wrecked 1801
Prince of Wales	Bird and Fisher, Milford		4.6.1765	1623	Broken up 1783
Monarch	Deptford DY		20.7.1765	1612	Broken up 1813
Magnificent	Deptford DY		26.8.1767	1642	Wrecked 1800
Egmont class (design dimensions: gundeck 168ft 6in, keel 140ft 0¾in, otherwise as *Bellona*)					
Egmont	Deptford DY		29.8.1768	1648	Broken up 1799
Elizabeth class (design dimensions: gundeck 168ft 6in, keel 139ft 3⅜in, depth in hold 19ft 9in, 1612 tons)					
Elizabeth	Porstmouth DY	6.5.1766	17.10.1769	1617	Broken up 1797
Resolution	Deptford DY	7.1767	12.4.1770	1612	Broken up 1813
Cumberland	Deptford DY	7.1.1769	29.3.1774	1647	Broken up 1804
Berwick	Portsmouth DY	5.1769	18.4.1775	1623	Captured 1795; recaptured and wrecked 1805
Bombay Castle	Perry, Blackwall	6.1780	14.6.1782	1628	Wrecked 1796
Powerful	Perry, Blackwall	4.1781	3.4.1783	1627	Broken up 1812
Defiance	Randall, Rotherhithe	4.1782	10.12.1783	1685	Prison ship 1813; broken up 1817
Swiftsure	Wells, Deptford	5.1784	4.4.1787	1612	Captured 1801; recaptured 1805 and renamed *Irresistible*, broken up 1816
Culloden class (design dimensions: gundeck 170ft, keel 139ft 8in, depth in hold 19ft 11in, 1658 tons)					
Culloden	Deptford DY	7.1770	18.5.1776	1659	Wrecked 1781
Thunderer	Wells, Rotherhithe	3.1782	13.11.1783	1690	Broken up 1814
Venerable	Perry, Wells & Green, Blackwall	4.1782	19.4.1784	1669	Wrecked 1804
Terrible	Wells, Rotherhithe	7.1.1783	28.3.1785	1660	Receiving ship 1823; broken up 1836
Victorious	Perry, Blackwall	11.1782	27.4.1785	1683	Broken up 1803
Ramillies	Randall, Rotherhithe	12.1782	12.7.1785	1670	Harbour service 1831; broken up 1850
Hannibal	Perry, Blackwall	4.1783	15.4.1786	1619	Captured 1801
Theseus	Perry, Blackwall	3.9.1783	25.9.1786	1660	Broken up 1814

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success. By this time the 74-gun ship was on the verge of obsolescence: in 1811 Sir Robert Seppings developed a new system of construction which made it possible to build much larger ships, and by the end of the Napoleonic Wars the two-decker 80 was beginning to be revived. The *Bellona* herself – virtually the prototype of the 168-foot 74 which was to dominate the battlefleet throughout this period – survived for the whole active life of the 74-gun ship, and was broken up at Chatham in 1814, having been on active service almost to the last.

What made the 74 so successful? Quite simply, she was a good compromise. The 32-pounder was found to be the most effective naval gun, having greater penetrating power and effect in proportion to its weight than any of the smaller ones. On the other hand, in a society which relied entirely on human muscles, it was the largest practicable for use at sea; 42-pounders had long been used in the largest ships, but it was eventually conceded that they had a lower rate of fire, because the ball was difficult to handle. The 74 was the smallest ship which could carry a full battery of 32-pounders. Other ships which had attempted to carry them, such as the three-decker 80s and the 70s of the 1745 Establishment, had been poor sailers if not complete disasters. The large three-deckers, the 100s, 98s and 90s, could of course carry them, but they were very expensive to build because they needed very large pieces of timber, and they sailed less well than the 74 because of their relatively high topsides and centre of gravity. They were useful as flagships and as prestige ships, but the 74 was to remain the backbone of the fleet. The larger two-decker, the very long 74 and the two-decker 80, was not very effective given the construction methods of the late eighteenth century – there was no system of diagonal support for the frame, which had to carry particularly heavy weights at the bow and stern, where there was less support from the hull below. That is why Seppings system of construction, introduced in 1811, was so important: it allowed the two-decker 80 – and eventually the two-decker 90 and the three-decker 120 – to become standard ships, replacing the 74.

But in its heyday the 74 was very efficient. It made up about half of the British battlefleet for most of the period, and a rather greater proportion of the ships on active service. Its advantages were explained by a well known naval architect in 1781:

> of those that carry (their guns) on two decks, the 74-gun ship is the most approved. The reason is evident. The ship whose topside is shallowest in proportion to her capacity under water is the most stiff, and will hold the least wind. The guns of a sloop should be as much above the water as those of a large frigate, and if possible, rather more so, if her dimensions are similar; because the larger the ship the more sail she will carry. For the same reason, the 74-gun ship will require but little more topside than that of 44 guns in

TABLE 2: **SAILING QUALITIES**

Observations of the qualities of His Majesty's Ship the...

	Bellona, Capt Charles Ellis 19 January 1763	**Bellona 28 May 1783**
Her best draught of water, when victualled and stored for Channel service - Afore	21ft 6in	21ft 3in
- Abaft	22ft 10in	22ft 9in
Her lowest gundeck ports will then be above the surface of the water	5ft 2in	
Query the 1st		
How she behaves close hauled, and how many knots she runs; In a topgallant gale	9kts, and often 10	9kts with smooth water
In a topsail gale	As much, if the water is smooth	8 to 8½ kts
How she steers, and how she wears and stays under her:	Very easy, wears very quick	Steers easy. Wears and stays quick
Reefed topsails	In smooth water, 9kts, otherwise 7 or 8. If in a head sea, 5 or 6	7 and 6kts
Courses	Has been known to go 5kts when blowing very hard. In common gales, 3½	That depends on the sea
And query, whether she will stay under her courses	Never tried	Never tried, but suppose that depends on the smoothness or roughness of the water
Query the 2nd		
In each circumstance above mentioned (in sailing with other ships) in what proportion she gathers to windward, and in what proportion she fore-reaches, and in general her proportion of leeway	Is remarkably weatherly, and for making little leeway in proportion to other ships	She is very weatherly, and gathers fast to windward, and makes as little leeway as any ship
Query the 3rd		
How she proves in sailing through all varieties of the wind, from being a point or two abaft the beam, to its veering forward upon the bowline in every strength of gale, especially in a stiff gale, and in a head sea; and how many knots she runs in each circumstance, and how she carries her helm.	Sails better than most ships, either by or large, and sails from 11 to 12 according to the wind and sea. Carries an easy helm	In general she goes as fast as any ship. She sails faster in proportion with a stiff gale. In a head sea she is easy, and carries a weatherly helm
Query the 4th		
The most knots she runs before the wind, and how she rolls in the trough of the sea	According to the wind rolls but driveth much in the trough of the sea	10 or 12kts, rolls easy
Query the 5th		
How she behaves lying to or under a try, under a mainsail, and also under a mizzen balanced	Lies to best under a mainsail and mizzen staysail with her helm half a turn a-weather, when she fore-reaches much, and makes an extra-ordinary wake	Perfectly well
Query the 6th		
What a roader she is, and how she careens	Indifferent roader. Never careened	A very good roader. I never careened her.
Query the 7th		
If upon trial the best sailing draft or water given above should not prove to be so, what is her best sailing draft of water? - Afore	21ft 6in	21ft 3in
- Abaft	22ft 10in	22ft 9in
Query the 8th		
What is her best draft of water when victualled to 6 months, and stored for foreign service? - Afore	Never fitted for foreign service	21ft 9in
- Abaft		23ft 0in
Query the 9th		
What height is her lowest gunport then above the surface of the water	-	4ft 8ins
Query the 10th		
Trim of the ship	As above	14 inches by the stern; fore mast etc upright. Main mast and mizzen inclining aft. NB: The ship bears her ports up a long time
	C Ellis	*Richard Onslow*

comparison to the difference in their dimensions; and therefore it must be rationally expected that the 74-gun ship will work as easy as the 44-gun ship, and must sail faster because she will bear a greater pressure of canvas.

If we were to examine a 90-gun ship we should find her very irregular and disproportioned; for if a 74-gun ship can carry her guns on two decks, the ship of three decks may as well be calculated to bear 100 as 90 guns. But ships so bulky in their dimensions, though they may be useful in particular cases, are far from being generally so. Their sails are so heavy, that it is with the utmost difficulty that they are managed if the wind blows high. The 74-gun ship on the contrary contains the properties of the First Rate and the frigate. She will not shrink from an encounter with a First Rate on account of superior weight, nor abandon the chace of a frigate on account of swiftness. The union of these qualities has therefore, with justice, made the 74-gun ship the principle object of maritime attention, and given her so distinguished a pre-eminence in our line of battle.

The *Bellona* and her sisters, despite their great effect on the British battlefleet, and therefore on European and world history, were not revolutionary in design. Nor were they direct copies from the French, as is sometimes supposed: they were simply an extension of British ships, built according to long established principles, in response to French competition. The expansion continued until a suitable minimum size was reached, and no longer. The *Bellona* herself was a perfectly typical ship, except perhaps in the matter of her system of framing, and to that extent she is representative of her forty near-sisters, and to a lesser extent of hundreds of ships of the line before and after her time.

THE SHIP'S HISTORY

The *Bellona, Dragon* and *Superb* were ordered by the Admiralty on 20 December 1757. Slade's draught was produced on 31 January 1758, and the three ships were named on the following day. The *Bellona* was to be built at Chatham, and was begun there on 10 May 1758. She was built relatively quickly, and launched on 19 February 1760, being rapidly fitted out with guns, masts, rigging and stores, commissioned on 22 February, and sailed to join the Western Squadron, then blockading Brest, on 8 April. Her service there was uneventful until the summer of 1761, when she was detached to patrol off the River Tagus. There, at 3pm on 13 August, in the company of the frigate *Brilliant*, she sighted the French 74-gun ship *Courageux* with two frigates, the *Malicieuse* and *Hermione*. They chased the French ships for 14 hours, and caught up with them at 5 the following morning. The *Brilliant* engaged the two frigates, while the *Bellona* fought the *Courageux*. After 9 minutes of fierce combat the *Bellona* lost her mizzen mast, but the *Courageux* lost hers 11 minutes later. The French suffered terrible casualties from the British gunfire, losing 240 men killed and 110 wounded, while the *Bellona* lost only 6 killed and 28 wounded, presumably because of the French habit of firing into the rigging. The *Courageux* struck her colours at four minutes past seven, and the French frigates were able to make good their escape, because neither of the British ships was in any condition to pursue.

The *Courageux* was severely damaged in the action, losing her main mast as well as her mizzen, and suffering great damage to her hull. She was taken to the River Tagus for repair, and eventually bought into the navy. She was as influential on British ship design as the *Bellona* herself, being copied many times, and her design was also used as the basis for the 'Surveyors' class' of 1806.

The *Bellona* was paid off in 1762, and in 1764 she was made a guardship at Portsmouth, being kept rigged and armed and with a crew of around 100 men ready for any emergency. She continued in this role until 1770, when she was briefly commissioned, and in 1771 she was laid up in ordinary at Chatham. She remained thus, with guns and rigging removed and only a small group responsible for maintenance on board, until 1778, when she was docked and began a major repair. She was ready by February 1780 and was recommissioned to take part in the war with France, Spain and the rebellious American colonists. Her bottom was coppered for the first time in her career, and this probably improved her performance considerably. During the next three years of war she cruised in the North Sea and the West Indies, and took part in two reliefs of Gibraltar, under Admirals Howe and Danby. In 1783 she was again laid up, at Portsmouth, and remained in ordinary, apart from a brief period in commission in 1787, until she was commissioned as part of a fleet prepared in expectation of a war with Russia in 1789. She took part in a review of the fleet, and a mock battle, and was fitted for a guardship at Portsmouth. In 1792–3 she was given a 'Middling Repair' at Chatham, and sailed from there in September 1793 to join Howe's fleet in the Channel. From 1795 to 1798 she was in the West Indies, and took part in several actions. In 1801 she missed the Battle of Copenhagen because she was grounded just outside the scene of the action. After some service on the Spanish coast she was paid off at the end of the French Revolutionary War, and put in ordinary at Portsmouth.

In 1805, on the eve of Trafalgar, she was one of the old ships subjected to 'doubling and bracing' as part of an emergency programme of repair. This was enough to prolong her active life for another nine years, and she served mainly in the North Sea and Bay of Biscay until 1814 when, as the Napoleonic Wars seemed to be nearing an end, she was paid off in February 1814, and ordered to be broken up. She was taken to pieces in September 1814.

CAREER SUMMARY

28 December 1757: Ordered to be built at Chatham
10 May 1758: Begun
19 February 1760: Launched
22 February 1760: Commissioned
8 April 1760: Sailed from Chatham to join the Western Squadron
May 1761: Detached from the Western Squadron to cruise off the River Tagus
14 August 1761: In action with the French 74-gun ship *Courageux*; captured her after a fierce battle
September 1761: Repaired in the River Tagus
4 April 1764: Fitted as a guard ship at Portsmouth
1 October 1770: Sailed from Portsmouth
14 May 1771: Arrived at Chatham and laid up in ordinary
22 February 1780: Admiralty order to refit her for Channel Service
March 1780: Bottom coppered for the first time
18 April 1780: Sailed from Chatham to join Grand Fleet
30 December 1780: Took part in the capture of the Dutch *Princess Caroline*, 44 guns
April 1781: Took part in the relief of Gibraltar under Danby
April–May 1781: Reported to be in bad condition
May–July 1781: Refitted at Portsmouth
December 1781: With the fleet in the North Sea
December 1781: Returned to Portsmouth
11 September 1782: Sailed from Spithead with fleet and convoy
October 1782: Took part in the relief of Gibraltar, and then sailed for the West Indies
January 1783: At the Leeward Islands
25 May 1783: Returned to Portsmouth
7 June 1783: Paid off at Portsmouth, and laid up in ordinary
3 October 1787: Recommissioned
7 December 1787: Paid off
11 February 1789: Recommissioned as guardship at Portsmouth
18 August 1789: Took part in a review of the fleet, and a mock battle
September 1790: Sailed with the Grand Fleet
October 1790: Returned to Portsmouth
January 1791: Guardship at Portsmouth
June 1791: Mobilised as part of the fleet prepared to meet a threat of war with Russia
12 September 1791: Paid off at Chatham
9 July 1793: Launched after middling repair
18 July 1793: Recommissioned
2 September 1793: Sailed from Chatham to join Howe's fleet in the Channel
7 November 1793: Took part in an unsuccessful chase of the French fleet
5 June 1794: Chased part of a French squadron after the Battle of the First of June
13 October 1794: Sailed to the West Indies
14 November 1794: Arrived at Martinique
5 January 1795: Led attack on French squadron near Guadeloupe
2 February 1797: In action with Spanish squadron at Caspagarde Islands
April 1797: Took part in attack on Puerto Rico
October 1797: Returned to Portsmouth and began refit
May 1799: At Gibraltar
May 1799: Joined St Vincent's fleet off San Sebastian
19 June 1799: In leading division at the capture of three frigates

TABLE 3: **PROGRESS BOOK REPORTS ON DATES AND COSTS OF MAINTENANCE**

Admiralty order, 28 December 1757 to cause a ship of 74 guns to be set up at Chatham; Admiralty order, 31 January 1758, to build her by the draught proposed; Ditto 1 February, to name her the *Bellona*

At what Port	Arrived	Docked Grounded or Careened	When Sheathed	Graved	Launched	Sailed	Nature of the repair	Charge £.s.d. of implementing: Hull, masts & yards	Rigging & stores	Total	Observations
Chatham	Begun the	10 May 1758		Feb 1760	19 Feb 1760	8 Apr 1760	Built & fitted	36917.9.7	6474.1.9	43391.11.4	
Plymouth	13 Jul 1760	28 Jul 1760		Jul 1760	29 July 1760	20 Aug 1760	Refitted	496.6.2	1694.6.9	2190.12.11	
Plymouth	7 Jan 1761	19 Feb 1761		Feb 1761	20 Feb 1761	27 Mar 1761	Refitted	1174.10.0	996.4.6	2160.15.6	
Portsmouth	10 Nov 1761	26 Nov 1761	Nov 1761	Nov 1761 at Plymouth in 1762	28 Nov 1761	18 Dec 1761	Refitted	521.10.7 92.7.0	1238.12.8 817.8.4	1760.3.3 909.15.4	
Portsmouth	15 Jan 1762					1 Feb 1762					
Portsmouth	2 Jan 1763	25 June 1763		Jun 1763	28 Jun 1763	6 Apr 1764	Fitted for a guardship	768.7.4	3779.2.6	4547.9.10	(a)
Portsmouth	4 Aug 1764	12 Sep 1764	Taken off & re-sheathed Sep 1764	Sep 1764	26 Sep 1764		Refitted	1152.7.11	3867.14.8	5020.2.7	
Portsmouth		12 Mar 1766		Mar 1766	13 Mar 1766		Refitted	780.18.11	956.18.2	1737.17.1	
Portsmouth		1 Apr 1767	Sheathing taken off May 1767	May 1767	14 May 1767		Refitted	2218.13.7½	1058.7.0	3277.0.7½	
Portsmouth		3 Mar 1768		Mar 1768	4 Mar 1768		Refitted	378.12.10	704.19.11	1083.12.9	(b)
Portsmouth		7 Mar 1769		Mar 1769	8 Mar 1769		Refitted	638.15.11	851.1.0	1489.16.11	
Portsmouth		11 Apr 1770		Apr 1770	25 Apr 1770	1 Oct 1770	Refitted	1283.18.10	3189.17.1	4473.15.11	
Chatham	14 May 1771	29 Mar 1774		Apr 1774	11 Apr 1774		Triennial Trimming	256.11.1		256.11.1	
Chatham		24 Oct 1778	Coppered her bottom Mar 1780		8 Mar 1780	18 Apr 1780	Large repair and fitted	27072.2.6	3800.19.9	30873.2.3	
Portsmouth	27 May 1781	9 Jun 1781	Copper repaired June 1781		23 Jun 1781	25 Jul 1781	Refitted	2448.10.5	5104.11.11	7553.2.4	
Portsmouth	29 Dec 1781	4 Jan 1782	ditto Jan 1782		14 Jan 1782	3 Mar 1782	Repaired damage	1762.9.11	3363.5.10	5125.15.9	
Portsmouth	25 May 1783	13 Jun 1783	ditto Jun 1783		14 June 1783		Examined bottom	107.5.1		107.5.1	
Portsmouth		5 Oct 1785	Copper taken off Oct 1785	Re-coppered Apr 1786	26 Apr 1786		Small repair	12953.11.1	3028.13.2	15982.4.3	
Portsmouth		Taken in hand Jan & completed Feb 1789				13 July 1789	Fitted for a guardship	1010.0.0	1567.0.0	2577.0.0	
Portsmouth	22 Sep 1789					10 May 1790					
Portsmouth	6 Oct 1790	11 Oct 1790	Copper repaired	Oct 1790	22 Oct 1790	31 Oct 1790	Refitted	703	3461	4164	
Chatham	8 Sep 1791	27 Dec 1791	Copper taken off Feb 1792 Re-coppered Jun 1793		9 Jul 1793	2 Sep 1793	Middling rep & made good defects	24772	3064	27836	
Plymouth	22 Dec 1793	Taken in hand Dec 1793 & completed Jan 1794				16 Jan 1794	Refitted				
Plymouth	19 Sep 1794					2 Oct 1794	Made good defects	1604	3486	5090	
Portsmouth	9 Oct 1797	7 Nov 1797	Copper taken off Nov & re-coppered Dec 1797		7 Dec 1797	1 Feb 1798	Refitted				
Portsmouth	22 Apr 1798	30 Apr 1798	Copper taken off & re-coppered May 1798		30 May 1798	10 June 1798	Made good damages	10929	7191	18120	
Plymouth	22 Jan 1799	7 Mar 1799	Copper repaired		23 Nov 1799 [*sic*]	1 May 1799	Made good defects	3128	4316	7444	
Portsmouth	2 Jan 1801	17 Jan 1801	Copper taken off & re-coppered Jan 1801		2 Feb 1801	26 Feb 1801	Refitted				

At what port	Arrived	Docked	When Coppered	Launched or undocked	Sailed	Built or nature of the repair	Charge [£] of the Hull			Charge [£] of the Mast and yards			Charge [£] of the Rigging and Stores			
							Materials	Work-manship	Total	Materials	Work-manship	Total	Materials	Work-manship	Total	Grand Total
Portsmouth	25 June 1802	13 Apr 1805	Copper taken off Apr recoppered Jun 1805. Doubled and diag beams put in	26 Jun 1805	20 Aug 1805	Fitted	11694	3874	15568	2396	266	2662	9357	26	9383	27613
Plymouth	Dec 1805				24 Dec 1805	Defects	141	106	247	334	-	334		7	7	588
Portsmouth	15 Oct 1809	15 Dec 1809	Copper taken off & recoppered Jan 1810	24 Jan 1810	17 Mar 1810	Refitted	4271	1806	6077	1672	121	1793	7007	56	7063	14933
Plymouth	8 Jan 1811	26 Jan 1811	Copper repaired	29 Jan 1811	19 Mar 1811	Defects	1138	750	1888	505	31	536	2430	51	2481	4905
Chatham	20 Nov 1811	3 Dec 1811	Copper repaired	17 Dec 1811	13 Jan 1812	Defects	860	566	1426	82	26	108	153	41	1572	3106
Plymouth	17 Jan 1814				27 Jan 1814		5									
Chatham	4 Feb 1814	19 July 1814					503	1072	1575	16	16	13		13	1604	
Taken to pieces Sept 1814																

(a) Fitted for a guardship
(b) Surveyed afloat 3rd December 1771 and found to want between small and middling repair, estimate for the hull £15160 and 18 months

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September 1799: In Torbay with St Vincent's fleet
12 March 1801: Sailed to the Baltic with Sir Hyde Parker's squadron
3 April 1801: Battle of Copenhagen–grounded on a shoal and took no part in the battle
7 July 1801: Sailed from the Baltic
October 1801: With blockading squadron off Cadiz
16 March 1802: At Jamaica. Reported to be 'an old crazy ship'
6 July 1802: Paid off at Portsmouth, and laid up in ordinary
13 April 1805: Docked at Portsmouth
26 June 1805: Relaunched after being doubled and braced according to the Snodgrass system
October 1805: With Strachan's squadron, but accidentally separated before the action with four French survivors of Trafalgar
19 May 1806: Sailed from Plymouth with squadron for Barbados
14 September 1806: Took part in the chase of the *Foudroyant* and the destruction of the *Impetueux*, 74 guns
July 1807: In Hampton Roads, involved in incident over pressing of US seamen
7 March 1808: With fleet at Basque Roads, which failed to attack the French fleet in harbour
July 1809: Took part in the Walcheren expedition
September–November 1809: Took part in the San Domingo expedition
September 1810: On patrol off Flushing
18 December 1810: Captured *L'Heros*, privateer
1811–12: Blockading the Dutch coast
May 1813: Returned from St Helena
July 1813: Off Flushing
September 1813: Ordered to join squadron off the Basque roads
October 1813: With the Channel fleet off Cherbourg
4 February 1814: Arrived at Chatham
19 July 1814: Docked
September 1814: Broken up at Chatham

CAPTAINS OF THE BELLONA

1760	Charles Ellis
1761	Robert Faulkner (Acting)
1763	Charles Ellis
1763	George Elliot
1765–6	W Campbell
1766–9	M Everett
1770–1	John Montague
1779–83	Richard Onslow
1787	George Bowyer
1789–91	F J Hartwell
1793–99	George Wilson
1799–1801	Sir Thomas Boulden Thomson
1801–3	Thomas Bertie
October 1805	Charles Dudley Pater
December 1805	John Erskine Douglas
1808–12	Stair Douglas
1812–14	G McKinley

DESIGN

Until about 1745 the design of a ship was normally the responsibility of the builder, in a naval dockyard or even in a private shipyard, although a detailed set of dimensions was usually specified. By the 1745 Establishment design was standardised, with one approved draught for each type, but this was too rigid, and prevented any experimentation. When Slade designed the *Dublin* class in 1755 he began the practice of centralised design that was to become standard, making the Surveyor of the Navy responsible for designing all the navy's ships. Thus the draught of the *Bellona* was probably drawn by Slade personally, with some help from the draughtsmen in the Navy Office. The basic draught consisted of three parts, on one large sheet of paper. The sheer plan showed the ship in profile, with the shape of the keel, stem and stern, the positions of the decks, gunports, quarter galleries, etc. It showed virtually nothing of the decorations or structure. On the same sheet were drawn the body sections, showing the shape of every third frame. These were made up entirely of straight lines and segments of circles, using a complex system that had been evolved over many years. Finally on this sheet were drawn the waterlines and diagonals, sections through the length of the hull

intended to 'prove' the design, to show that all the lines were fair and regular. Other draughts gave information on the structure of the ship, rather than the shape of the hull. The longitudinal section showed the positions of the decks and the beams which supported them, the riders and breast and deck hooks which were fitted inside the hull, and the position of some fittings such as hatches, capstans, bitts, etc. At this time it was not normal to draw a plan showing the disposition of the frames, or to give any information on the layout of the planking. The only other plans drawn for the *Bellona* were those of the decks. One was drawn for each, showing sizes and positions of hatches, ladderways, capstans, standing cabins, bitts, masts, and various other fittings. The deck beams and lodging knees were shown, but not the carlines and ledges. These plans were copied by the Navy Board draughtsmen, and one copy was sent to each site where a ship of this class was to be built.

LAYOUT

The two-decker was, by definition, a ship with two complete decks of guns – the lower deck or gundeck, and the upper deck. These, especially the gundeck, had to carry considerable weights, and therefore had to be made strong. The gundeck had to be far enough above the waterline to allow the gunports to be opened in almost any weather, and this was a very important factor influencing the size of the ship. The guns had to be far enough apart to allow the crews to operate them, and this helped to determine the length of the ship, though a more important factor was the need to keep the gunports above the waterline even when the ship was heeling.

Below the gundeck, and therefore to a large extent below the waterline, was the orlop deck. This was used for various purposes – for storerooms, for cabins for some of the officers, and for stowing the anchor cables when they were not in use. Since it had to bear no great weight, it was of lighter construction than the gundeck and upper deck. Below it was the hold. Since a ship of the line was expected to operate independently of the shore for several months, and carried a crew of several hundred men, the hold had to be roomy enough to carry a large amount of provisions, as well as allowing room for the magazine and powder room. At the lowest level the hold contained ballast, both iron and shingle, and above that several layers of casks containing provisions. It was divided vertically into several parts, so that certain provisions – such as spirits, which were likely to be stolen unless locked away, and fish, whose smell could contaminate the rest of the food – could be kept separate.

The gundeck itself, as well as providing the space for twenty-eight 32-pounder guns, was the main area for the crew's accommodation. Their hammocks were slung from the underside of the upper deck beams, and their mess tables suspended between the guns. The upper deck was open in midships, so that it provided less space for accommodation. Aft, under the quarterdeck, was the wardroom, and cabins for eight of the officers. Forward, under the forecastle, was the cook room and galley stove, and the ship's sick bay. The forecastle and quarterdeck themselves were intended to carry light guns, and provided platforms for working the ship and handling the sails. They were of lighter construction than the gundeck and upper deck. The quarterdeck also provided the main conning position of the ship, the area for the officers' recreation, and had the captain's cabin fitted aft. This was covered by the poop deck, which was originally of very light construction as it was intended to carry no guns, but was made to carry carronades in later years. The space between the quarterdeck and forecastle, was covered only by light gangways along the sides in 1760, but over the years these became more permanent, and wider. Between the gangways extended booms to hold the ship's boats.

STRUCTURE

It is clear that by 1757 the structure of a ship of the line was determined by specifications drawn up at the Navy Office. The actual specification of the *Bellona* has not survived, but that of a near-sister, the *Bombay Castle*, occupies 35 pages of closely written text; as far as can be seen, it was identical to that of the *Bellona*. It prescribed the size of almost every piece of timber of any importance, and laid down the numbers and sizes of bolts that were to hold them in place.

The first stage was the laying of the keel. This was one of the few major pieces of timber which was not made of oak, for elm provided a much straighter piece of wood. The keel was made of six pieces, scarphed together. It was square in midships, kept the same depth throughout its length, but its breadth reduced towards the bow and stern. Towards the top, it had a triangular bevel (a rabbet) cut in it, to receive the edge of the lowest plank of the hull. Under the keel was the false keel, 7 inches thick and of the same breadth as the keel. It was made in several pieces scarphed together, and was held to the main keel by either bolts or staples.

At the stern, rising almost vertically from the end of the keel, was the sternpost. In the angle between it and the keel was fitted the deadwood, which would hold the ends of the cant frames. From the forward end of the keel rose the stempost, curved and made up of several pieces of timber scarphed together; aft of the stempost was deadwood, similar to that of the stern, and likewise made up of various pieces of timber scarphed together. Forward of it was the knee of the head, which formed a cutwater, and supported the figurehead and its fittings.

It was not possible to make the frames of the ship from a single piece of timber, so each had to be made of several parts, called futtocks, joined together by scarphs or chocks. Two frames were joined together with the joins at different places, so as to give strength to the frame. The usual procedure was to place the floor timbers across the keel, and bolt them in position; the rest of the frame was meanwhile constructed, and was fitted into place. At this stage of construction, the frames were held in place by rib-bands, bolted to their outsides. When the frames were in place, the kelson was bolted above them, over the keel, to hold the structure together.

The frames of the *Bellona*, as depicted in the model, were rather unusual, in that, instead of being straight in profile, some of them curved under the edge of the upper deck ports, and a short frame was placed under the gap. This method must have made the timber more expensive, and it is not clear whether it was used for the ship itself, or the model was intended to demonstrate some new idea. Nevertheless the system was used for at least one ship, the *Vengeance* of 1774.

Some of the frames were complete, in that they stretched the full length from keel to topsides. They were fitted first. Others were interrupted by gunports, and they were fitted later, after the gunport cills had been put in place between the long frames, into grooves cut into the frames for that purpose. The futtocks became progressively narrower and shallower as they moved further from the keel, so that the sides of the ship were less thick at the topsides than at the floor.

Towards the bow and stern an ordinary frame, at right angles to the keel, would not be suitable, and angled frames called cant frames were used instead. These were made in two halves and bolted into the sides of the deadwood. At the bows the foremost parts of the frame, called the hawse pieces, were fitted parallel to the line of the knee of the head and deadwood, while at the stern the last part was made up of horizontal timbers called transoms, joined to the upper half of the sternpost.

The deck beams were fitted next. They were made in either two or three parts, scarphed together, and were bolted between the frames on each side. They were supported from below by the hanging knees, roughly L-shaped and with one arm bolted to the frame, and the other to the side of the deck beam. These were among the most expensive pieces of timber in the ship, because it was very difficult to find

timber with suitable grain. In the horizontal plane, the deck beams were strengthened by the lodging knees, similar in shape to the hanging knees, and designed to prevent the ship from working out of shape due to the stresses of the waves and water. Between the deck beams stretched the carlines, and between them the ledges, rather weaker timbers which were intended to give extra support to the guns as they moved over the deck. The orlop, quarterdeck, forecastle and poop had no carlines and ledges, for they carried only light guns, or none at all. Often the deck beams has to be curved, to allow space in midships for hatches, capstans, masts and other fittings.

The planking of the bottom was 4 inches thick. Because of the shape of the hull, it was necessary to taper each individual plank towards the bow and stern, and at the bows some planks, called stealers, ended short of the stempost. The edges of the plank were fitted into the rabbets, triangular grooves cut in the keel, stempost and sternpost to receive them. Where the planks fitted into the sternpost and stempost was called the hooding ends. These were a particularly vulnerable part of the ship, as the planks, curved to fit round the frames, would spring out of position if the ship was put under great stress.

The wales were rather thicker planking, put along the hull in several bands, the first of which was almost level with the waterline in midships. The main wale was 4 feet 3 inches deep and 8½ inches thick, and amidships it was fitted under the lower gunports. It curved upwards towards the bow and stern, so that at the stern it was cut by some of the gunports. It was made by 'anchor-stock construction', that is by pentagonal pieces of timber joined together. Above the main wale was the channel wale, which, among other things, provided an anchorage for the chainplates which supported the shrouds. Between the wales the plank was thinner. Above and below the main wale it tapered over several strakes to its normal thickness of 4 inches. Above the wales was the sheer strake, and the planksheer formed the top of the hull side amidships. At the forecastle, the timbers continued above the level of the planking to form the timberheads, which were used as belaying points for the rigging.

The hull was also planked internally. Substantial strakes, known as 'thick stuff', covered the joins between the futtocks to give extra strength. Between these was thinner planking, known as footwaling. The limber board joined the top of the kelson to the first strake of footwaling, and allowed a channel for water alongside the kelson on each side. The strake immediately under the beams of each deck, called the clamp, was also especially thick, and that below the gunports was called spirketting. Not all of the interior was planked; one strake under the clamp was usually left open, for drainage purposes. The internal planking of the hold was known collectively as the ceiling. Above the footwaling were placed the riders in the hold, which gave extra strength to the structure. Towards the bows were the breast hooks and deck hooks, which helped support the ends of the decks, as well as reinforcing the frame.

The decks were covered with three-inch plank. Near the edges of the deck, against the sides, were the waterways, thicker strakes intended to keep the water off the sides, and direct it towards the scuppers.

DECORATION

Though the extreme elaborations of the second half of the seventeenth century were usually avoided, ships of the 1760s were still richly decorated, and the *Bellona* was no exception. Decoration in British ships was usually done by local craftsmen, whereas in France it was performed by well known artists and sculptors. Nevertheless the British craftsman did not necessarily have a free hand. The Navy Board usually required models to be approved before the ship was begun, though this custom was dying out by 1760, and in any case it is not clear exactly how much effect it really had on decorations. The real restraint on decoration was financial, in that the amount of money to be spent on it was limited by Admiralty Order.

Judging from the model the decorations of the *Bellona* were impressive enough. They began at the bows with the figurehead, presumably a representation of the Roman goddess of war from which the ship took her name. The figurehead was supported by the beakhead, made up of curved rails and pillars. Below them, against the knee of the head was a bas-relief carving called the trailboard, which in this case bore a stylised representation of flags and spears, no doubt reflecting the profession of arms. The sides of the ship carried very little carving, as was common in the eighteenth century, though the model bears a very elaborate frieze. It is not clear whether this was really painted on the side of the ship, but if it was, it would have been very vulnerable to damage, and all but impossible to maintain in conditions of active service.

The bulk of the decoration was carried on the stern and on the quarter galleries. A line of carved figures curved round the quarter pieces and the taffrail, surrounding the windows of the officers' cabins. The cabin windows themselves were separated by pilasters and munnions. The rail of the stern gallery was the only feature that was slightly unusual: most ships had vertical carved pillars, but the *Bellona* had a rail made up of a curved lattice-work. This style is occasionally seen on other ships of the mid-eighteenth century, and it seems that it enjoyed a brief fashion around that time. The pattern was repeated on the quarter galleries, between the upper and lower rows of windows. The *Bellona*, like all large two-deckers of her time, had a single stern gallery, projecting from the end of the quarterdeck, and attached to the captain's cabin. A screen bulkhead, of relatively light construction, separated it from the cabin proper. Below were the windows, or lights, of the wardroom and officers' cabins. The quarter galleries were also of light construction, being appended to the main structure. They served as toilet facilities for the officers, and to increase the decorative effect of the stern.

STEERING GEAR

The rudder was of similar thickness to the sternpost, and about the same length, beginning at the foot of the keel and carrying on up through a hole in the stern called the helm port transom, to above the level of the upper deck. It was held in its place against the sternpost by brackets known as gudgeons and pintles. The tiller which operated it was under the upper deck, and the end away from the rudder was supported by the sweep, a segment of a circle made of wood, giving support to the tiller in any position. There were two emergency steering systems. Chains were fitted to the after edge of the rudder, to rings specially provided, and these would be used if the head of the rudder was shot away; and a spare tiller could be fitted into a socket at the head of the rudder, where it projected above the upper deck.

Since the beginning of the century all large British ships had carried a steering wheel, fitted on the quarterdeck. It was a double wheel: that is, it had two separate wheels, complete with spokes, joined together by the barrel, which held the tiller rope. This arrangement made it possible for up to four men to handle the wheel in strong winds. The tiller rope led from the forward end of the tiller, through a block attached to the side of the ship, back through another block fitted near the centre-line, and up to through the upper deck and quarterdeck to the wheel. About seven turns were taken round the barrel of the wheel, and then the rope was led down through a similar series of blocks on the other side. Tackle was provided against the side of the tiller to tighten the tiller rope.

The main ship's compasses were housed in the binnacle, just forward of the wheel. Two were provided within a wooden box, to compensate for parallax when

TABLE 4: **ANCHORS AND CABLES OF A 74-GUN SHIP**

About 1775

	ANCHORS				CABLES	
	No	Cwt	Qrs	Lbs	No	Size in ins
Best bower	1	69	0	0	4	22
Small bower	1	57	0	0	2	22
Spare bower	1	65	3	5	–	–
Sheet	1	68	3	0	2	22
Stream	1	16	3	2	1	14
Kedge	1	9	2	6	–	–

Anchors about 1800

	WEIGHT			
	Cwt	Qrs	Lbs	No
Anchors [bowers] of	67	0	0	4
Stream	16	0	0	1
Kedge	8	0	0	1

Cables and messenger

	SIZE	LENGTH	WEIGHT			
	Ins	Fathoms	Cwt	Qrs	Lbs	No
Cables of	22	100	102	1	14	7
	13½	100	38	3	1	1
Viols	13	44	15	3	1	2
Messenger	13	60	21	1	7	1

the helmsman was obliged to move his position, and to allow a spare. An oil lamp was situated inside the binnacle, for night sailing.

GROUND TACKLE

A ship of the line carried four large anchors, and two small. Two of the large ones were kept in the bows, ready for immediate use, and hence were called bower anchors. Two more, the sheet and spare bower, were kept just aft of the bowers, lashed against the ship's side. Originally these four anchors had been of different sizes, but there was an increasing tendency for them to become similar, and this was generally achieved by about 1800. The smaller anchors were the stream and kedge, intended to be moved with the help of the ship's boats, for hauling the ship in a calm, or against the wind in a narrow channel. They were generally kept lashed to the sheet and spare anchors, but it is possible that on occasions they were stored in other ways. All the anchors with the exception of the kedge had wooden stocks, constructed in two halves and held together by hoops. The kedge had an iron stock, which could be taken out of position and lashed against the shank to save space.

A ship of this size generally carried seven cables of 22 inches circumference. Cables could be joined together when necessary, when anchoring in deeper water. Two were usually kept attached to the bower anchors, ready for use. The cables were stowed in the cable tier on the orlop deck, between the cockpit in the stern and the store rooms in the bows. This part of the deck did not have permanent deck planking. Instead, short lengths were placed between the beams, with spaces to allow wet cables to drain into the bilges. There was also space for smaller cables, and the viols and messenger.

The ship had two capstans – the main, situated about halfway between the main and mizzen masts, and the fore jeer, situated in the waist. Both were double, in that they had heads on both the lower and upper decks. Bars were pushed into holes in the heads, and this allowed several men to push on each bar. Ropes called swifters were tied between the ends of the bars, and these allowed extra men to pull on them. Using this system, up to 72 men could push on the bars of each head, and 24 more at the swifters – a total of 192 men on each capstan. The flat circular head of the capstan was called the drumhead. It had holes for 12 bars. Below the drumhead were the whelps, which projected from the barrel and increased its diameter, so that the rope being hauled could be coiled round them.

Capstans were used for many purposes – for hauling up masts and spars, for hoisting in guns, and for lifting the ship's boats – but their main purpose was to haul in the anchors. The anchor cable, with its 22-inch circumference, was too thick to coil round the capstan, and instead it was fitted temporarily to the messenger, an endless rope, which was itself taken round the whelps of the capstan. The cable itself passed through one of hawse holes in the bows of the ship, and was sent through down one of the hatches into the cable tier, where a large party worked to stow it. After the anchor reached the surface of the water, its upper ring was hooked onto the cat block, and hauled by a triple purchase tackle to the cathead, a strong beam projecting from the bows. The other end of the anchor, the crown, was then lifted with the help of the spanshackle boom, until the shank of the anchor was approximately horizontal.

PUMPS

British ships had used the chain pump for almost two centuries when the *Bellona* was built. It was more useful than the suction pump in that it allowed a greater volume of water to be raised in a given time, though it did not deliver the water under pressure, and so was less useful for fire-fighting. For that reason, suction pumps were often fitted in addition to chain pumps after about 1800.

The chain pump utilised an endless chain, which passed round wheels at its top and bottom end. Leathers and saucers were attached to the chain at regular intervals. Each leather was fitted between two saucers, which held it in place, while the leather provided a watertight joint in the pump shaft. The conventional chain pump used ordinary chain, but the Coles pump, introduced in the 1770s, used something similar to a modern bicycle chain, though of course much larger.

The drainage system of the ship was designed so that water would be led to the pump well, in midships in the hold, where it was picked up by the saucers of the pump, and carried up one of its tubes, and then into the cistern, on the gundeck. From there it discharged through tubes called dales, which carried it out through one of the gunports. Power was provided by men operating the handles to produce a turning motion. There were four pumps, with two side by side forward and aft of the main mast.

Water which found its way directly on to the decks, rather than into the bilges and the hold, would be kept from falling down the hatches by the coamings, raised pieces of timber round the edges of the hatches. The camber of the deck would cause it to drain towards the side of the ship, where the waterway would help to keep it off the side itself. It would eventually find its way to the scuppers, lead pipes which would allow it to drain out of the ship, through the side.

BOATS

A ship of the line of 1760 normally carried five boats: a longboat, two pinnaces of different lengths, a cutter and a yawl. The longboat was the largest boat, though not in fact the longest. It was used for heavy work, such as bringing stores on board, moving anchors, and especially for fetching water. It was also a good sea-boat. The pinnaces were long and narrow, and designed mainly for rowing the officers in harbour. The larger of the two was usually reserved for the captain, and was after referred to as his barge, while the smaller served for the lieutenants and other officers. The yawl and the cutter were good light sea-boats, able to carry out a variety of tasks. Unlike the other boats, they were clinker-built.

It was eventually found that the longboat was not able to double efficiently as a

TABLE 5: **BOATS OF A 74-GUN SHIP**

About 1775

	NO. OF OARS	BREADTH Ft	BREADTH Ins	LENGTH OF KEEL Ft	LENGTH OF KEEL Ins
Longboat	8	10	2	30	0
Barge	10	6	6	30	0
Pinnace	8	6	6	28	0
Large cutter	6	6	6	23	6
Small cutter	6	6	6	23	0
Yawl	6	5	10	23	0

In 1771

Longboat	10 feet broad
Barge	6 feet 10 inches broad
Pinnace	6 feet 6 inches broad
Yawl	6 feet 4 inches broad
Cutter	7 feet 4 inches broad
Cutter	6 feet 2 inches broad

About 1800

	Length Ft	Number allowed
Longboat or launch	31	1
Pinnace	32	1
Pinnace	28	1
Cutter	25	2
Cutter	18	1

sea-boat and as a heavy working boat. After about 1780 it was generally replaced by the launch, which was less seaworthy but more useful as a lifter of heavy weights in sheltered waters. The cutter tended to take over some of its role as a sea-boat, and a second cutter began to replace the yawl.

In past periods many boats had been towed behind the ship, but a pair of booms was also rigged along the waist, between the main mast and the forecastle, to carry one boat (usually the pinnace). The practice of towing boats was obviously wasteful, and many examples are recorded of boats being lost in bad weather. From about 1740 gangways were fitted along the sides of the waist, and between these were fitted athwartships beams which could be used to carry boats. Models of this period mostly show only one boat, usually a pinnace, on the booms, but it is clear that they could carry many more, and the practice of towing them astern was beginning to die out.

Boats were hoisted out using tackle rigged from the tops of the main and fore masts. This of course was a labour-intensive and time-consuming business. Towards the end of the eighteenth century, davits were often rigged above the quarter galleries, with cutters suspended from them ready for emergency launching. Many captains preferred lighter and handier boats than the barges and pinnaces, and acquired gigs and dinghies for their own use.

SHEATHING OF THE HULL

Damage to the hull by shipworm was a constant problem in warm water, especially in the West Indies, while in cooler climates weed and barnacles growing on the underwater hull could do much to reduce speed. This was a particular disadvantage for British ships, which, pursuing the Royal Navy's aggressive policy, spend considerably more time at sea than those of other nations. Small ships could be careened by hauling them down on one side and cleaning the other, but this was rarely possible for a ship of the line, which therefore had to make regular visits to a dry dock for cleaning. Various compositions were painted on the bottoms of ships to deter growth, and these generally gave the underwater hull a white appearance. When ships were sent to the West Indies, they were sheathed, which usually meant that the bottom was covered with a light layer of planks, with copper-headed nails in an attempt to deter the worms. It was not generally successful.

Satisfactory solutions to these problems had proved elusive, despite considerable ingenuity and effort over a long period – for example, experiments were carried out with lead sheathing as early as the seventeenth century. From the 1760s copper was tried on the hulls of several ships, but it was not until 1778, under the pressure of the American War, when the British battlefleet found itself heavily outnumbered by those of France and Spain, that it was decided to copper the whole fleet (and indeed the model of the *Bellona* was used to demonstrate the principle of this to the King). The copper was put on in sheets measuring 4 feet by 15 inches, with an overlap of 1½ inches between sheets. In general the strakes of sheathing followed the line of the planking, but of course it stopped at the load waterline. It was held on by thousands of copper nails: when the *Bedford* was coppered in 1779, she required 2741 sheets of copper and about 2½ tons of nails, while the *Alexander*, another 74-gun ship, required 2806 sheets. It had long been recognised that electrolytic action between the copper and the iron bolts of the hull would cause rapid decay, and at first sheets of paper were placed between the copper and the hull, but this was a very temporary solution. After the war ended in 1783, the iron bolts of most ships were replaced with copper, and the long term solution was found. The *Bellona* herself was coppered in March 1780, relatively late in the programme of coppering the whole fleet, and she was re-coppered several times in her career.

CREW

A 74-gun ship had a nominal crew of 650 men in 1760, but it is doubtful if any actually carried a full complement, as men were always difficult to find in wartime. The nominal crew was slowly reduced over the years, to 600 in 1783 and 590 in 1805. Commissioned officers included the captain and four or five lieutenants. Other officers entitled to use the wardroom were the captain of marines and his two lieutenants, the surgeon, the purser, the master, and the chaplain. The standing officers – so called because they stayed with the ship even when she was out of commission – were the carpenter, gunner and boatswain, who were mainly responsible for maintenance. The master's mates were warrant officers, who might eventually be commissioned as lieutenants, and the midshipmen were usually trainee officers in a more junior category. Numerous petty officers, such as the quartermasters, quarter gunners, and boatswain's mates, assisted the ship's warrant officers, while others, such as the armourer and sailmaker, headed their own small departments. There were about 100 Marines, commanded by a captain and two lieutenants, two sergeants, and two corporals. Marines often provided men for various duties about the ship, as barbers, tailors and shoemakers, as well as providing the ship's band. There was a large number of officers' servants, for the captain was entitled to four men for every hundred in the ship's company, and the other officers were entitled to one or two each. Not all of these, especially among the captain's servants, were expected to do menial work; often they were young men who would soon become midshipmen. The rest of the complement was made up of able seamen, ordinary seamen, and landsmen, rated according to their experience and ability.

The crew was probably divided into two watches, port and starboard. The men were also divided into divisions and duties attached to different parts of the ship,

TABLE 6: OFFICERS AND CREW ALLOTTED TO A 74-GUN SHIP IN COMMISSION, 1766

Captain	1
Lieutenants	4
Master	1
Chaplain	1
Master's mates	3
Midshipmen	16
Schoolmaster	1
Captain's clerk	1
Quartermasters	6
Quartermaster's mates	4
Boatswain	1
Boatswain's mates	2
Yeoman of the sheets	4
Coxswain	1
Master sailmaker	1
Sailmaker's mate	1
Sailmaker's crew	2
Gunner	1
Gunner's mates	2
Yeomen of the powder room	2
Quarter gunners	1 to every four guns
Armourer	1
Carpenter	1
Carpenter's mate	1
Carpenter's crew	8
Purser	1
Steward	1
Steward's mate	1
Cook	1
Surgeon	1
Surgeon's mates	3
Master at arms	1
Corporals	2
Trumpeter	1
Captain's servants	16
Other officers' servants	15

Midshipmen ordinary, cook's mate, coxswain's mate, yeomen of the boatswain's store room, swabber, cooper, able seamen, captain's cook, ordinary trumpeter, ordinary seamen, shifters, barbers, gunner's tailor

To a total of 650 officers and men

TABLE 7: OFFICERS AND CREW ON 14 AUGUST 1761 DURING THE ACTION WITH THE COURAGEUX

Captain	1
Lieutenants	4
Purser	1
Surgeon	1
Chaplain	1
Master	1
Boatswain	1
Cook	1
Schoolmaster	1
Carpenter	1
Master at arms	1
Captain's clerk	1
Gunner	1
Second masters	2
Master's mates	4
Midshipmen	15
Captain's servants	18
Other officers' servants	14
Quarter gunners	13
Quartermasters	5
Quartermasters' mates	4
Boatswain's mates	1
Carpenter's crew	6
Sailmaker's mates	1
Yeomen of the sheets	5
Cooper	1
Gunner's mate	1
Yeoman of the boatswain's store room	1
Sailmaker	1
Coxswain	1
Gunner's mates	2
Sailmaker's crew	2
Yeoman of the powder room	2
Cook's mate	1
Purser's steward	1
Trumpeter	1
Corporal	1
Able seamen	302
Ordinary seamen	46
Captain of marines	1
Lieutenants of marines	2
Sergeants of Marines	2
Corporals of marines	2
Privates of marines	90
Total	567

and allotted a very complicated series of duties during different evolutions. In battle, the great majority of the men served the guns.

ACCOMMODATION

By long tradition, the ship's officers lived at the stern, where windows and galleries were provided for their comfort. The captain's cabin was sited on the quarterdeck, and below, on the upper deck, was the wardroom. Not all the officers entitled to use the wardroom were able to have their cabins there, and several small cabins were provided below, in the gunroom, while the purser and the surgeon were accommodated in the cockpit, in the after part of the orlop deck. The gunroom also housed the gunner and his assistants, while the cockpit was also used for the surgeon's dispensary, the captain's and lieutenant's store rooms, the clothing stores, and the room where the purser's steward issued provisions. The space in the middle served as a midshipman's berth, and as an operating theatre in action. Forward on the upper deck, under the forecastle, were sited the cook room and the sick berth. The latter was put there because the compartment could be heated by the galley stove in cold weather, and well ventilated in warm. The carpenter and the boatswain had their cabins nearby.

The great majority of the crew slept in hammocks slung under the upper deck; 14 inches were allotted per man, with 28 inches for petty officers. Only the fact that half the men would have been on watch at any given time seems to have made conditions bearable. In the daytime the hammocks were unslung and rolled into a tight cylinder. They were then placed in the nettings round the sides of the ship, where they helped provide protection against enemy gunfire. On the gundeck, one table was slung between each pair of guns, and benches were allowed to seat the men from each mess. On the *Bellona* two or more messes often shared a table, so each might have to accommodate up to sixteen men. One man from each mess was

TABLE: 8 A CALCULATION OF THE WEIGHT OF THE MASTS AND YARDS, ORDNANCE, NAVAL AND VICTUALLING STORES ETC ON BOARD HIS MAJESTY'S SHIP BELLONA, AT HER SAILING FROM BLACKSTAKES 19 APRIL 1760, VIZ:

Particulars	Butts	Punch	Hhd	Weight Tons	Cwt	Qrs	Lbs
Provisions etc	16						
Water in the ground tier	164	30	60	107	0	0	0
Water in the second tier	175		100	112	10	0	0
Beer	236			118	0	0	0
All species of dry and wet provisions				77	0	2	16
Coals, wood and candles				48	0	0	0
To what time the above provisions are complete for the complement of men (650)	Four months						
Iron ballast				50	2	0	0
Shingle ballast				160	0	0	0
Masts and yards complete				71	1	0	13
Rigging and fitting the same; Cordage				40	9	3	7
Blocks, deadeyes, thimbles and hooks				8	13	2	14
Other stores expended about the rigging				0	15	1	0
Boatswain's sea stores for eight months							
Cables and other cordage				44	18	1	23
Anchors				13	16	2	0
Sails				8	11	0	0
Boats				8	0	0	0
All other sea stores				10	19	2	2
Carpenter's sea stores for eight months							
Iron fire hearth and double kettle				3	13	1	16
All other sea stores				19	0	0	11

BELLONA, 3rd RATE, 74 GUNS, AT THE NORE, 24 APRIL 1760

QUANTITY	Ft	Ins	WEIGHT Tons	Cwt	Qrs	Lbs
Height of the ports from the water:						
Afore	6	9½				
Midships	5	4				
Abaft	6	1½				
Draught of water:						
Afore	20	10				
Abaft	22	7				
[Difference]	1	9				

Ballast:					
Iron		50	2	0	0
Shingle		190	0	0	0
Provisions:					
Beef	5200 pieces	9	5	2	24
Pork	9620 pieces	8	11	3	4
Beer	236 butts	118	0	0	0
Water	339 butts, 30 puncheons 60 hogsheads	194	10	0	0
Bread	650 bags	32	10	0	0
Butter		1	14	3	8
Cheese		2	6	1	20
Oatmeal	297 bushels	8	9	2	24
Peas	325 bushels	9	5	2	24
Flour		6	19	0	22
Suet		1	3	0	24
Vinegar	590 gallons	2	6	3	8
Candles		0	17	3	12
Wood	44 cord				
Coals	20 cauldrons	27	0	0	0
(Provisions for 650 men, four months)					
Boatswain's stores					
Carpenter's stores	8 months				
Number of men	650	40	12	2	0
Guns:					
Lower deck	32-pounders, 28	78	10	3	0
Upper deck	18-pounders, 28	56	3	2	8
Quarterdeck and forecastle	9-pounders, 18	22	16	3	9
Powder	353 barrels	15	15	0	20
Shot	32-pounders, 1680	24	0	0	0
	18-pounders, 1960	15	15	0	0
	9-pounders, 1260	5	1	1	0
Grape shot	32-pounders, 140	2	0	0	0
	18-pounders, 196	1	11	2	0
	9-pounders, 94	0	7	2	6
Double-headed	32-pounders, 84	1	4	0	0
	18-pounders, 84	0	13	2	0
	9-pounders, 54	0	4	1	10
Anchors		6	15	0	27
Cables (exclusive of those down)		26	14	1	13
Tare of casks		75	16	3	19

sent to collect food from the galley, in bowls and receptacles provided. The captain, in contrast, lived in comparative luxury, with three large cabins, two quarter galleries and a stern gallery for his sole use.

Toilet facilities for the crew was provided in the heads, where they used 'seats of ease' which discharged directly into the water. Petty officers were allowed to use the roundhouses, on the forward side of the beakhead. The wardroom officers had two quarter galleries, but one opened directly into the first lieutenant's cabin, leaving only one for the other officers.

By the orders of 1757, the cabins in the wardroom were to be constructed by 'canvas hanging loosely before it like a curtain, or laced above and below with a parting in the middle of each bulkhead to go in and out, and to roll up in the daytime or when not in use.' More permanent cabins, made of canvas stretched on a frame, were often fitted, and were eventually authorised officially. It is possible that even more permanent structures were fitted in later years. Each officer provided himself with a canvas cot, 6 feet by 2 feet 3 inches. It is doubtful if he was given any other furniture, but often he provided his own.

TABLE 9: DIMENSIONS OF CASKS USED IN THE NAVY

NAMES OF CASKS	LENGTH Ft	LENGTH Ins	BILGE Ft	BILGE Ins	CHIME Ft	CHIME Ins	CONTENTS Galls	PIECES Beef	PIECES Pork	FLOUR Lbs	PEAS Galls	OATMEAL Galls
Leaguer	4	6	3	0	2	5	150					
Butt	4	4	3	0	2	2	108					
Puncheon	3	5	2	6½	2	1	72	170	310	672	76	
Hogshead	3	0	2	3	1	11	54	124	220	448	64	84
Barrel	2	7	2	0	1	11	36	86	154	336	48	72
Half hogshead	2	4	1	11	1	7	28	64	120	224	32	48
Tierce												
Rundlett or rumlet	5	1	3	0	deep							
Vat for sails	4	7	2	9	deep							
Leaguer for water	4	10	3	3	2	6½	189	used in ground tier				

TABLE 10: DIMENSIONS OF MASTS AND YARDS FOR HIS MAJESTY'S SHIP THE DRAGON OF 74 GUNS

	MASTS Length Yds	MASTS Length Ins	MASTS Diam Ins	YARDS Length Yds	YARDS Diam Ins	YARDS Ins
Main mast	30	0	36	32	8	22⅝
Main topmast	21	22	19¼	23	18	14⅝
Main topgallant	11	0	11	15	10	9¼
Fore mast	31	32	31¾	28	4	19⅝
Fore topmast	19	9	19¼	20	18	12¾
Fore topgallant	9	22	9⅝	13	12	8½
Mizzen mast	31	6	21⅜	28	30	15⅜
Mizzen topmast	15	32	13	15	13	9⅝
Bowsprit	22	0	34⅛	20	18	12¾
Flying Jibboom	16	0	14⅛	13	12	8½
Crossjack yard	-	-	-	20	18	12¾

MASTS AND YARDS

Like all ships of the line, the *Bellona* had three masts – fore, main and mizzen. It is probable that the ship's original masts were constructed in one piece, but by about 1780 the supply of timber had been affected by the American war, and it became increasingly common to make lower masts from several pieces, joined together by a system of tables and coaks. It is not known if and when such masts were fitted to the *Bellona*, though presumably a new mizzen was fitted after the engagement with the *Courageux* in 1761. The upper masts (topmasts and topgallants) were always constructed in one piece.

The lower mast was fixed at its lowest end to the step, a heavy piece of timber bolted over the keel, and resting on the frames on each side. As the mast passed through each deck, it was fixed to strong timbers called the partners. There was usually a gap between the partners and the mast; this was filled by wedges.

At the upper end of the lower mast, the crosstrees and trestletrees were fitted, resting on the hounds of the mast. Above them was built the main structure of the top, which was planked, and had a rail on its after side. The heel of the topmast passed between the trestletrees, and was supported by a removeable peg called the fid. There was some overlap between the two masts, as the head of the lower mast came some way above its hounds. The cap joined the top of the lower mast to the topmast. The join between the topmast and the topgallant was similar, but the top was less elaborate, and was not planked because, unlike the lower top, it was not expected to mount light swivel guns in action.

The yards were octagonal in section near their centres, and circular otherwise. They were fitted with sling cleats near their centres, to retain the ropes of that name in position. Near their ends they had small yardarm cleats, to help retain the ropes which stretched the sail. The lower yards, like masts, were sometimes made in several pieces. There were two main ways of doing this, by tonguing or by scarphing.

STANDING RIGGING

The job of the standing rigging was to support and brace the masts. Therefore it was tarred to protect it against wind and water. There were three main types of standing rigging – shrouds, backstays and forestays. The lower shrouds led from the channels (platforms built on the outside of the hull) to the head of the lower mast. Those of the upper masts led from their respective tops to the heads of the appropriate masts. All were provided with a system of deadeyes and lanyards to

TABLE 11: ROPE FOR WOLDING MASTS, AS ESTABLISHED IN 1764 FOR SHIPS OF 74 GUNS

	SIZE*	LENGTH Fathoms	WEIGHT Cwt	Qrs	Lbs
Fore mast					
Main mast	3½	552	16	0	21½
Bowsprit					
Mizzen mast	2½	83	1	1	6½

*Circumference in inches

TABLE 12: DIMENSIONS OF CAPS AND TOPS

	LENGTH Ft	LENGTH Ins	BREADTH Ft	BREADTH Ins	DEPTH Ft	DEPTH Ins
Main mast						
Lower trestletrees	15	5½	1	5⅜	0	11⅝
Lower crosstrees	20	10⅜	0	11⅜	0	7⅝
Tops	21	7⅜	16	2½	-	-
Topmast crosstrees	16	2½	0	5⅜	0	4½
Topmast trestletrees	7	0⅛	0	9⅝	0	5¼
Lower cap	6	5	3	2½	1	5⅛
Topmast cap	3	8	1	10	0	8¾
Fore mast						
Lower trestletrees	13	8	1	1⅜	0	10¼
Lower crosstrees	18	5⅝	0	10	0	6⅛
Tops	19	2⅝	14	5	-	-
Topmast crosstrees	14	5	0	4¾	0	4
Topmast trestletrees	7	0⅛	0	9⅝	0	5¼
Lower cap	6	5	3	2½	1	5⅛
Topmast cap	3	2½	1	7¼	0	7⅝
Mizzen mast						
Lower trestletrees	11	3	0	11¼	0	7½
Lower crosstrees	15	2⅝	0	7½	0	5
Tops	15	10⅝	11	11	-	-
Topmast crosstrees	11	11	0	3⅞	0	3¼
Topmast trestletrees	4	10½	0	6⅝	0	3⅝
Lower cap	4	4	2	2	0	11⅛
Topmast cap	2	5	1	2½	0	5¾

TABLE 13: CUT OF SHROUDS, AS ESTABLISHED ON 30 JULY 1773

	SIZE	TOTAL	NO OF	FIRST WARP		
	Ins	Fathoms	PAIRS	Yds	Ft	Ins
Fore shrouds	11	193	9	19	2	0
Fore topmast shrouds	6½	106	6	17	1	0
Fore topmast backstays	6½	149	4	37	0	0
Topgallant shrouds	4	75	3	25	0	6
Topgallant backstays	4	90	2	45	0	0
Main shrouds	11	220	9	22	2	0
Main topmast shrouds	6½	117	6	19	0	0
Main topmast backstays	6½	167	4	41	0	0
Topgallant shrouds	4	86	3	38	2	0
Topgallant backstays	4	102	2	51	0	0
Mizzen shrouds	6½	116	6	19	0	0
Mizzen topmast shrouds	4½	56	4	14	0	0
Mizzen topmast backstays	4½	62	2	31	1	0
Topgallant shrouds	2½	40	2	20	0	0
Topgallant backstays	2½	39	1	39	0	0

TABLE 14: FOUR-STRAND STAYS, CABLE-LAID, FOR A SHIP OF 74 GUNS

	SIZE	LENGTH	WEIGHT OF EACH STAY		
	Ins	Fathoms	Cwt	Qrs	Lbs
Fore stay	17	14	8	1	6
Fore preventer stay	11	14	3	1	25
Fore topmast stay	8½	23	3	1	20
Fore topmast preventer stay	6½	23	1	3	10
Fore topgallant stay	4½	29	1	0	26
Main stay	18	22	14	2	12
Main preventer stay	12½	19	6	0	8
Main topmast stay	8½	23	3	1	20
Main topmast preventer stay	6½	22½	1	0	19
Main topgallant stay	4½	22½	1	0	0
Mizzen stay	8½	14½	2	0	0
Mizzen preventer stay	5	14	0	3	0

tighten them when they stretched. Those of the upper masts had futtock shrouds under the tops. These led downwards and inwards from under the end of the shroud, and were fixed to the shrouds of the mast below. Catharpins were stretched between the pairs of lower shrouds to prevent them spreading under pressure from the futtock shrouds.

Both the shrouds and futtock shrouds were fitted with ratlines – light ropes which crossed the shrouds and provided a kind of ladder for men to climb the mast. An eye splice was put in each end of the ratline, and seized to one of the outer shrouds. The rope was then fixed to each of the inner shrouds in turn, by a clove hitch. The other end was finally fixed to the after shroud, by seizing through an eye splice.

The backstays performed a similar function to the shrouds, except that, instead of covering one mast only, they extended from the channels to the head of either the topmast or topgallant. Some, called the standing backstays, were fixed; others could be moved as required, and these generally used ordinary blocks rather than deadeyes.

The forestays were among the thickest pieces of rope in the ship, apart from the anchor cables. They led forward from the heads of the masts, to a suitable position on deck, on the bowsprit or jibboom, or to the after side of another mast, from where they were led down to the deck. They were tightened by means of lanyards, which, in the case of the larger shrouds, were led through heart blocks.

The more important stays were doubled, by the use of a preventer stay, slightly lighter than the principal stay. It was often linked to the other stay by means of 'snaking', a light rope laced between the two stays. This was to prevent the ship being endangered in action by one of the stays being cut.

RUNNING RIGGING

The running rigging was intended to hoist the yards and sails, to help furl and reef the sails, and to control their movement to suit the wind conditions. Because they had to be ready for constant movement, they could not be tarred like the standing rigging.

The lower yards were hoisted into place by means of the jeers, and held against the mast by trusses. The upper yards used halyards and parrels for the same purposes. The yard was held by means of lifts, one leading to each end of the yard. Braces controlled the angle of the yard, in the horizontal plane; they were therefore very important when the ship was manoeuvring. They began at the ends of the appropriate yards, those of the fore and main yards leading forward, while some of those of the mizzen yards led aft. The sheets controlled the loose corners of the sails. Those of the lower sails were led through blocks in the side of the hull. The sails were furled by means of clewlines, leechlines and buntlines, which led from a suitable point on the sail to a block on the yard, and then down to the deck. Bowlines and their bridles led forward from the edges of the sail, and were used to stretch it forward to catch the wind when close hauled. The staysails were hauled up on their stays by means of halyards, and down by downhaulers. Each had two sheets, to be used according to the side on which the sail was set; the four-cornered ones also had a tack, to control the forward lower corner. The mizzen sail was carried on a long yard, apparently too long for the sail itself. At one time such yards had carried lateen sails, the full length of the yard, but some years before *Bellona*'s time the part of the sail forward of the mast had been eliminated, to leave a quadrilateral sail, the fore edge of which was lashed to the mast. The yard was supported by throat and peak halyards, and its lower end was controlled by a bowline, with the upper part by vangs which led down to the deck. The corners of the sail were controlled by a sheet and a tack, and for furling it could be raised up, like a curtain, by means of brails.

SAILS

The sails were made of strips of canvas, two feet wide, sewn together. Seams were sewn round the edges, and to these were sewn bolt ropes, leech ropes and head ropes to strengthen the sail. Vulnerable areas were also strengthened by adding an extra thickness of canvas, known as lining. On many sails reef points were fitted, to reduce the effective area of the sail in strong winds. Short ropes were passed through the sail, and these could be tied together round the yard. The canvas along the row of reef points was strengthened by a strip of canvas known as a reef band. Rings of rope were sewn at several points on the edges and corners of the sails, for fitting the various ropes.

Sails were fixed to their yards by means of robbands – ropes which passed through a hole in the head of the sail and then round the yard, and were tied at the top of the yard. Sails were made in six different thicknesses of canvas, for use in different wind conditions. In very strong winds only the reefed topsails were carried, and these were made especially strong. Several spare sails were carried, particularly topsails, and these were stored in sail rooms on the orlop deck.

TABLE 15: **DIMENSIONS OF SAILS FOR A SHIP OF 74 GUNS, AS ESTABLISHED ON 30 JULY 1773**

Head	NO OF CLOTHS Foot		Yards deep	Sort	Yards in each sail
Spritsail course	31	31	8	2	261
Spritsail topsail	18½	29½	9	6	216
Flying jib	—	26	25	6	227
Fore course	41	41	13	1	579¼
Fore topsail	27	42	17½	2	637¼
Fore topsail lining	27	42	17½	5	46
Fore topgallant sail	18½	26½	8¾	6	196¾
Main course	50	50	15¾	1	817¾
Main topsail	31	48	19¾	2	865¾
Main topsail lining	31	48	19¾	5	56
Main topgallant sail	21½	30½	10	6	260
Mizzen course	16	17	11½	2	284½
Mizzen topsail	21	30½	14½	4	391½
Mizzen topsail lining	21	30½	14½	6	34½
Mizzen topgallant sail	16	21	7	7	129½
Staysails:					
Fore		22	13	2	145
Main		31	15¾	2	246½
Mizzen	20½	22½	9	2	246
			13½		
Main top	25	27	9½	6	436¼
			24		
Fore top		21	17½	6	185¾
Main topgaliant	21	21	6	7	231¾
			15½		
Mizzen	19	20	6½	6	209¼
			14½		
Middle	24	24	7½	6	295
			16½		
Steering sails:					
Main	16	20	18½	6	335¾
Main top	14	17	21	6	328
Main topgallant	10	13	10½	7	120¾
Fore	15	19	15	6	255
Fore top	13	16	18½	6	268¼
Fore topgallant	9	12	9¼	7	97¼
Driver	19	27	21	6	483

GUNS

The smooth bore muzzle-loading gun was a very simple weapon. In essence it was a long tube of iron, sealed at one end except for the touch hole which was used to ignite the powder. Various rings round its body provided reinforcement, but the whole gun was moulded in a single piece. On each side were fitted trunnions, which allowed it to elevate and depress when fitted to its carriage. The 32-pounder gun, firing a ball of that weight, was the standard lower deck gun of the *Bellona* throughout her life, and her upper deck likewise carried 18-pounders. The forecastle and quarterdeck originally carried 9-pounder guns, of differing lengths, but these were later partly replaced by carronades.

The carronade was the main innovation in gun design during the career of the *Bellona*. In essence it was a short gun, more accurately finished than normal guns, so that its ball fitted more tightly and thus wasted less of the explosive power of the powder. Most carronades had a lug underneath, rather than a trunnion on each side. These improvements resulted in a gun which was remarkably efficient for its its weight at short range, and could be used to increase the fire power of the ship

TABLE 16: **SIZE OF BOLT ROPES FOR 74-GUN SHIP SAILS**

SAILS	BOLT ROPE Ins	HEAD ROPE Ins
Main course	5½	2¼
Fore course	5	2
Main topsail	5	2
Main topsail leech	4½	-
Fore topsail	4½	1¾
Fore topsail leech	3¾	-
Mizzen course at the foot, and two yards up the leech	4½	1¾
Leech ropes down to there	3¼	-
Spritsail course	3¾	1½
Mizzen topsail	3¼	1½
Mizzen topsail leech	2½	-
Main topgallant sail and fore topgallant sail	2½	1½
Mizzen topgallant sail	2	1¼
Spritsail topsail	2½	1½
Main and fore staysails	3	3
All the clews half an inch bigger, two fathoms long		
Fore topmast staysail	2¼	2¼
All the clews half an inch bigger, two fathoms long		
Flying jib foot rope head or stay rope	2¾	2¾
And about two yards up the leech for after clews, and one yard down from the peak		
After leech	1½	-
Main and top studding sail	2	1¼
Mizzen driver	2½	1¼

Stay sails	Clews and peak	Mast and head	Leech and foot
Main top	3¾	3	2½
Main topgallant	2¾	2½	2
Middle	3¼	2¾	2¼
Mizzen	4	3¼	2¾
Mizzen top	3	2½	2

TABLE 17: **TYPES OF GUN CARRIED AT VARIOUS TIMES**

Weight of shot Lbs	Length Ft	Weight Cwt	Date
32	9½	55	1760–1812
18	9	40	1761
18	9	42	1812
12	9	34	1812
12	7½	29	1812
9	8½	27½	1761
9	7½	24½	1761
Carronades			
32		17	1812
18		9½	1812
12		6	1793,1812

TABLE 18: **NUMBER OF GUNS CARRIED IN 1761**

Number	Weight of shot Lbs	Length Ft	Weight Cwt
28	32	9½	55
28	18	9	40
14	9	7½	24½
4	9	8½	27

TABLE 19: **GUNS ON BOARD AT CHATHAM, 6 JANUARY 1812**

NATURE	CUT NO.	FOUNDERS MARKS ON TRUNNIONS Letter	No	CWT	WEIGHTS QRS	LBS	CYPHER	REMARKS
32-pounders, 9 feet 6 inches	1	WCo	84	55	2	0	NP	
	2	WCo	82	55	2	0	NP	
	3	WCo	88	55	2	4	NP	
	4	WCo	118	55	2	2	NP	
	5	WCo	108	55	3	0	NP	
	6	WCo	111	55	3	0	NP	
	7	WCo	113	55	2	14	NP	
	8	WCo	267	56	2	0	NP	
	9	WCo	265	56	2	0	NP	
	10	WCo	263	55	2	0	NP	
	11	WCo	270	55	2	0	NP	
	12	WCo	233	56	1	14	NP	
	13	WCo	268	55	1	21	NP	
	14	WCo	71	55	3	0	NP	
	15	WCo	114	55	2	1	NP	
	16	WCo	89	55	2	0	NP	
	17	WCo	100	55	1	0	NP	
	18	WCo	106	55	2	14	NP	
	19	WCo	72	55	2	14	NP	
	20	WCo	120	55	2	21	NP	
	21	WCo	269	55	3	0	NP	
	22	WCo	103	55	3	0	NP	
	23	—Co	255	56	3	0	NP	
	24	WCo	271	55	2	0	NP	
	25	WCo	263	56	2	0	NP	
	26	WCo	275	56	2	0	NP	
	27	WCo	266	56	1	14	NP	
	28	WCo	256	56	1	7	NP	
18-pounders, 9 feet	1	Carron	54400	41	3	14	NP	1796
	2	Carron	54408	41	0	14	NP	1796
	3	WCo	901	42	0	0	NP	
	4	WCo	902	42	0	0	NP	
	5	WCo	904	42	0	7	NP	
	6	WCo	891	42	0	0	NP	
	7	Carron	54418	42	1	14	NP	1796
	8	Carron	54385	42	0	21	NP	1796
	9	WCo	345	41	3	7	NP	
	10	WCo	903	42	0	7	NP	
	11	WCo	894	42	0	14	NP	
	12	WCo	890	42	0	14	NP	
	13	WCo	896	41	2	0	NP	
	14	Carron	54404	41	3	14	NP	1796
	15	WCo	348	41	3	21	NP	
	16	WCo	900	42	0	0	NP	
	17	WCo	803	42	0	0	NP	
	18	Carron	54380	42	0	0	NP	1796
	19	WCo	889	42	0	4	NP	
	20	Carron	54410	42	0	14	NP	1796
	21	Carron	54408	42	0	14	NP	1796
	22	Carron	54301	42	0	14	NP	1796
	23	Carron	54402	42	0	14	NP	1796
	24	WCo	892	42	0	14	NP	
	25	WCo	888	42	0	14	NP	
	26	WCo	899	42	3	14	NP	
	27	WCo	925	41	3	0	NP	
	28	WCo	124	42	0	5	NP	
12-pounders, 9 feet	1	Carron	66574	34	1	14	NP	1804
	5	Carron	66567	33	3	17	NP	1804
12-pounders, 7½ feet	2	WCo	46	29	1	0	NP	
	3	WCo	134	29	1	2	NP	
	4	WCo	14	29	2	1	NP	
	6	WCo	31	29	0	3	NP	
	7	WCo	139	29	1	3	NP	
	8	WCo	120	29	0	24	NP	
32-pounder carronades	1	Carron	66743	17	3	25		1804
	2	Carron	66688	17	2	21		1804
	3	Carron	66683	17	3	21		1804
	4	Carron	66712	17	3	18		1804
	5	Carron	53433	17	1	0		1795
	6	Carron	66672	17	3	0		1804
	7	Carron	53438	17	1	14		1795
	8	Carron	66716	17	3	14		1804
	9	Carron	53608	17	2	0		1795
	10	Carron	60816	17	1	4		1800
18-pounder carronades	1	Carron	51783	9	3	0		1794
	2	Carron	62722	10	0	14		1802
12-pounder carronades	1	HCo	441	6	2	11		
	2	HCo	390	6	2	7		

quite considerably. Originally they supplemented the guns on the upper works, but from 1793 they began to replace them.

Both cannon and carronade mostly fired a spherical ball of solid iron, but could also fire grape shot, for use against personnel, and bar or chain shot against the enemy's rigging. The charge of powder was carried in a bag, originally of canvas and later paper. The ball was inserted after the charge, followed by a canvas wad, to prevent it from rolling out with the movement of the ship.

The standard gun carriage was a wooden structure, fitted with four wheels called trucks. The gun itself was held in place by its trunnions, which fitted into semi-circular recesses on the top of the sides, over which were placed the metal cap-squares. This type of carriage was perhaps a little inefficient, in that the direction of recoil could not easily be predicted. The carronade used a very different carriage, which controlled the recoil by means of a slide. This was sometimes criticised because it often broke under active service conditions, and consequently it never showed any signs of replacing the carriages of the long guns.

Gun tackle consisted of three main parts. The gun tackle itself was used to haul

TABLE 20: **SIZES OF GUN TACKLES 1814**

GUNS Pdrs	Ft	Breechings Circum Ins	Length Ft	Tackles Circum Ins	Length Ft	Tackle falls Circum Ins	Length Ft
32	9½	7	34	3	54	3	54
18	9	5½	28	2½	48	2½	48
12	9	5½	27	2½	42	2½	42
12	7½	5½	25	2½	42	2½	42
9	8½	4½	24	2	30	2	30
9	7	4½	24	2	30	2	30
CARRONADES							
32		8	20	2	30	2	30
18		5½	16	1½	20	1½	20
12		5½	15	1½	20	1½	20

the gun out after reloading. The breeching tackle limited the recoil. The train tackle, which linked the rear of the carriage to a ringbolt near the centre-line of the hull, controlled the gun against the movement of the ship during reloading. In addition, other tackles were used to lash the gun to the ship's side in heavy weather.

The main magazine was situated in the hold, aft of the mizzen mast. Instead of normal planking, it used a system of palleting, which prevented any leaking gunpowder from seeping into the hold. The magazine was used for storing powder in barrels. Made up cartridges were stored in the filling room, just forward of the main magazine, and in the after powder room, which supplied the after guns. Because of the danger of fire, the lanterns of the magazines and filling rooms were kept in separate rooms, known as the light rooms, with glass between the light room and the magazines.

SOURCES FOR TABLES

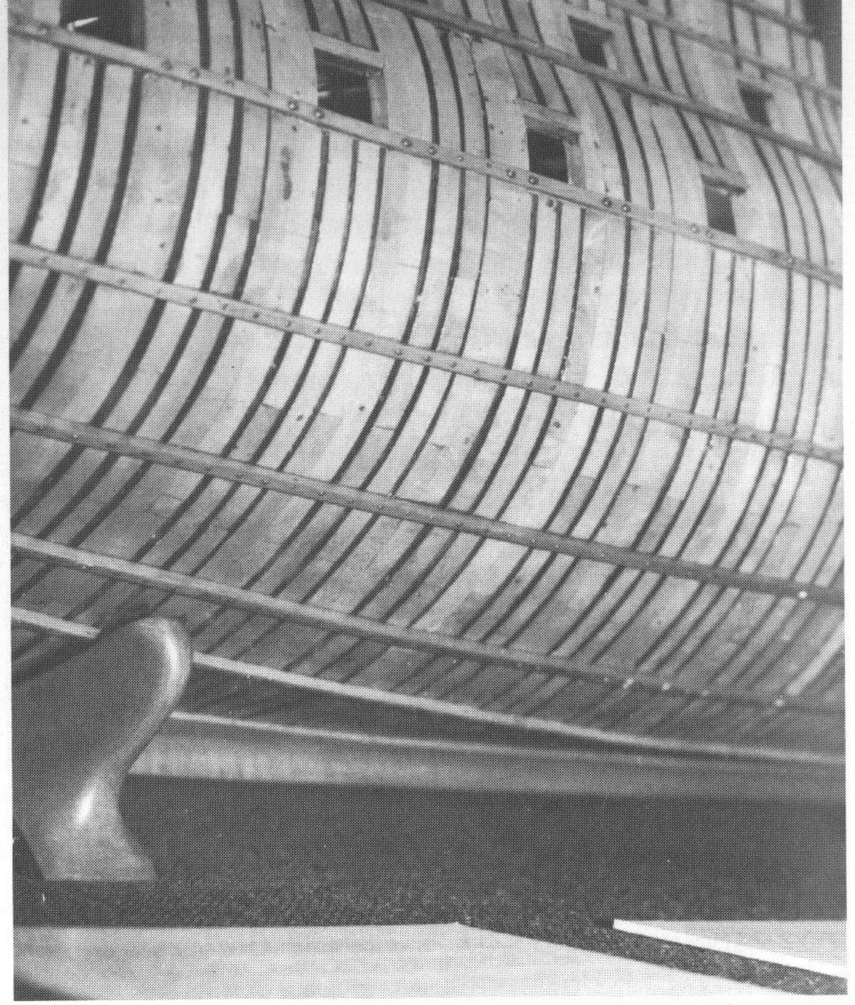
1. Ships similar to the *Bellona* - *Ship of the Line*, Vol 1
2. Sailing qualities - PRO Adm 95/33, 95/35
3. Maintenance history of the *Bellona* - Admiralty Progress Books, PRO Adm 180/2, 6, 10
4. Anchors and cables
   About 1775 - NMM RUSI/NM/86
   About 1800 - NMM SPB 15
   Cables and messenger - NMM SPB 15
5. Boats of a 74 gun ship
   About 1775 - NMM RUSI/NM/86
   In 1771 - PRO Adm 106/2508
   About 1800 - NMM SPB15
6. Officers and crew allotted 1766 - Admiralty Orders and Instructions, 1766
7. Crew on 14 August 1761 - PRO Adm 33/551
8. Weights and provisions 1760
   Weights on 19 April 1760 - PRO Adm 95/66
   Provisions on 24 April 1760 - PRO Adm 95/66
9. Dimensions of casks - NMM SPB 15
10. Dimensions of masts and yards for the *Dragon* - NMM Draughts, Ch 7/19
11. Rope for wolding masts - NMM SPB 15
12. Dimensions of caps and tops - NMM SPB 15
13. Sizes and lengths of shrouds - NMM SPB 15
14. Sizes and lengths of stays - NMM SPB 15
15. Dimensions of sails - NMM SPB 15
16. Sizes of bolt ropes - NMM SPB 15
17. Guns carried at various times - Various
18. Guns carried in 1761 - PRO Adm 106/3067
19. Guns aboard in 1812 - PRO Adm 160/54
20. Guns tackles in 1814 - Atkinson and Clarke, *Naval Pocket Gunner*, 1814
    List of captains - Mainly PRO Adm 8 series

The Photographs

2. The starboard side of the framed model, showing the unusual system of framing, with a curved frame under the forward edge of the upper deck ports, and a short frame under that.
Author

3. The coppered model of the *Bellona*. It probably represents the ship after her major repair of 1778–80, and it differs from the other model in many details. It was used by Charles Middleton, Comptroller of the Navy, to demonstrate the practice of copper sheathing to King George III in 1778.
National Maritime Museum

4. The stern of the coppered model, showing details of the carving and painting, and something of the copper sheathing.
National Maritime Museum



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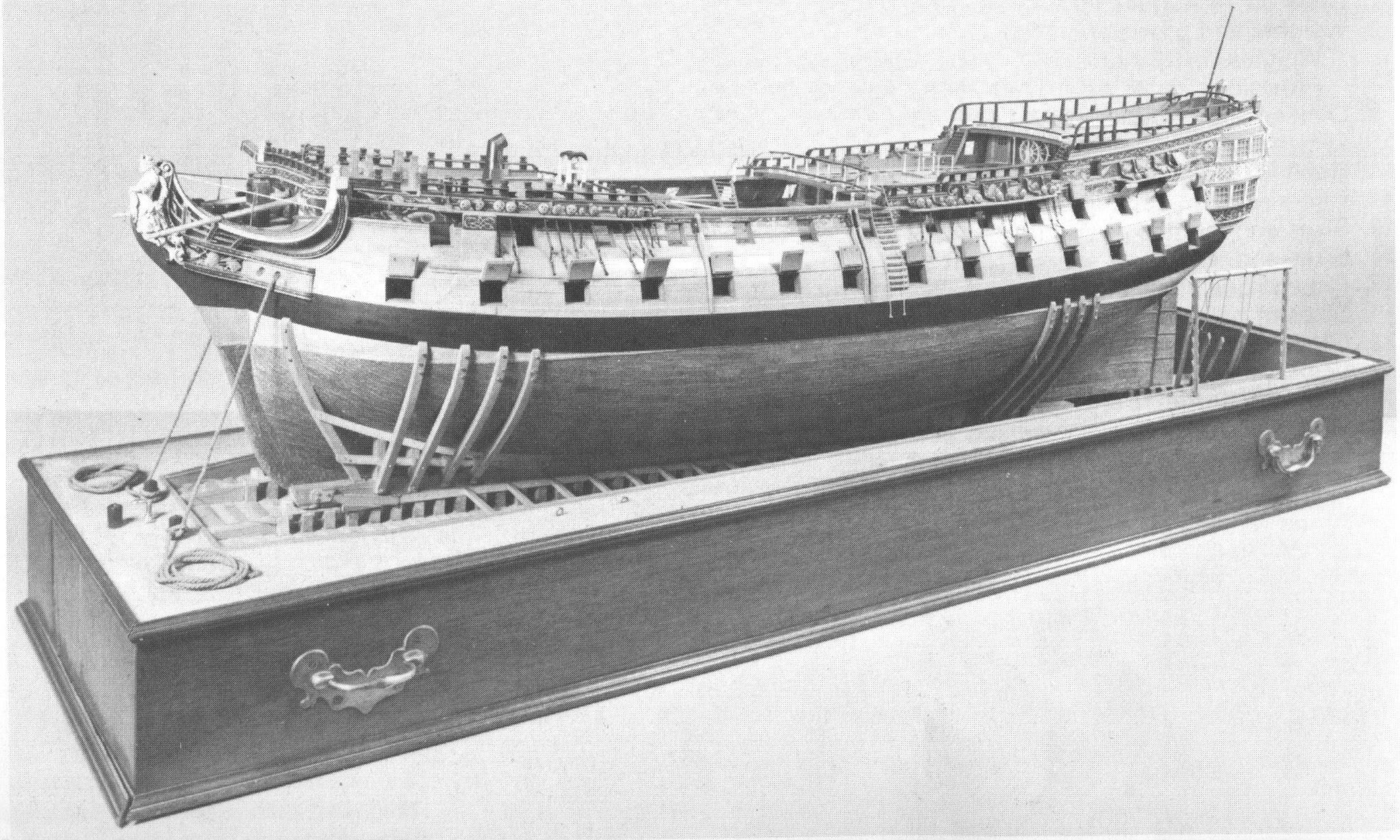

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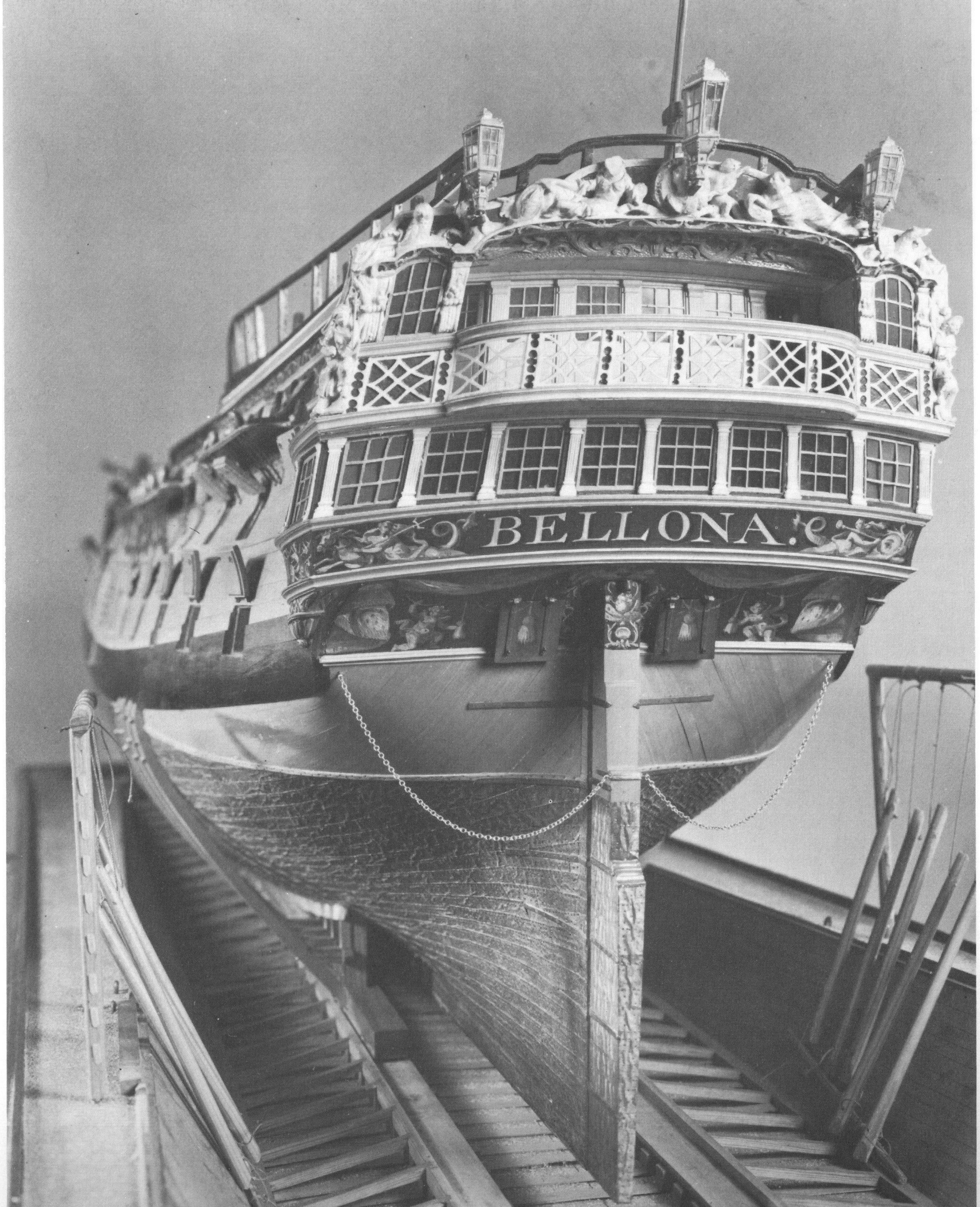
BELLONA.

similar in most respects, and the rigging would have been virtually identical.
National Maritime Museum

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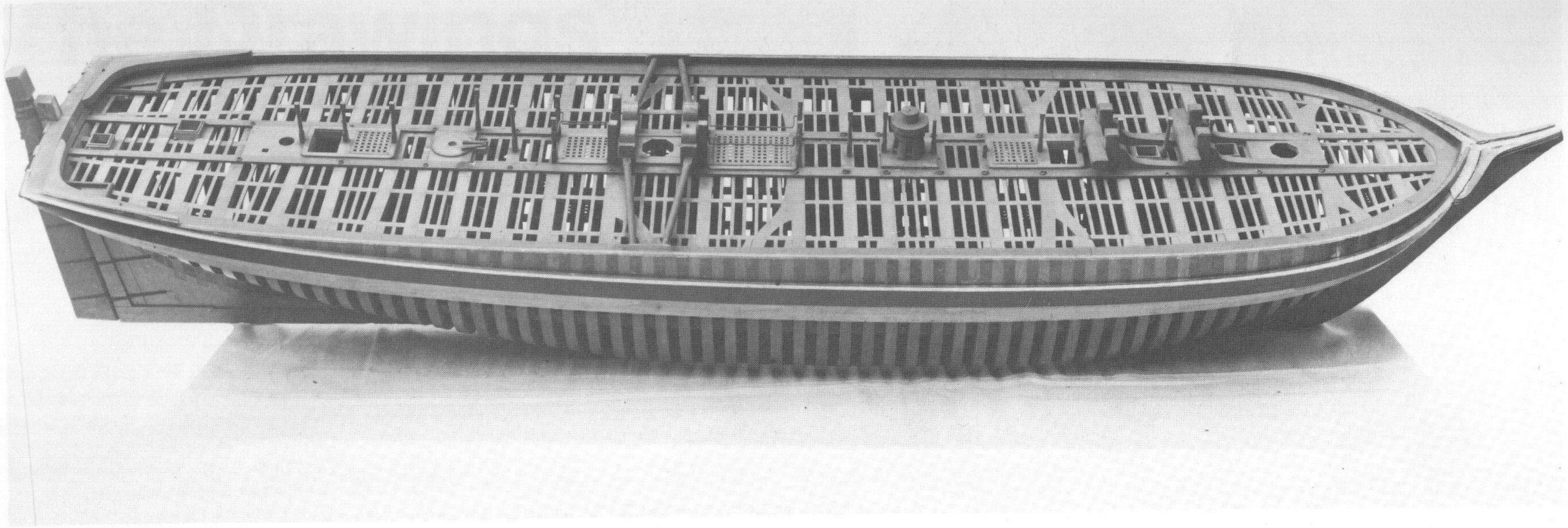

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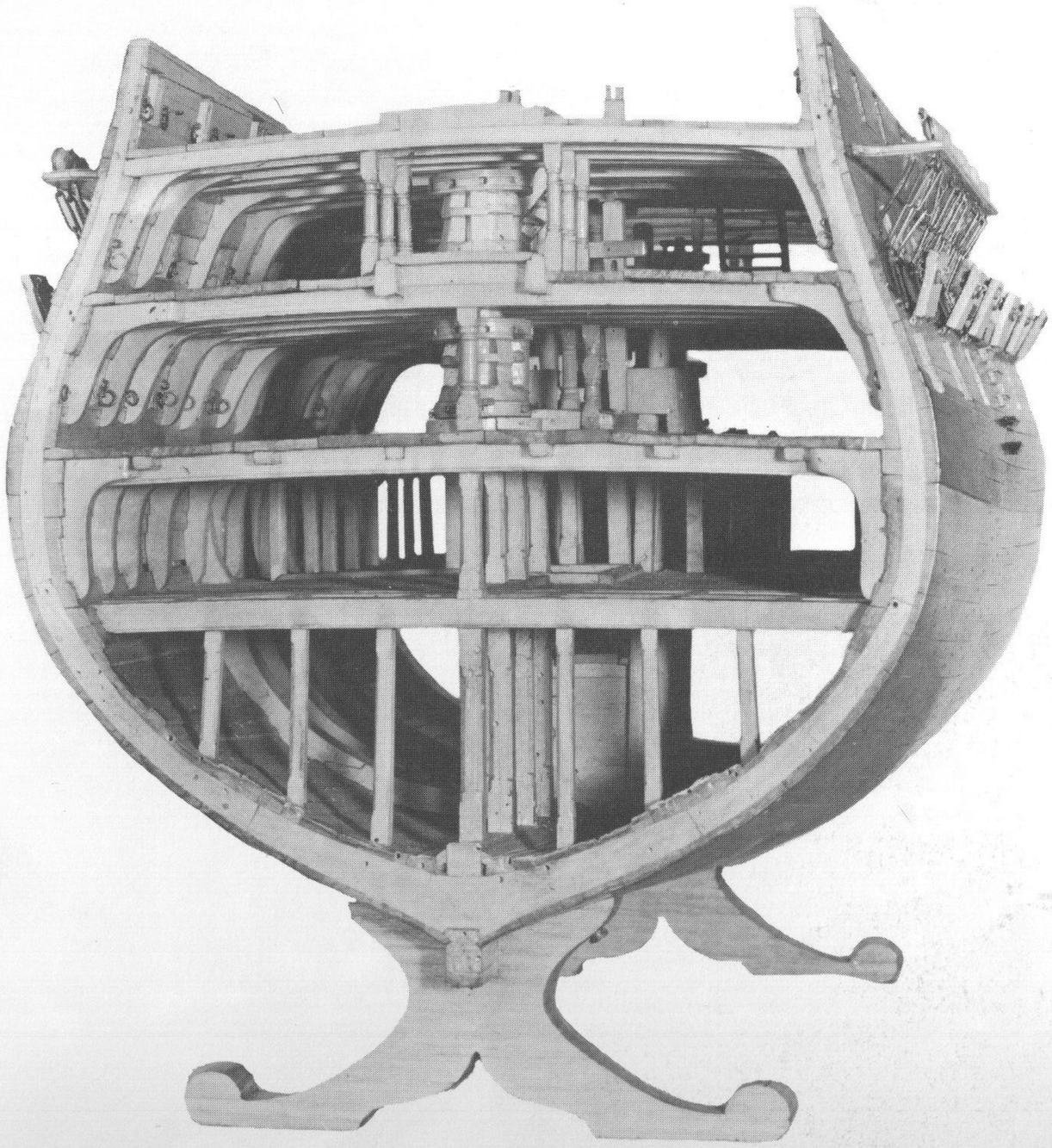


6. A model showing the lower deck of the *Ajax* of 1767. It shows the structure of the deck, as well as the pumps, riding bitts, and the fore jeer capstan. The main capstan is not shown, though there is a place for it aft of the pumps, and its pawls are in position.
Science Museum

7. A model showing a midship section of a 74-gun ship, here seen from about halfway between midships and the stern, looking towards midships. It shows the capstans, knees, and pillars.
Science Museum

(Page 28)

8. Above: The *Bellona* returning home after capturing the Dutch ship *Princess Caroline* in 1780.
National Maritime Museum.

9. Below: The Battle of Copenhagen in 1801. The *Bellona* is the foremost of the two large ships on the extreme left. She is aground on the Middle Ground shoal, and was unable to take part in the action.
National Maritime Museum

The Drawings

SOURCES FOR THE DRAWINGS

It is necessary to look at many different sources for a book of this nature. Shipwrights of the eighteenth century did not always record their methods in detail, and it is often by chance that we can find out useful information. On the other hand, many writers of this period published books aimed at the growing numbers of men aspiring to become naval officers, and others published books on ship design, though they were not always concerned with matters of detail. Such writers include Falconer, Burney, Steel, Rees and D'Arcy Lever. To some extent all these have been useful in this work.

Nevertheless, the main sources are to be found in the National Maritime Museum. The most important, of course, are the official Admiralty plans at present kept in the Draught Room. Those of the *Bellona* herself include lines, profile, longitudinal section, and deck plans. These are rather basic, and need to be supplemented by much other information. Various other plans show small details, and a particularly useful one is that for the *Dorsetshire* of 1757. She was a slightly smaller ship than the *Bellona*, but her plans are very detailed, and give much information on fittings. There are also many plans of boats and other fittings in the collection, though many of them date from the end of the eighteenth century or later, and are not always relevant to the *Bellona* as first built.

The other important source in the National Maritime Museum is the two models of the *Bellona*. One shows her in frame, while the other shows her completed, and coppered as she was to be in 1780. There are many detailed discrepancies between the two models, and it seems likely that the coppered model was built around 1778, when the ship was undergoing major repair. I have therefore considered the framed model to be the more reliable, since she probably shows the ship as she was originally built.

Two manuscript sources were particularly useful. The contract for the *Bombay Castle* of 1782 (also in the Draught Room) gives a vast amount of detail about the structure and scantlings of a ship which was almost identical to the *Bellona* in these respects. SPB 15, in the Manuscripts Department, gives much information, especially on rigging. I have also used many other documents in the National Maritime Museum, Public Record office, and other libraries, and interested readers are directed to the Notes and Bibliography of my book *The Ship of the Line* for further references.

Several later works have also proved useful. Fincham's *Outline of Shipbuilding*, though written in 1851, often gives details of earlier practices. Two modern works on the *Victory*, a near contemporary of the *Bellona*, are also helpful. These are *The Anatomy of Nelson's Ships* by C Nepean Longridge, and *HMS Victory: Rigging, Restoration and Repair* by A R Bugler. Finally, James Lees' *The Masting and Rigging of English Ships of War, 1625 to 1860*, has proved extremely valuable and, as far as I have been able to determine, very accurate.

SCALES

Like most Admiralty draughts of the period, *Bellona's* was drawn to a scale of $\frac{1}{48}$ (ie $\frac{1}{4}$in = 1ft). Therefore this scale and multiples thereof have been adopted for this book, the principal general arrangements being 1/192 or $\frac{1}{16}$ = 1ft.

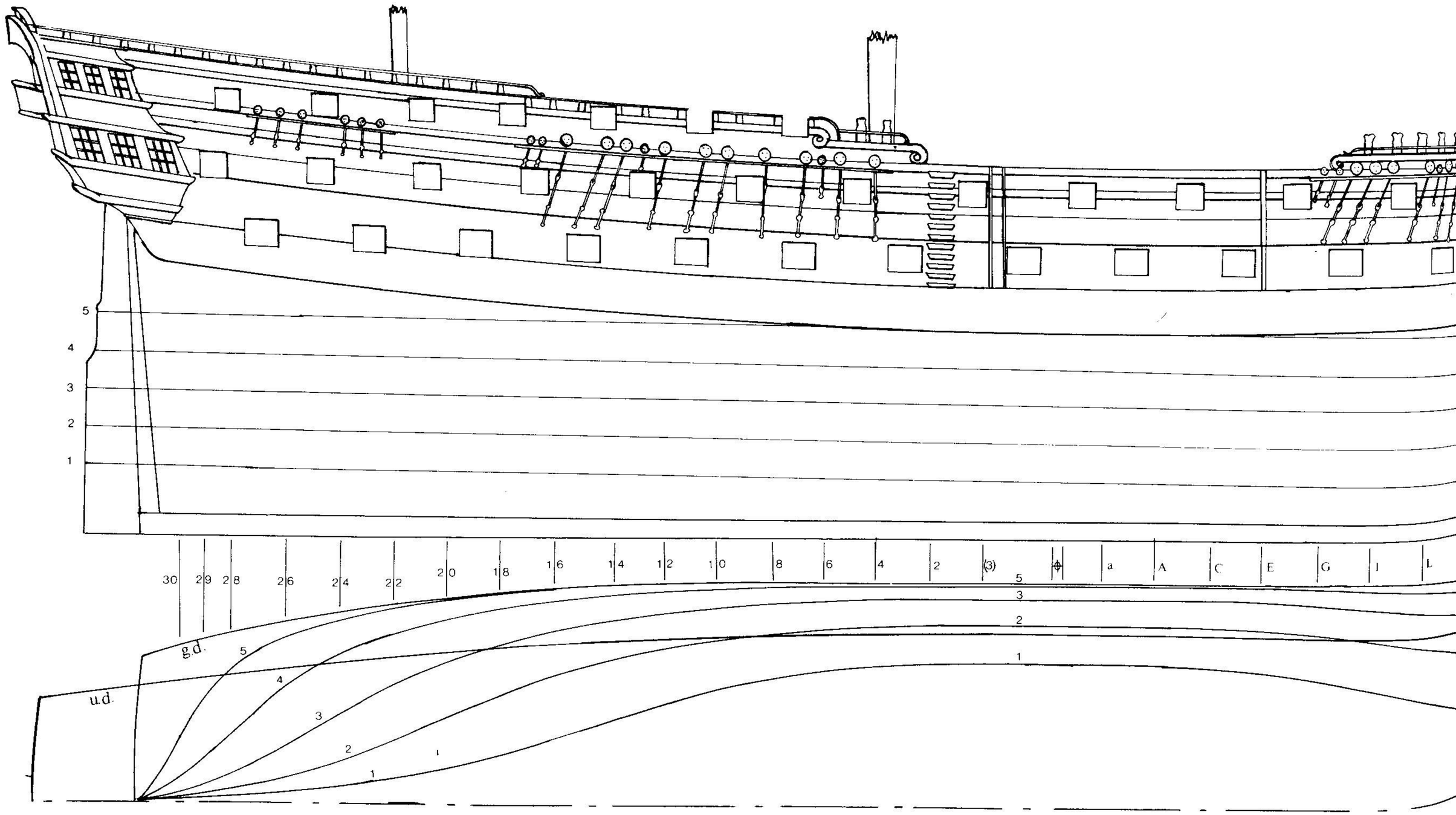
A General Arrangements

A1 SHEER AND HALF-BREADTH PLAN (1/192 scale)

A1/1 Sheer elevation

A1/2 Half-breadth plan showing waterlines

A2 BODY PLAN (1/96 scale)



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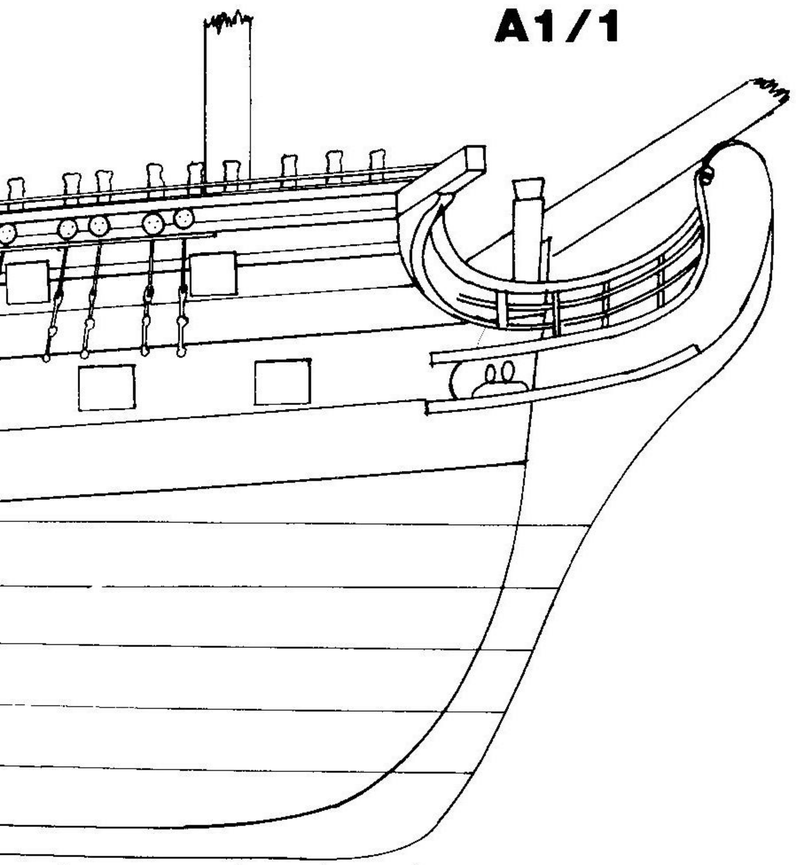

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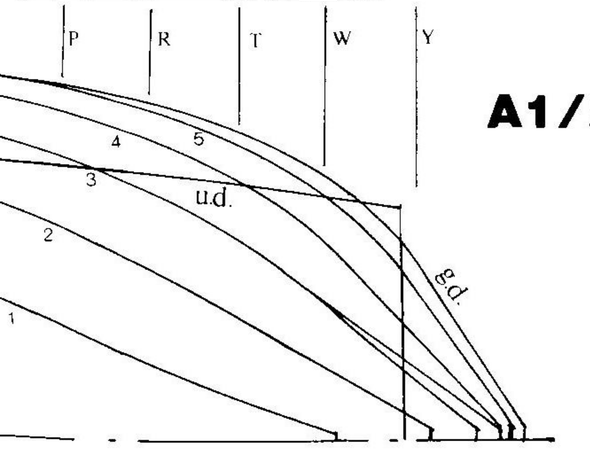
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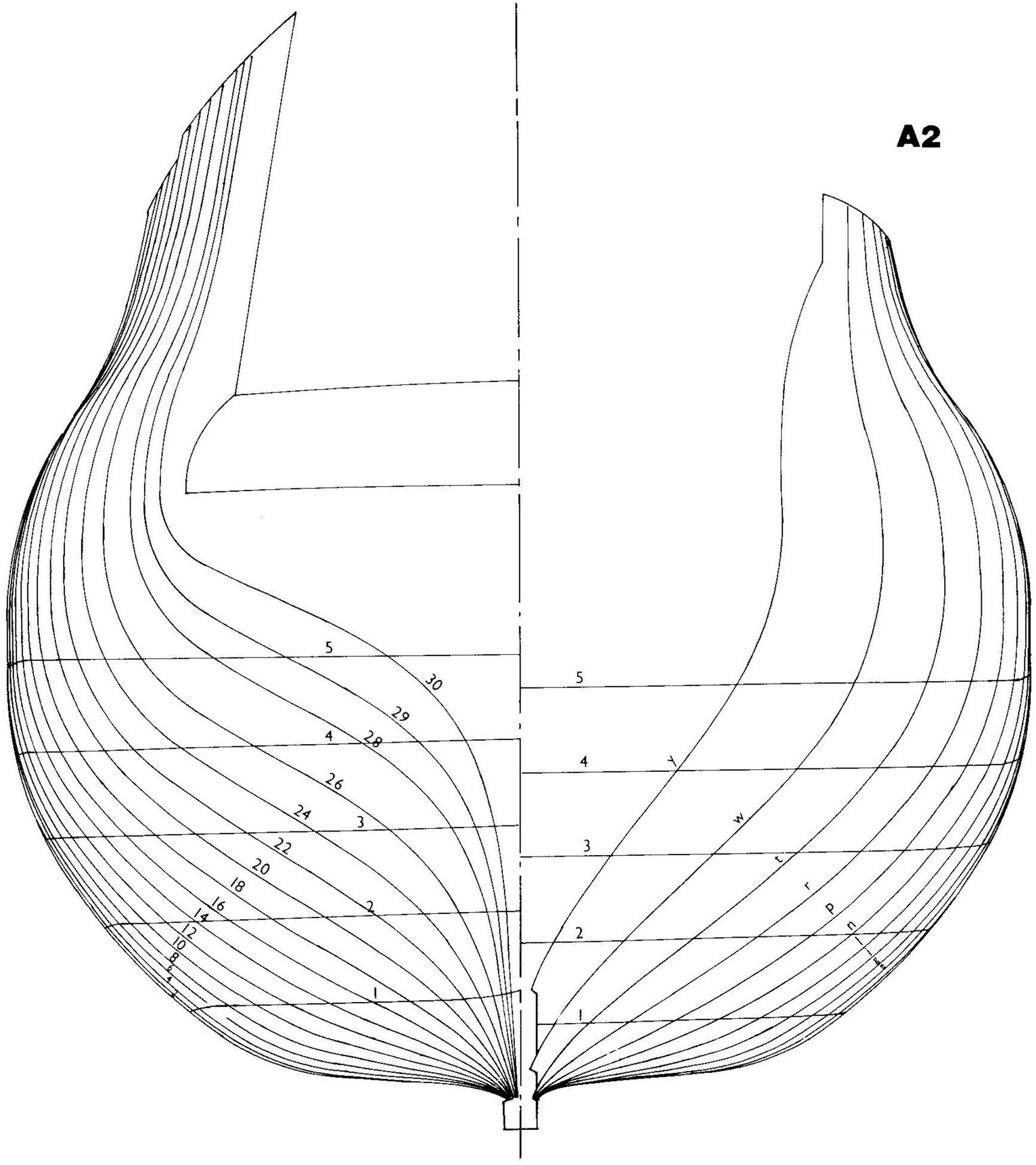
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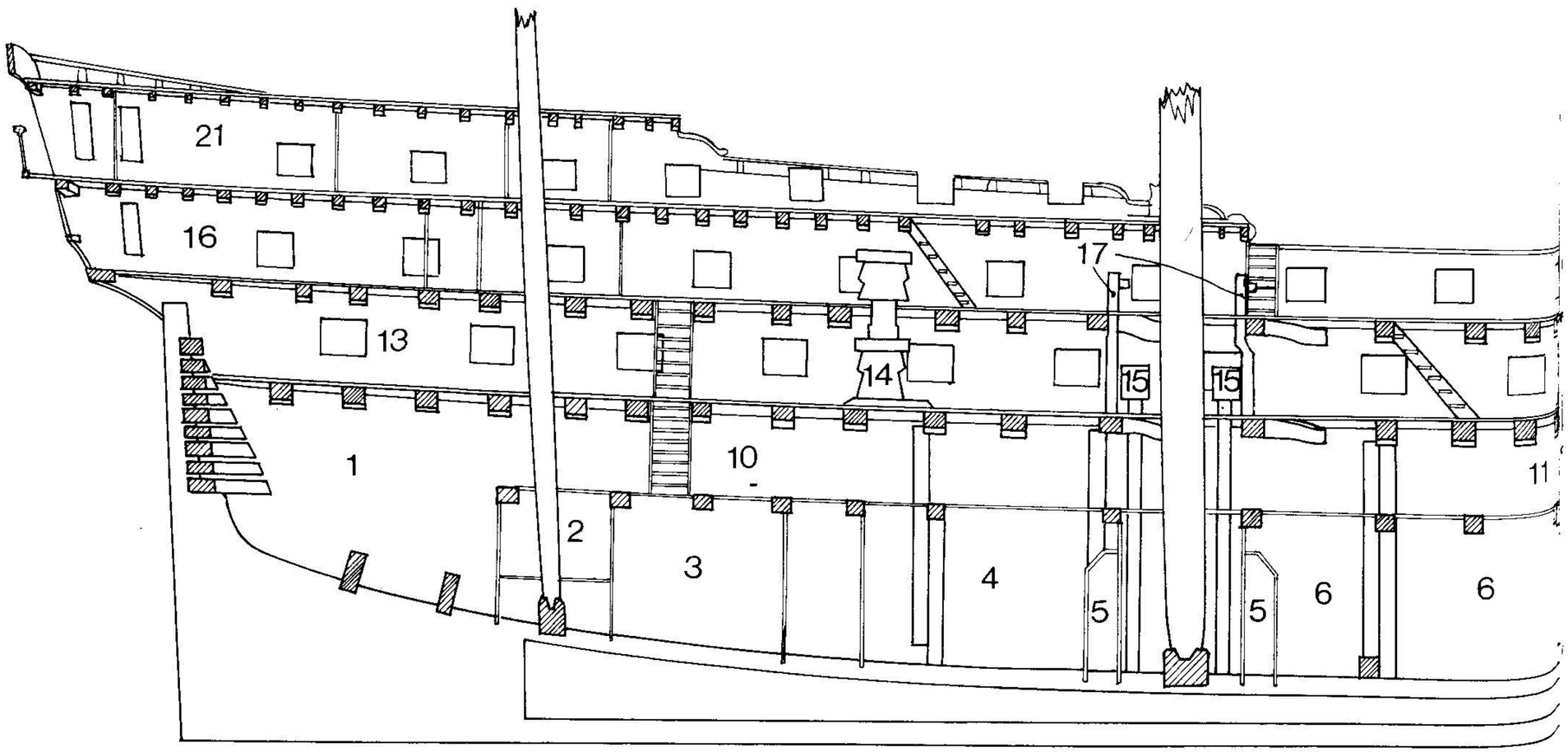
A General arrangements

A3 LONGITUDINAL SECTION (1/192 scale)

1. Bread room
2. Powder room
3. Spirit room
4. After hold
5. Shot lockers
6. Main hold
7. Main magazine
8. Filling room
9. Light room
10. After cockpit
11. Sail rooms
12. Carpenter's, gunner's, and boatswain's store rooms
13. Gun room
14. Main capstan
15. Pumps
16. Wardroom
17. Jeer bitts
18. Fore jeer capstan
19. Fire hearth
20. Jeer bitts
21. Captain's cabin



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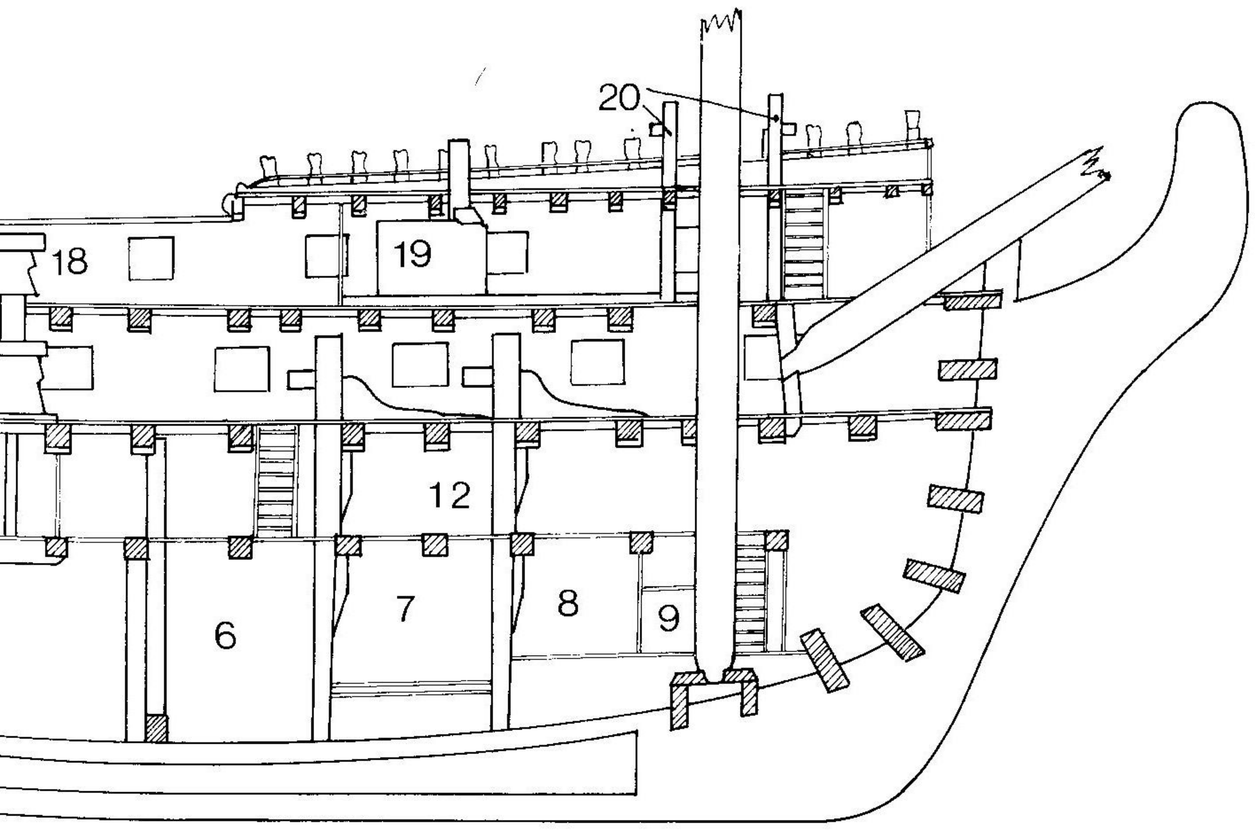


B1 KEEL, STEM AND STERN ASSEMBLY (1/192 scale)

B1/1 Profile

B1/2 Plan

1. Keel, 18in square in midships, 14in wide at bows, 12½in at stern
2. False keel, 7in deep
3. Scarphs
4. Rabbet, to take edge of planking
5. Deadwood under midship frames, 8in deep
6. Kelson, 18in square, recessed 1in to take floor timbers

B2 SCARPHS OF KEEL AND FALSE KEEL (no scale)

1. Keel
2. Rabbet, 3in deep
3. Scarph of keel, in vertical plane
4. Table of scarph
5. Coak of scarph
6. White flannel or kersey
7. Eight bolts of 1¼in diameter for keel scarph
8. False keel, 7in deep
9. Scarph of false keel, arranged not to coincide with scarph of main keel
10. Nails to fix false keel to main keel
11. Staples, as alternative to nails
12. Hair and tar composition on upper surface of false keel, to make it unnecessary to remove false keel for re-sheathing, etc

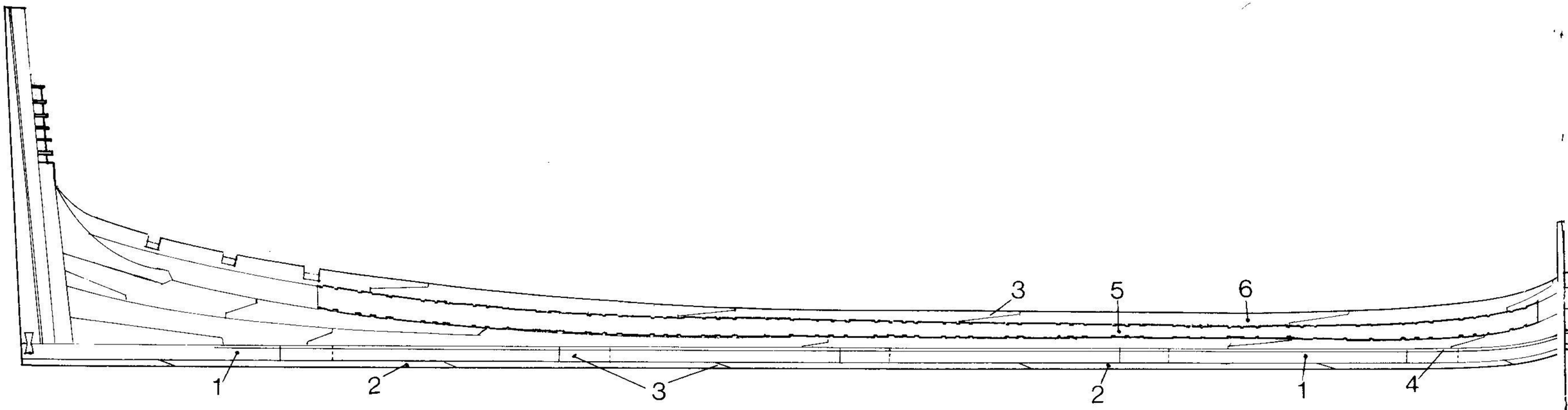
B3 STEMPOST AND KNEE OF HEAD (1/96 scale)

B3/1 Profile

B3/2 End view

1. Keel
2. False keel
3. Stempost (3 pieces)
4. Kelson
5. Apron or false stem, 11in thick
6. Gripe
7. Main piece
8. Bobstay piece
9. Knee of the head
10. Gammoning piece
11. Deadwood
12. Lacing
13. Rabbets
14. Gammoning hole
15. Bobstay holes
16. Seat of the figure
17. Lacing to the figure
18. Stemson
19. Recesses for deck and breast hooks
20. Front view

B1/1



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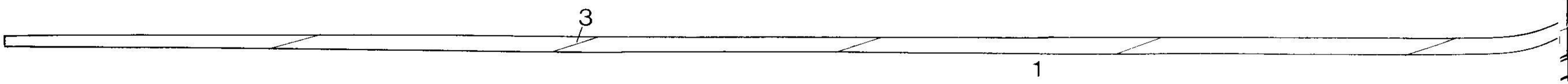

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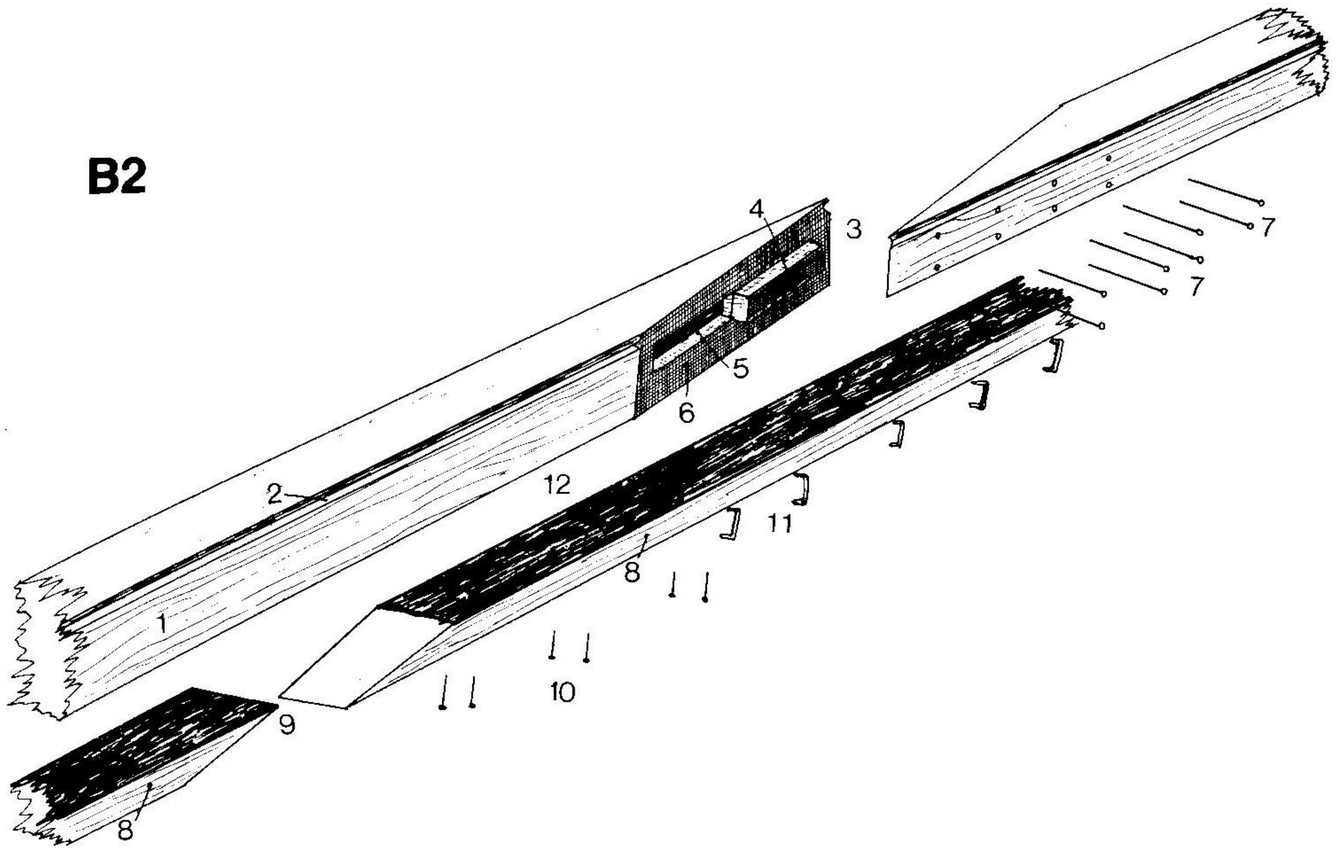
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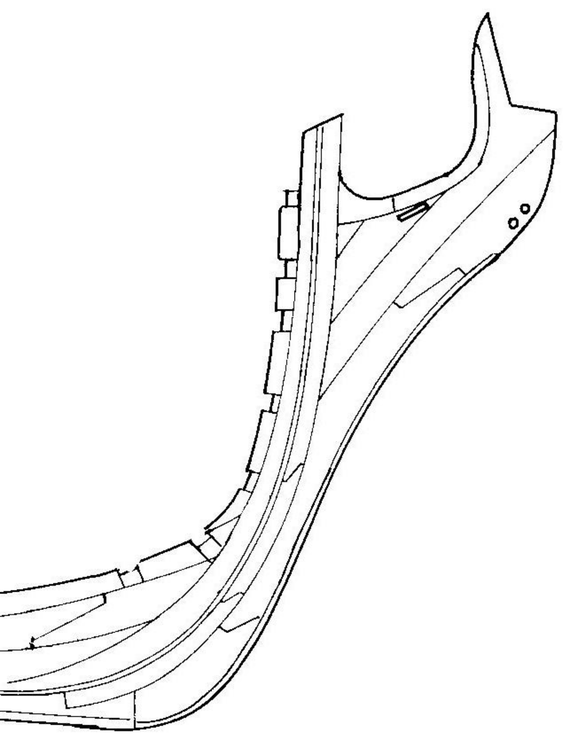

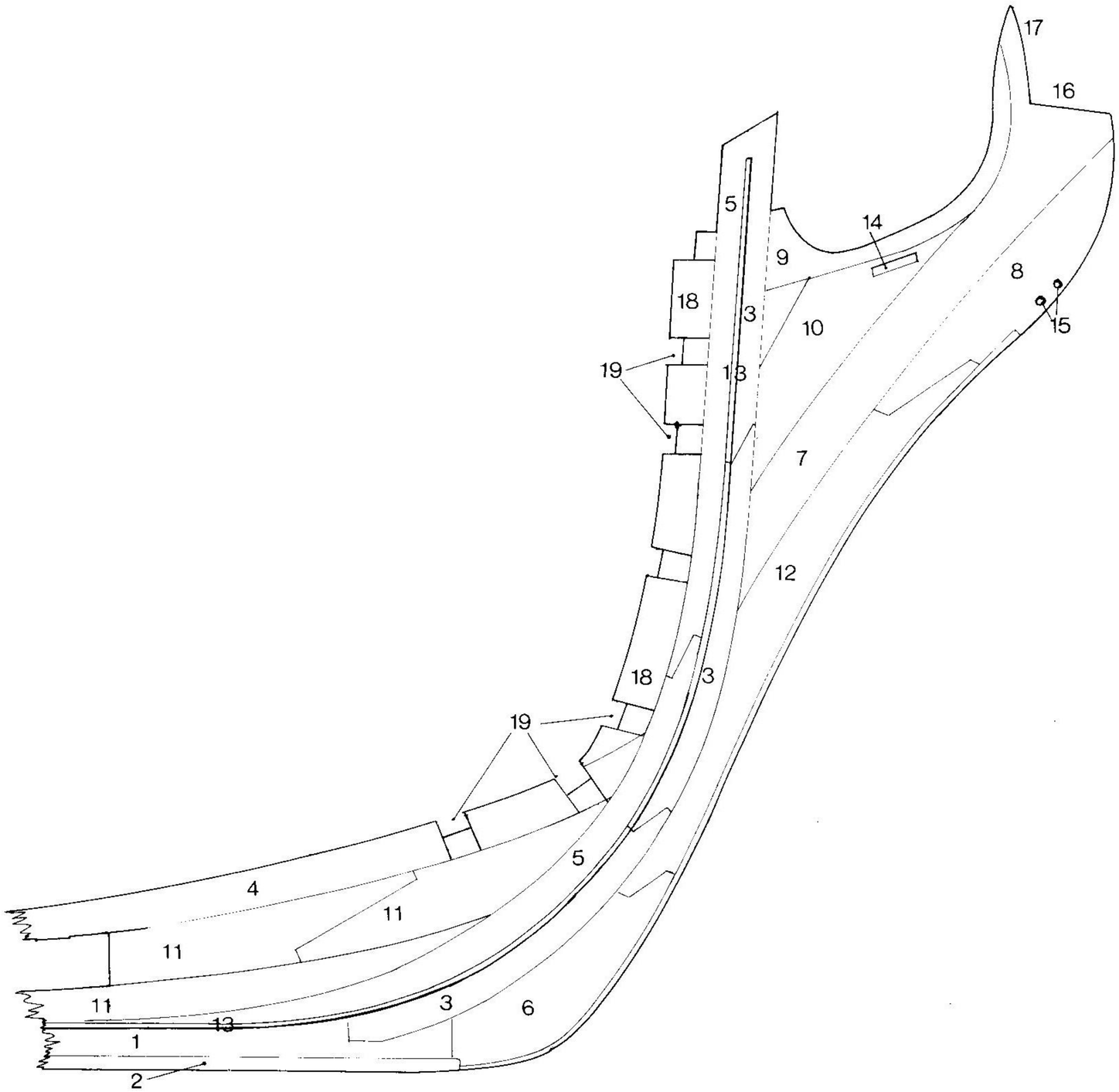
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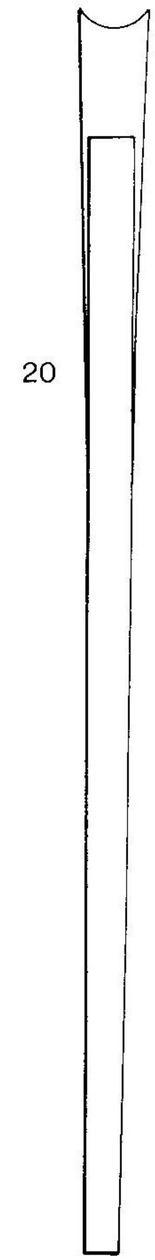
B3/2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B Hull construction

B4 SYSTEM OF SCARPHING STEM AND APRON (based on Fincham's 'Outline of Shipbuilding'. No scale)

1. Apron, upper piece
2. Apron, lower piece
3. Scarph
4. Stem, upper piece
5. Scarph
6. Stem, middle piece
7. Stem, lower piece
8. Boxing scarph
9. Forefoot

B5 DETAILS OF FOREFOOT

1. Keel
2. Stempost
3. Horseshoe plate

B6 KEEL - STERNPOST - DEADWOOD ASSEMBLY (1/96 scale)

B6/1 Profile

B6/2 End view

1. Keel
2. False keel
3. Sternpost
4. Rabbet
5. Dovetail plate
6. Inner post
7. Recesses for transoms
8. Kelson
9. Scarph
10. Recesses for crutches and mast step
11. Deadwood knee
12. Deadwood

B7 TENON JOINING STERNPOST TO KEEL (1/96 scale)

B8 ASSEMBLY OF TYPICAL MIDSHIPS FRAME (no scale)

B8/1 Exploded view

B8/2 Frame assembled

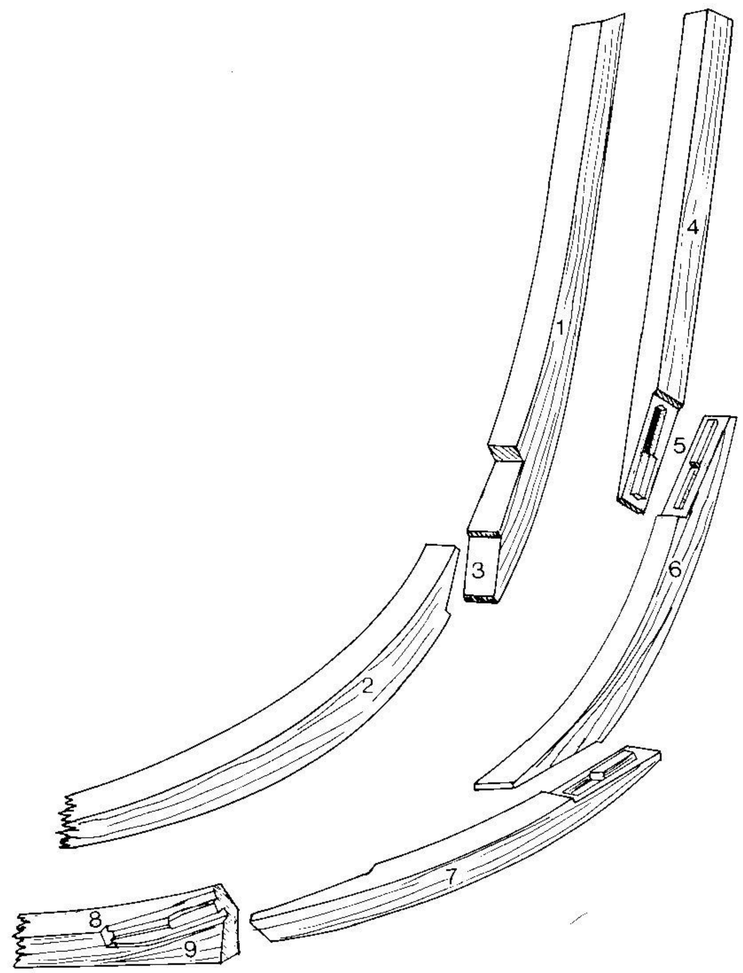
1. Keel
2. Floor timber
3. First futtock
4. Second futtock
5. Third futtock
6. Fourth futtock
7. Toptimbers
8. Triangular chocks, to give scarph to frame joints
9. Chocks between frames

B9 METHOD OF MOUNTING FRAMES ON KEEL IN MIDSHIPS (no scale)

B9/1 Exploded view

B9/2 Frame - keel assembly

1. Keel
2. Deadwood
3. Floor timber
4. First futtock
5. Chock



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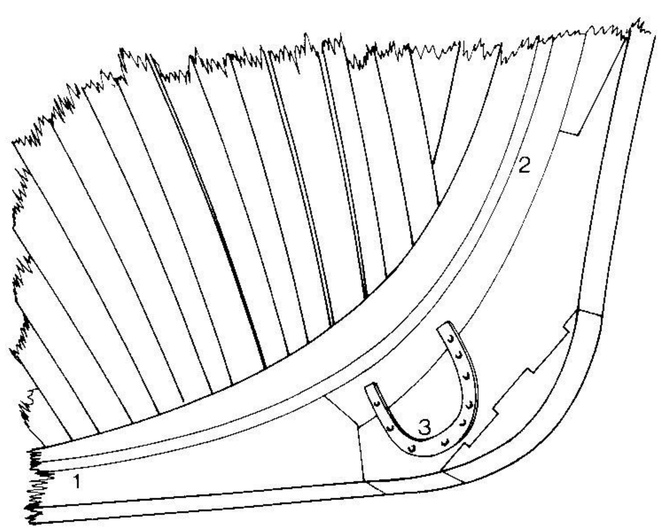

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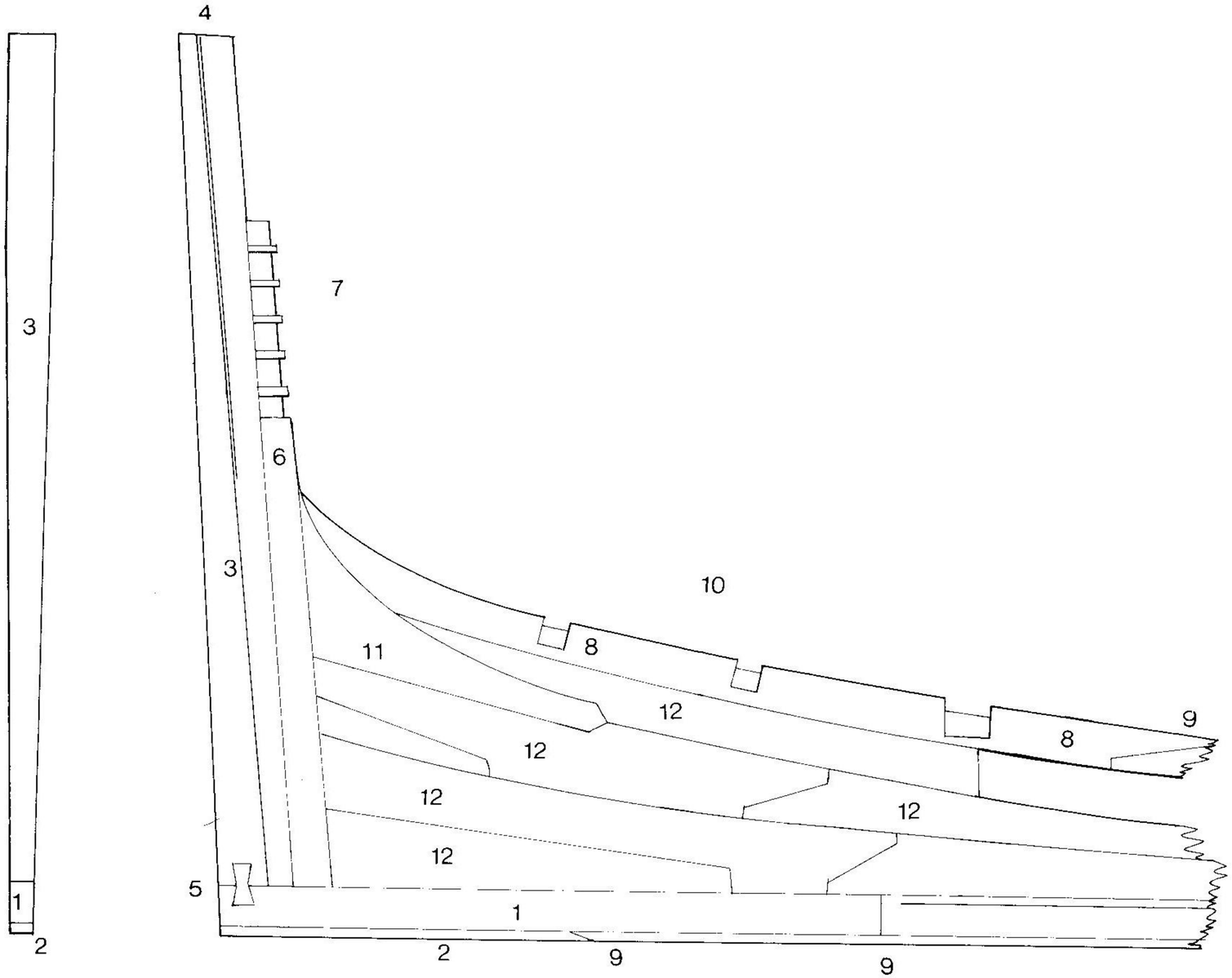

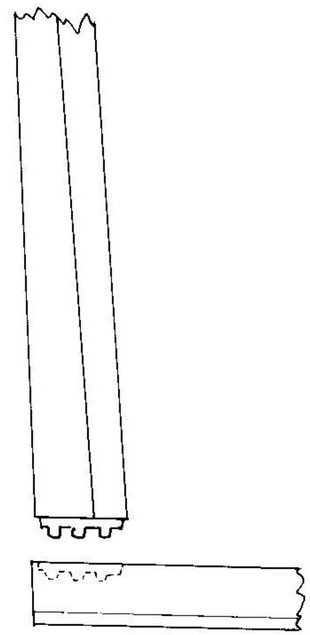

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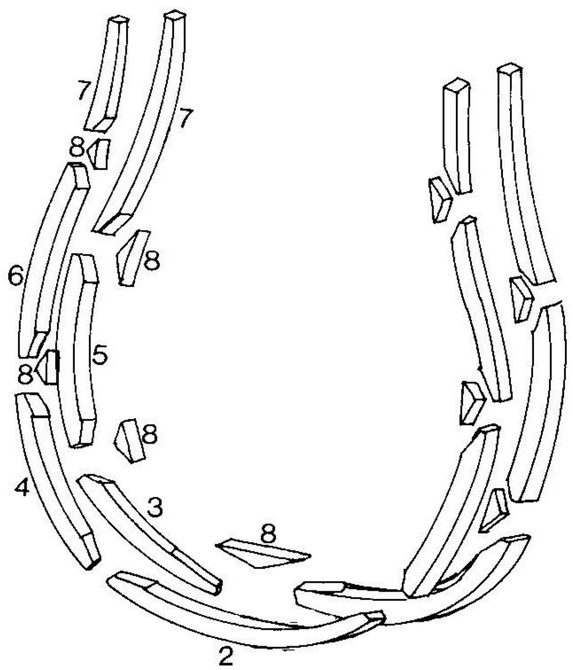

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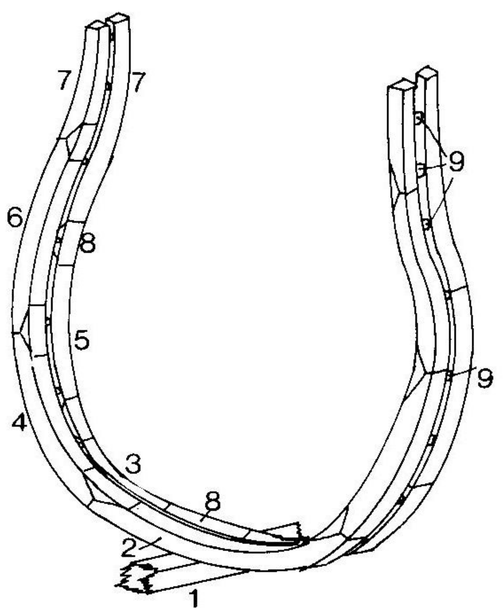

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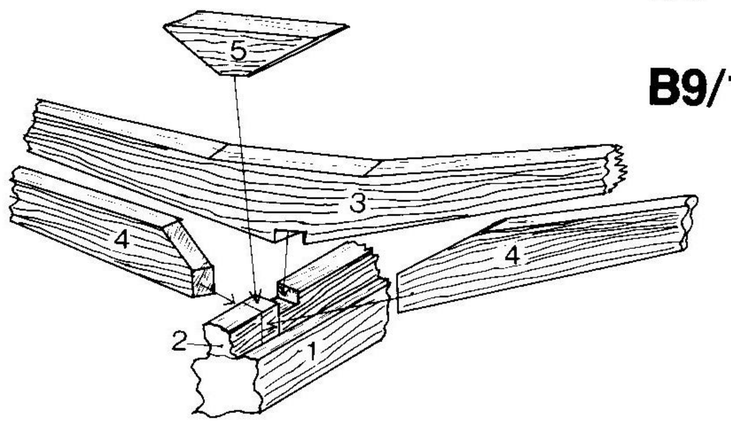

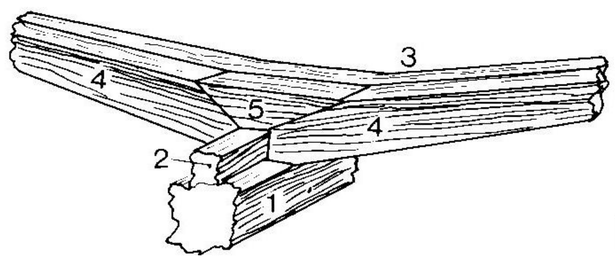

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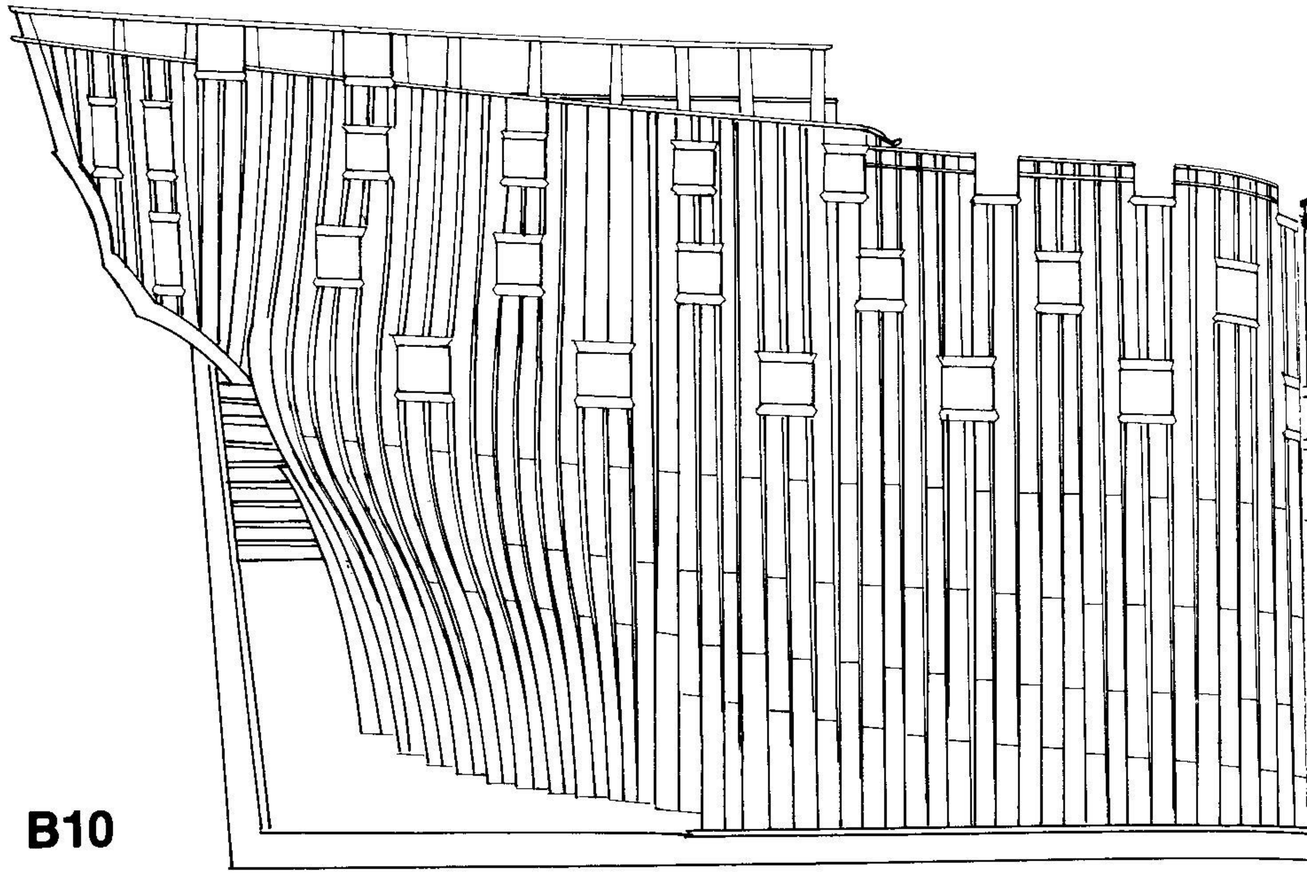
B Hull construction

B10 STANDARD SYSTEM OF FRAMING, AS USED FOR SHIPS OF THE LINE (based on the 'Elephant' of 1785 – 'Arrogant' class. 1/192 scale)

B11 CONVENTIONAL SYSTEM OF FRAMING, IN MIDSHIPS (1/96 scale)

1. Keel
2. Pair of frames, making complete unit
3. Gunport cills, 7½in deep on gundeck, 6½in on upper deck
4. Recesses for port cills
5. Filling frames below gunports
6. Floor timbers, 14in to 15½in wide at foot, 13½in square at head
7. First futtock, 15in to 14in wide at foot, 12⅞in square at head
8. Second futtock, 14¼in to 13¾in wide at foot
9. Third futtock, 13¾in wide at foot, 11⅝in × 11½in at head
10. Fourth futtock, 13½in wide at foot
11. Long toptimbers, 13¼in at foot, 12in at head
12. Short toptimbers, 12in at head
13. Chocks between frames
14. Room and space, 2ft 8½in distance between the edge of one frame and the corresponding edge on the next



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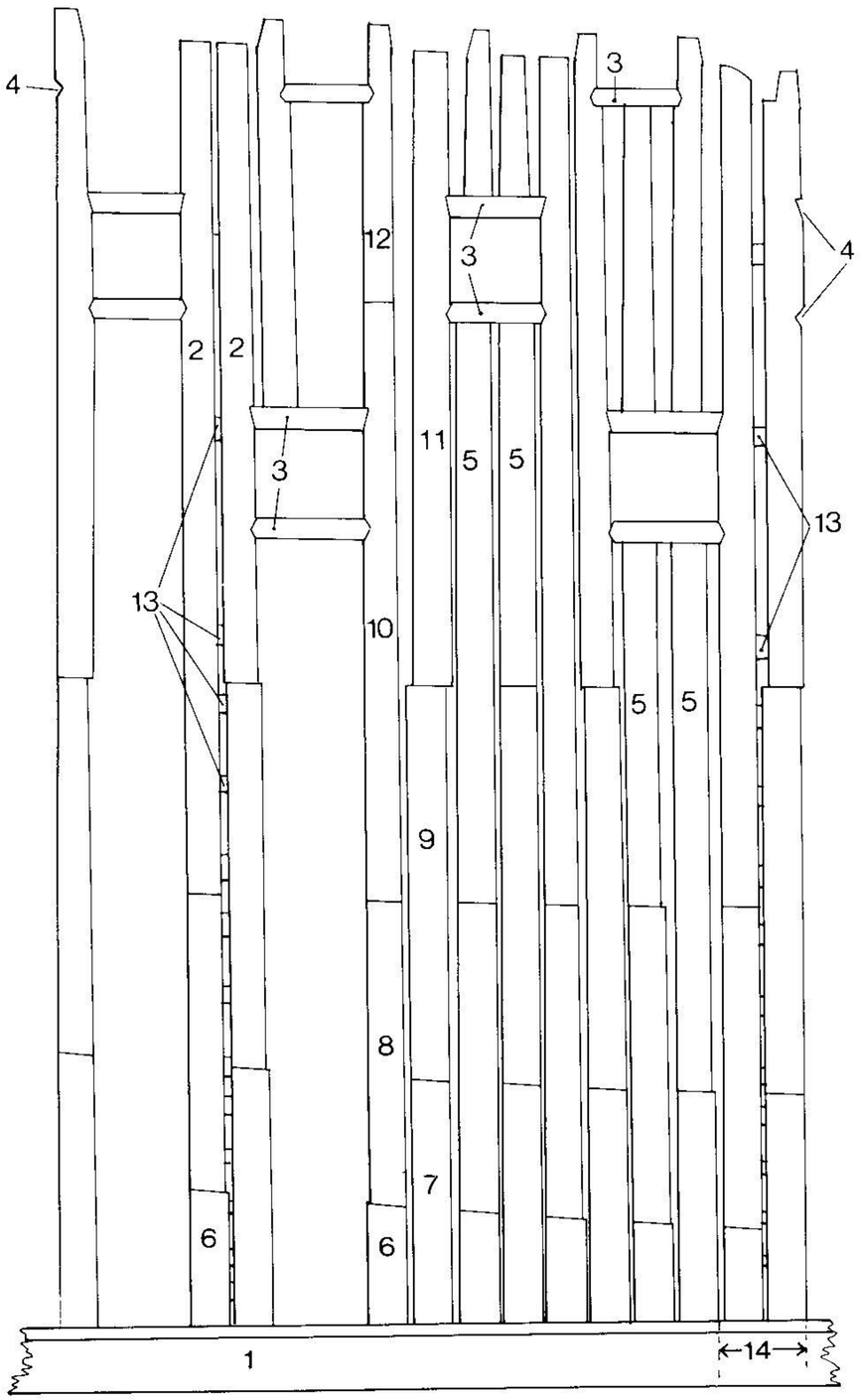

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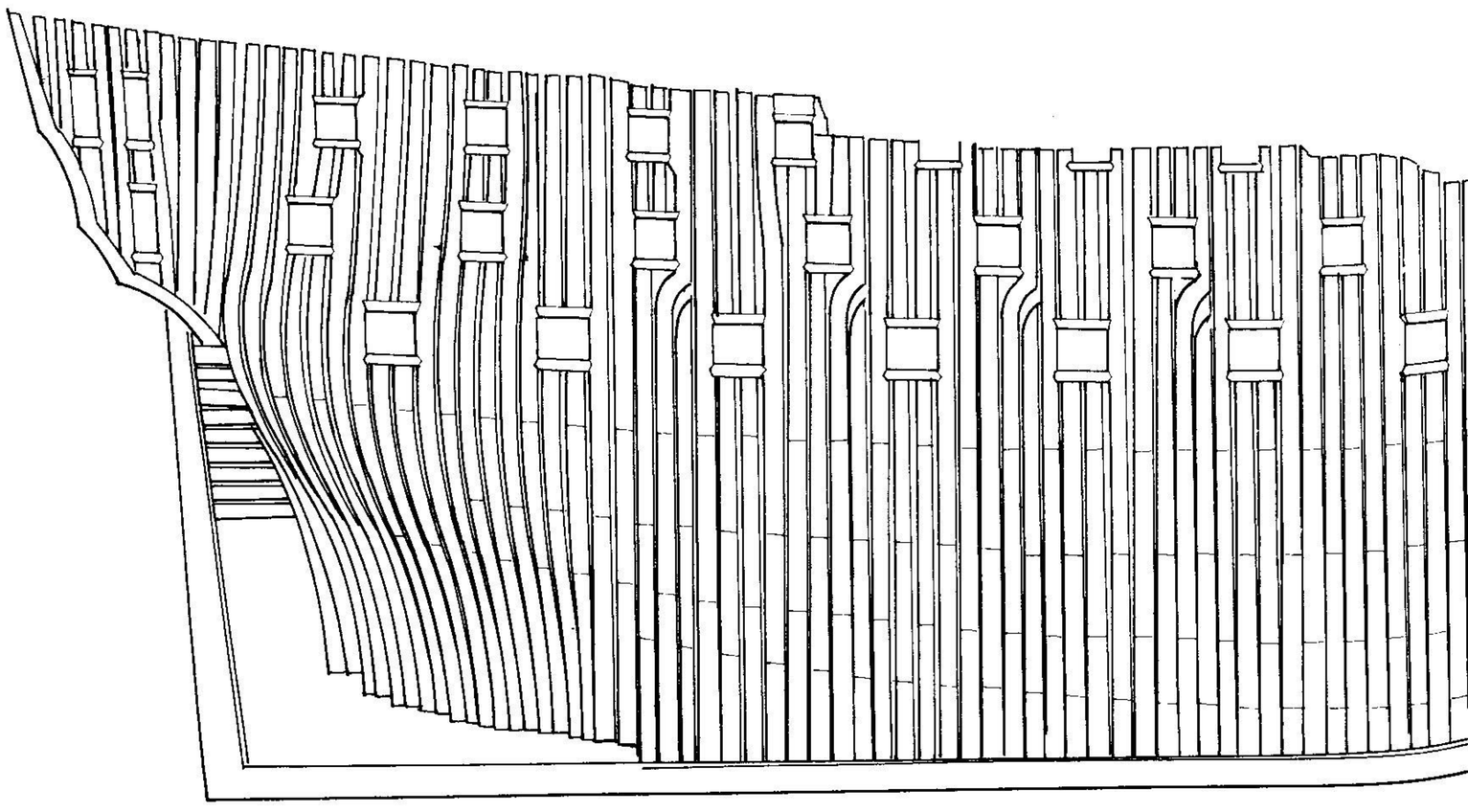
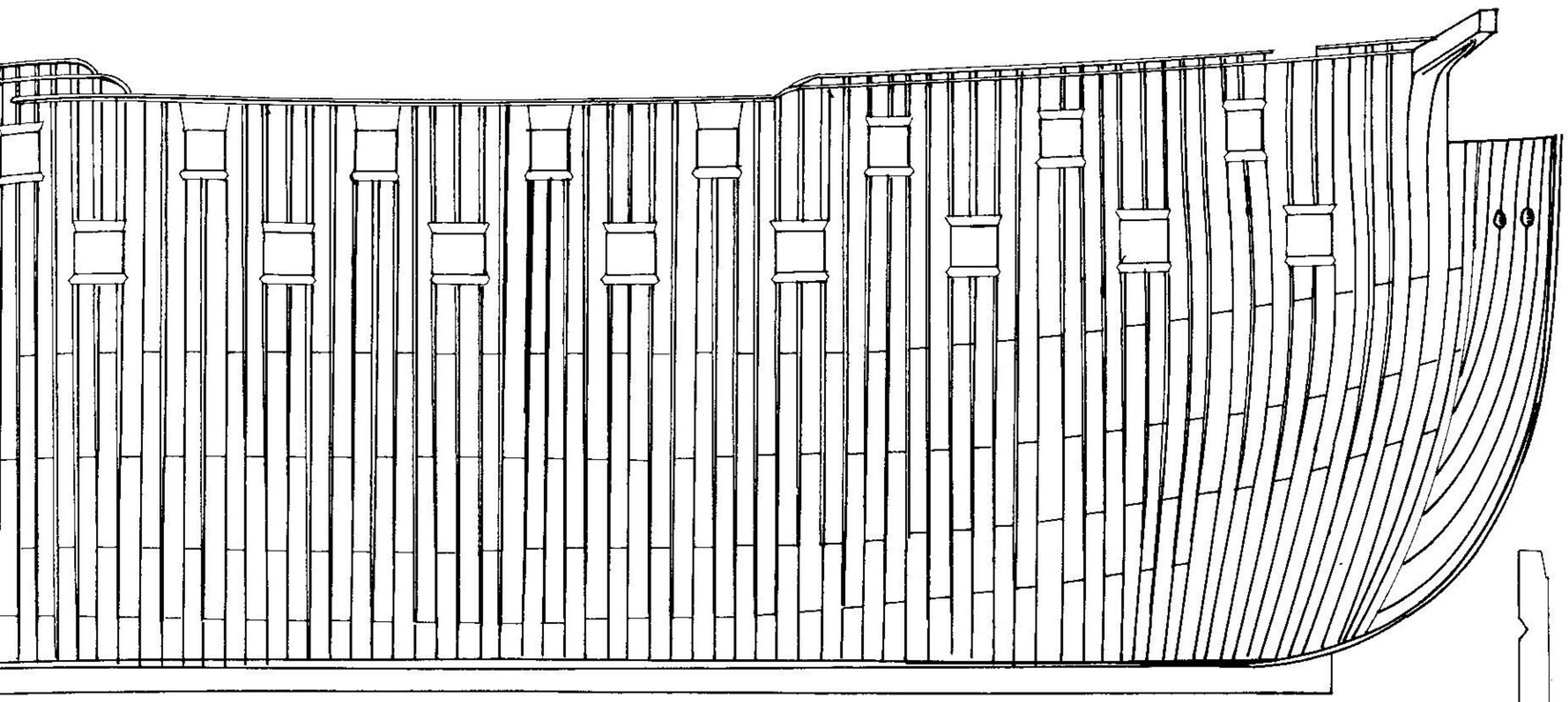
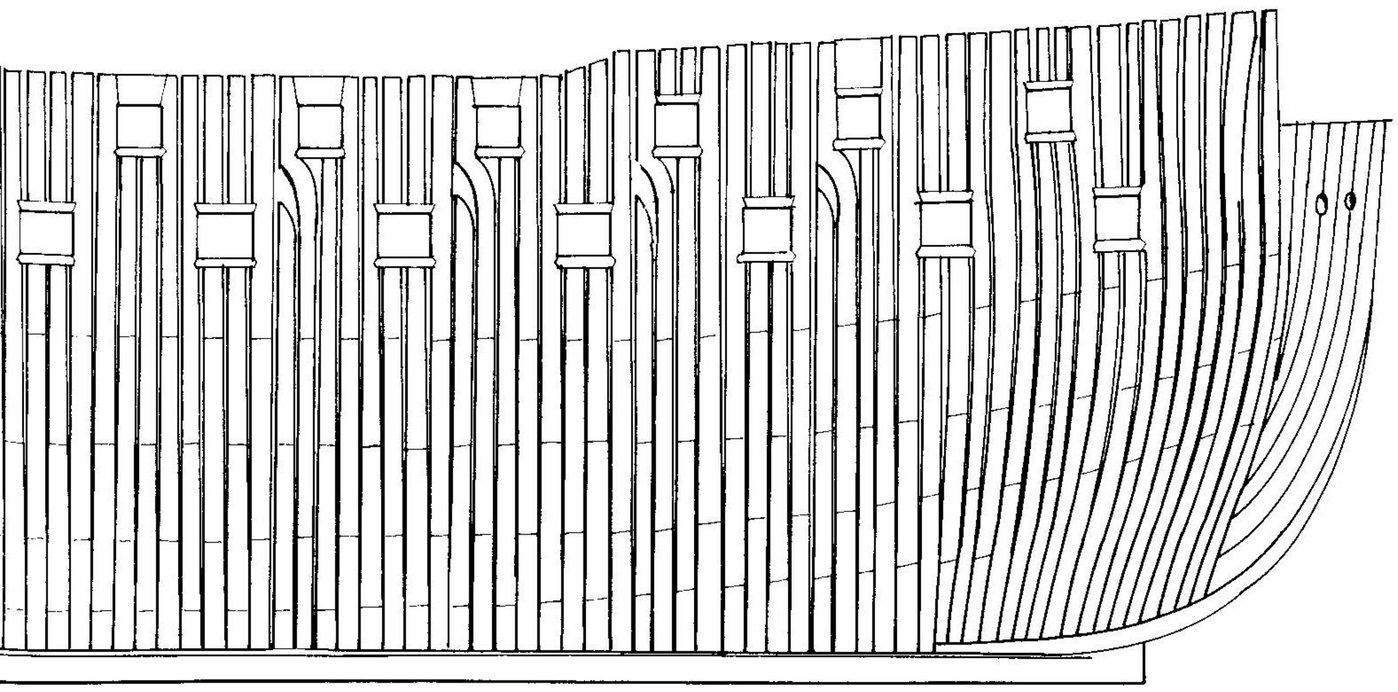


B12 SYSTEM OF FRAMING USED ON THE 'BELLONA' MODEL, AND ON A FEW OTHER SHIPS OF THE LINE (1/192 scale)



B13 DETAILS OF FRAMES ON 'BELLONA' MODEL (1/96 scale)

1. Keel
2. Straight frames forming sides of gunports
3. Curved frames forming sides of gunports
4. Recesses for port cills
5. Port cills
6. Short frames under gunports
7. Short frames under curved frames



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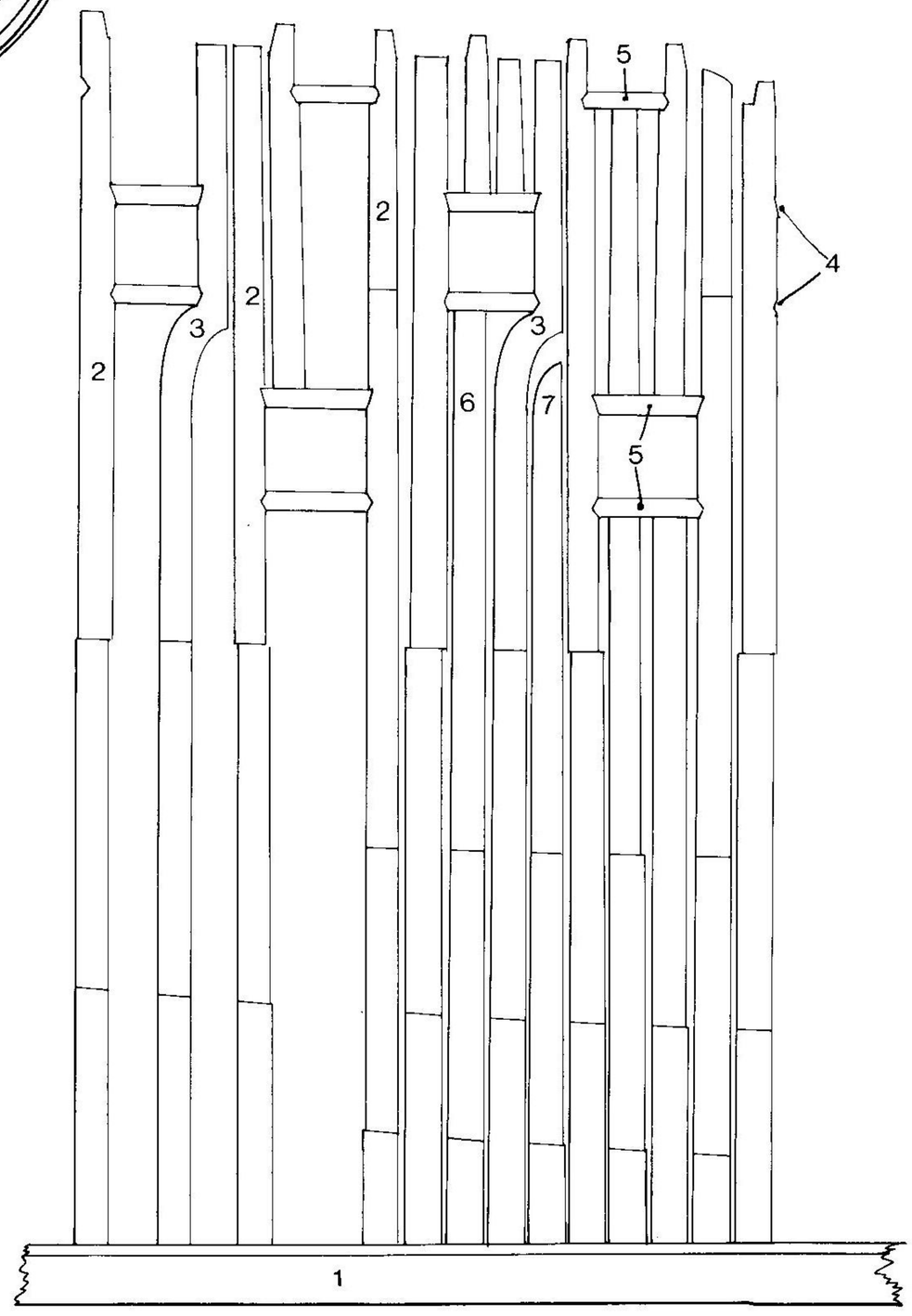
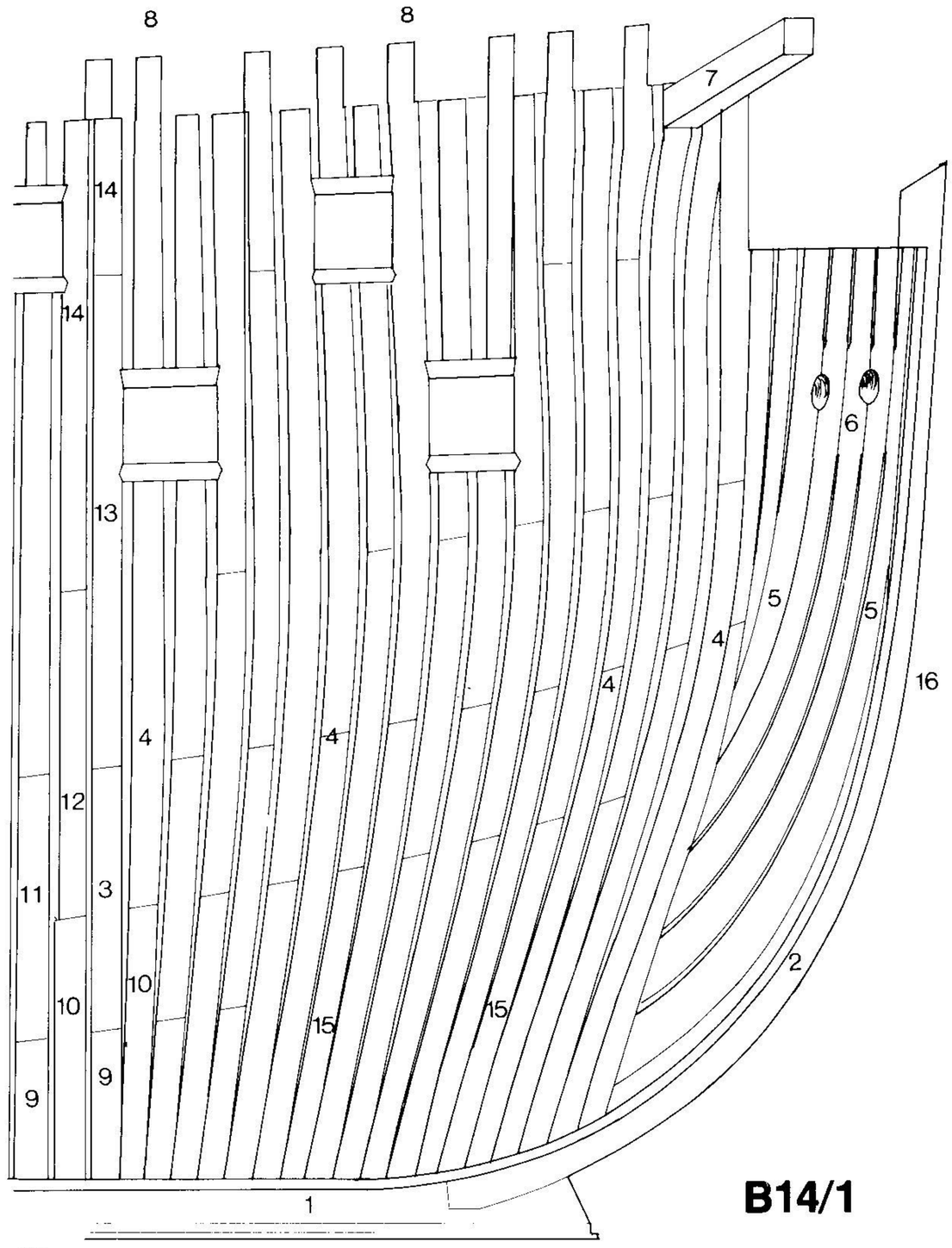


B Hull construction



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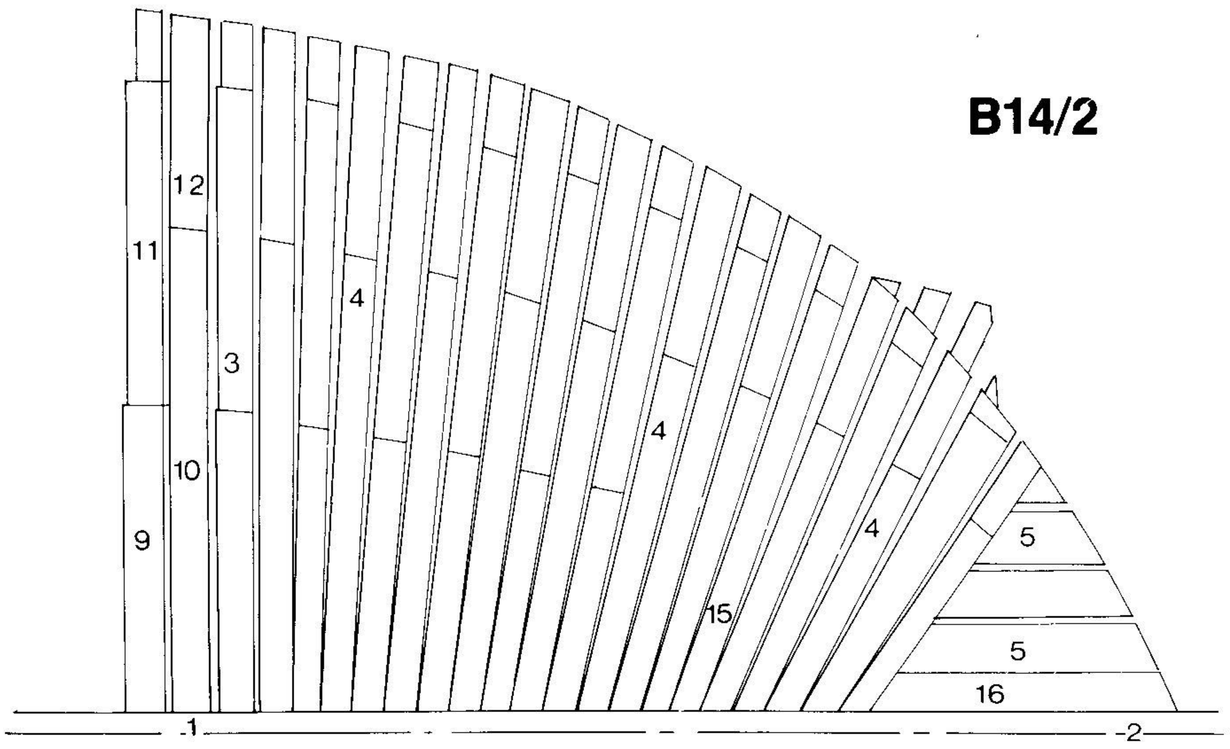


B14/2

B14 FRAMING OF BOWS (1/96 scale)

B14/1 Profile

B14/2 Half-breadth plan

1. Keel
2. Stem
3. Last square frame
4. Cant frames
5. Hawse pieces, 1ft 6in × 1ft 7in
6. Hawse holes
7. Cathead
8. Timberhead
9. Floor timber
10. First futtocks
11. Second futtocks
12. Third futtocks
13. Fourth futtocks
14. Toptimbers
15. Half timbers
16. Knightheads

B15 STRUCTURE OF BOWS (no scale)

1. Keel
2. Stempost
3. Knee of the head
4. Frames
5. Gunports
6. Ribbands
7. Hawse pieces
8. Knightheads
9. Timberheads

B16 CANT FRAMES (1/96 scale)

B16/1 Plan view

B16/2 Athwartship section

1. Keel
2. Deadwood
3. Kelson
4. Half timbers
5. First futtocks
6. Second futtocks
7. Rabbet
8. Plank of the bottom
9. Chock

B17 STRUCTURE OF STERN (1/96 scale)

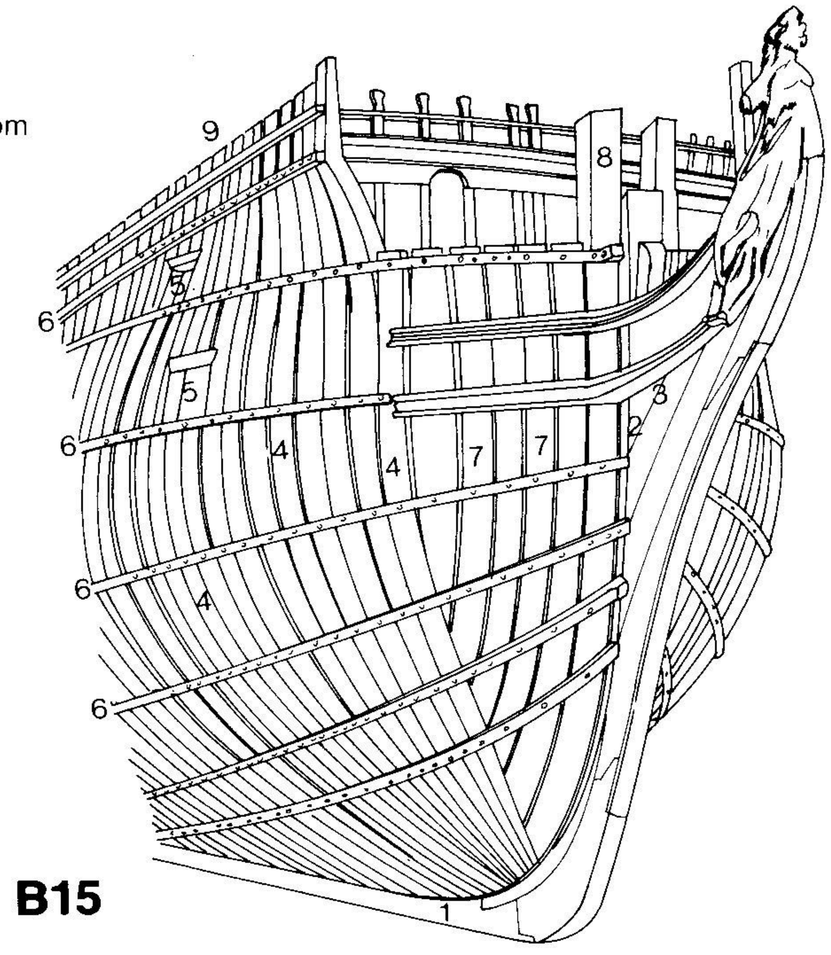
B17/1 Profile

B17/2 Half-breadth plan

1. Keel
2. Sternpost
3. Last square frame
4. Cant frames
5. Fashion pieces
6. Wing transom, 13½in × 18in
7. Deck transom, 12½in deep
8. Filling transoms, 10in to 12in deep
9. Filling pieces
10. Side counter timber
11. Deadwood
12. Gallery doors, 10in wide
13. Rabbets

B18 FRAMING OF STERN (no scale)

1. Sternpost
2. Rudder
3. Fashion pieces
4. Cant frames
5. Transoms
6. Ribbands
7. Side counter timbers
8. Counter timbers
9. Counters
10. Gallery doors



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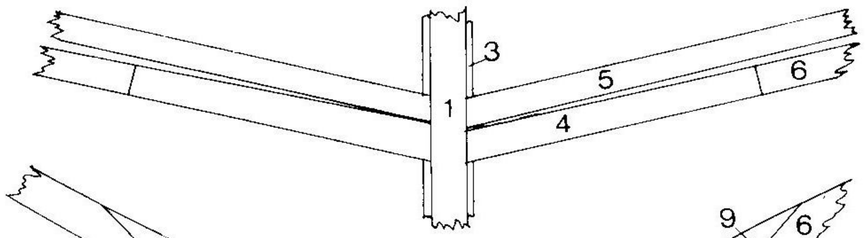

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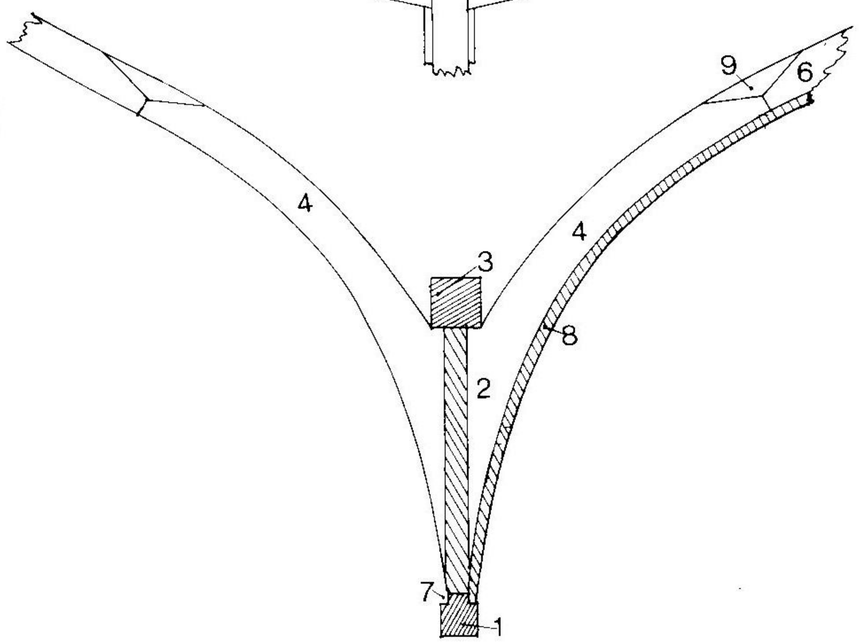

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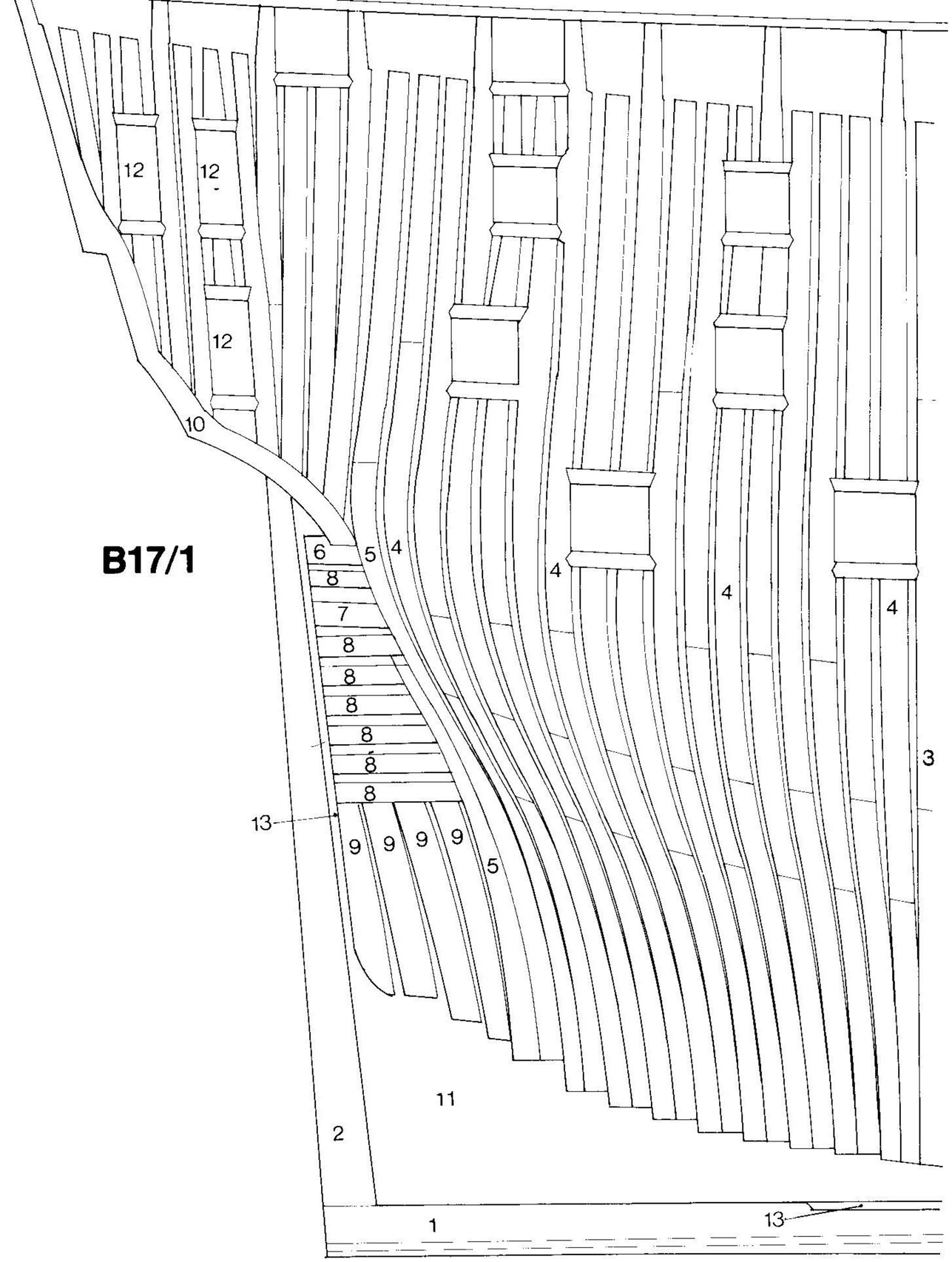

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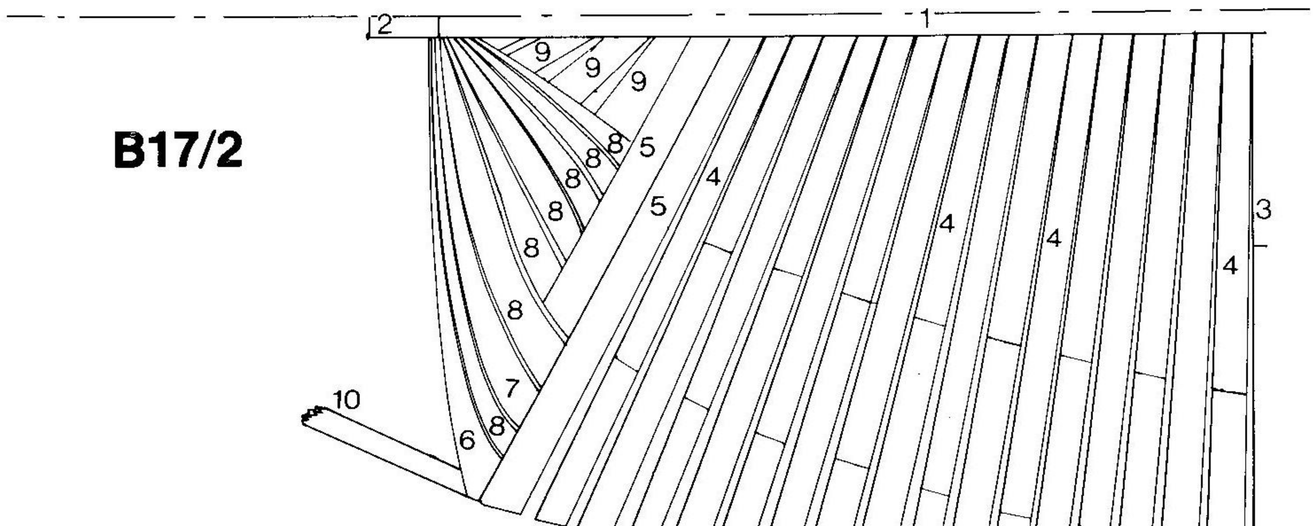

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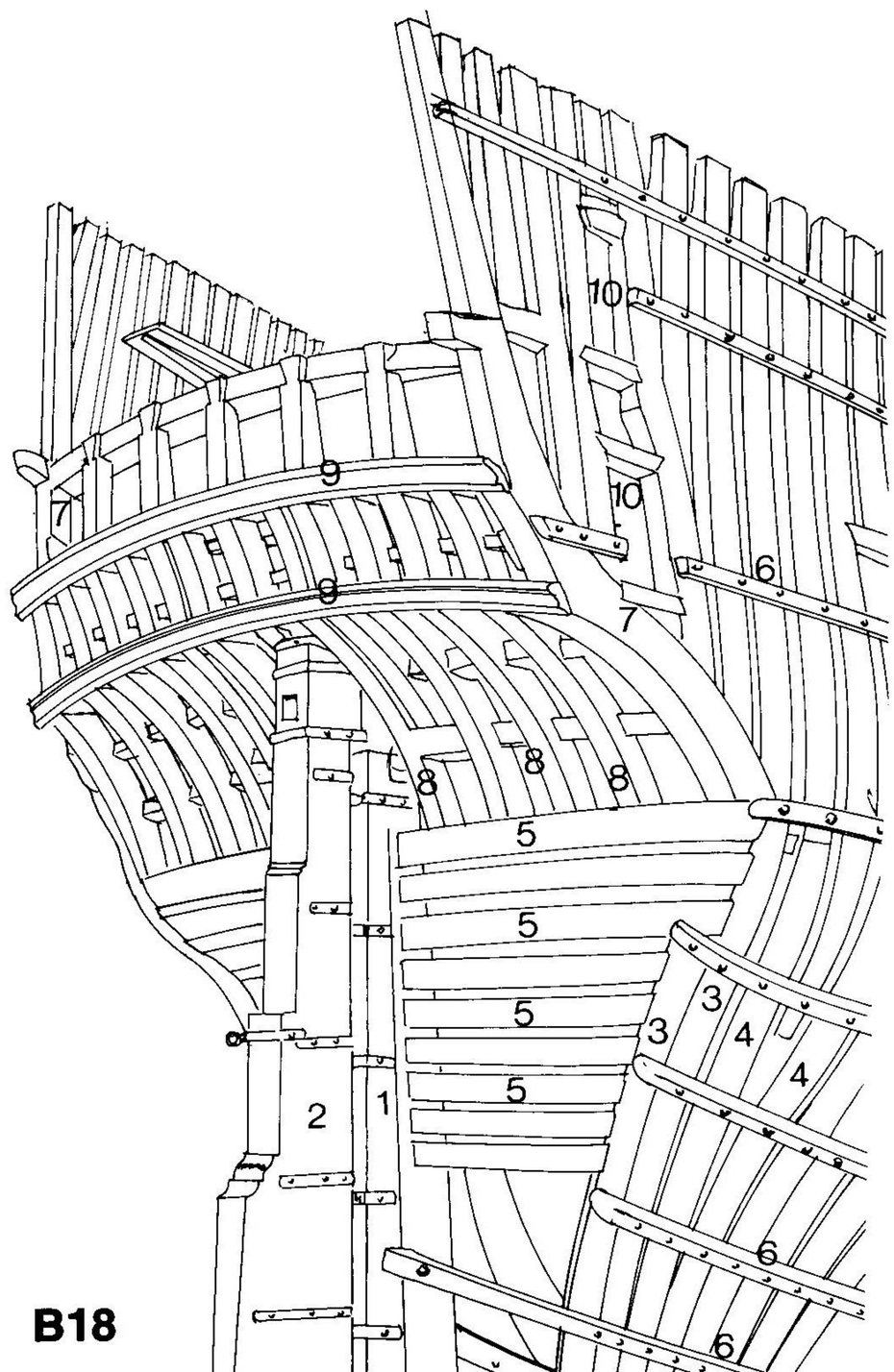
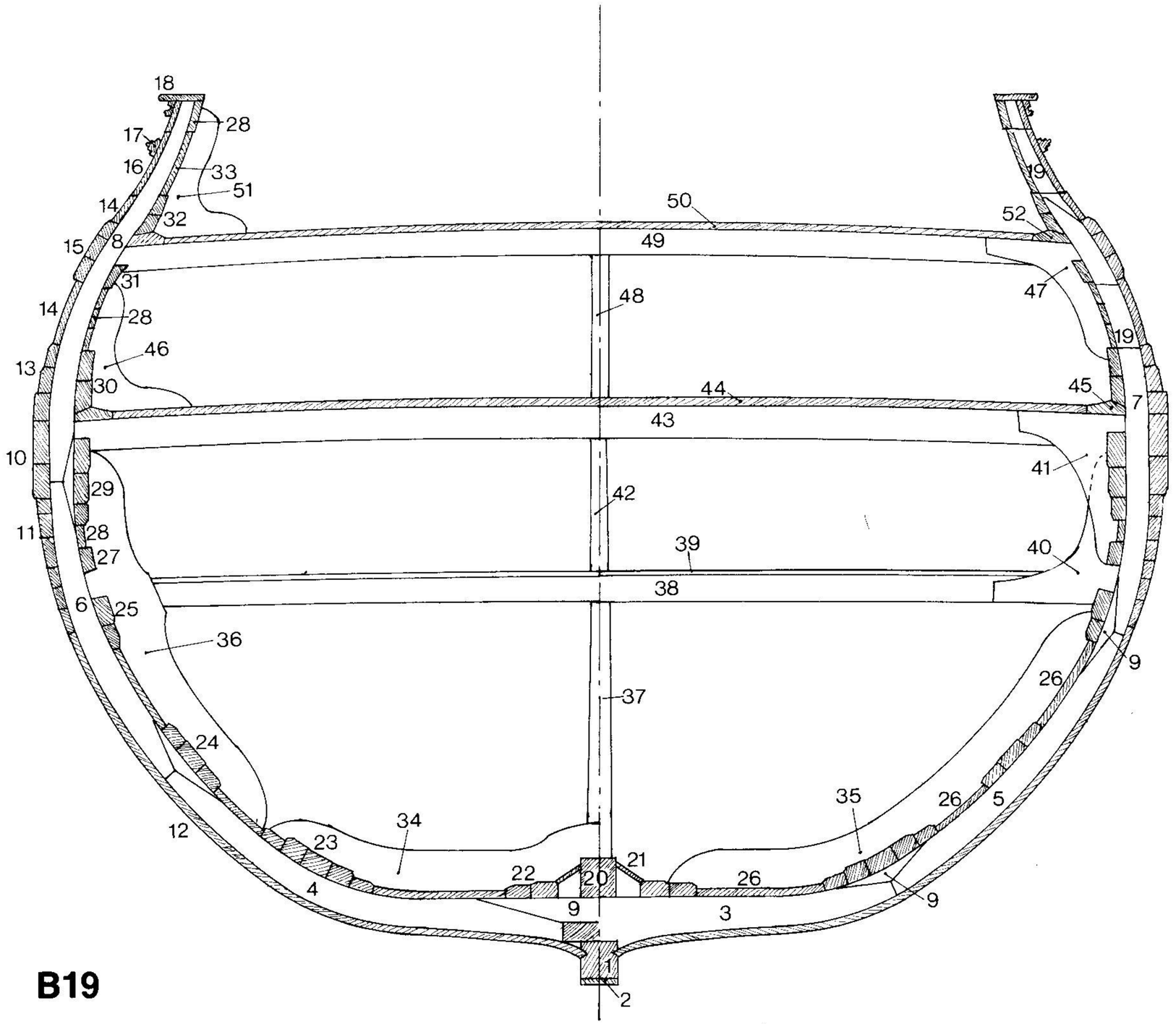


B Hull construction

B19 MIDSHIP SECTION (1/96 scale)

1. Keel, 18in square in midships
2. False keel, 7in deep
3. Floor timber, 15½in thick in midships
4. Lower futtock, 15in thick
5. Second futtock, 14¼in thick
6. Third futtock, 13¾in thick
7. Fourth futtock, 13½in thick
8. Toptimbers, 12in at head
9. Chocks
10. Main wales, 4ft 3in × 8½in
11. Six strakes of plank under the main wale, reducing from 6¾in to 4in
12. Plank of the bottom, 4in thick
13. Two strakes above the main wale, reducing from 6¾in to 5½in
14. 4in plank
15. Channel wale, 2ft 9in × 5½in
16. 3in plank above level of gunport cill
17. Rail
18. String
19. Gunports
20. Kelson, 18in square
21. Limber board, 3in thick
22. Strakes next the limbers: first strake, 14in × 7in; second strake, 13in × 6½in
23. Thick stuff at the floor head; middle strake, 15in × 8¼in; two strakes, 18in × 8¼in; two strakes, 13in × 6¾in
24. Thick stuff at the first futtock head: middle strake, 15in × 8¾in; two strakes, 13in × 8¼in
25. Orlop deck clamp: lower strake, 13in × 6¼in; upper strake, 15in × 7¼in
26. Footwaling between thick stuff, 4in in midships
27. Strake on the end of the orlop beams, 13in × 6¼in
28. 4in plank
29. Gundeck clamp: two lower strakes, 14in × 7¼in; upper strake, 17in × 8¼in
30. Gundeck spirketting, 6in thick
31. Upper deck clamp, 5¼in on the upper edge, 4½in on lower
33. 3in plank
34. Floor rider, 17in thick
35. Lower futtock rider, 16in thick
36. Second futtock rider, 14in thick
37. Pillar in hold, 9¾in square at lower end, 8¾in at upper
38. Orlop deck beams, 15¾in square
39. Orlop deck plank, 1½in
40. Orlop deck standard, 12in thick
41. Gundeck hanging knee, 10in thick
42. Pillar
43. Gundeck beams, 16½in square
44. Gundeck plank, 4in
45. Gundeck waterways, 5½in thick
46. Gundeck standard, 12¼in thick
47. Upper deck hanging knee
48. Pillar, 8½in square at the lower end, 7½in at the upper
49. Upper deck beams, 14in thick, 12in deep
50. Upper deck plank, 3in thick
51. Upper deck standard, 10¾in thick
52. Upper deck waterway, 4½in thick



B19

B20 DETAILS OF MIDSHIP CONSTRUCTION (no scale)

1. Keel
2. Frame timbers
3. Deadwood
4. Pillars in hold
5. Footwaling
6. Riders
7. Orlop deck beams
8. Knees
9. Gundeck beams
10. Hanging knees
11. Upper deck beams
12. Capstan
13. Quarterdeck beams
14. Capstan room (used for boatswain's stores)
15. Stanchions for hammock netting
16. Beams in waist (as fitted after 1780)
17. Clamp
18. Carlines
19. Ledges
20. Kelson

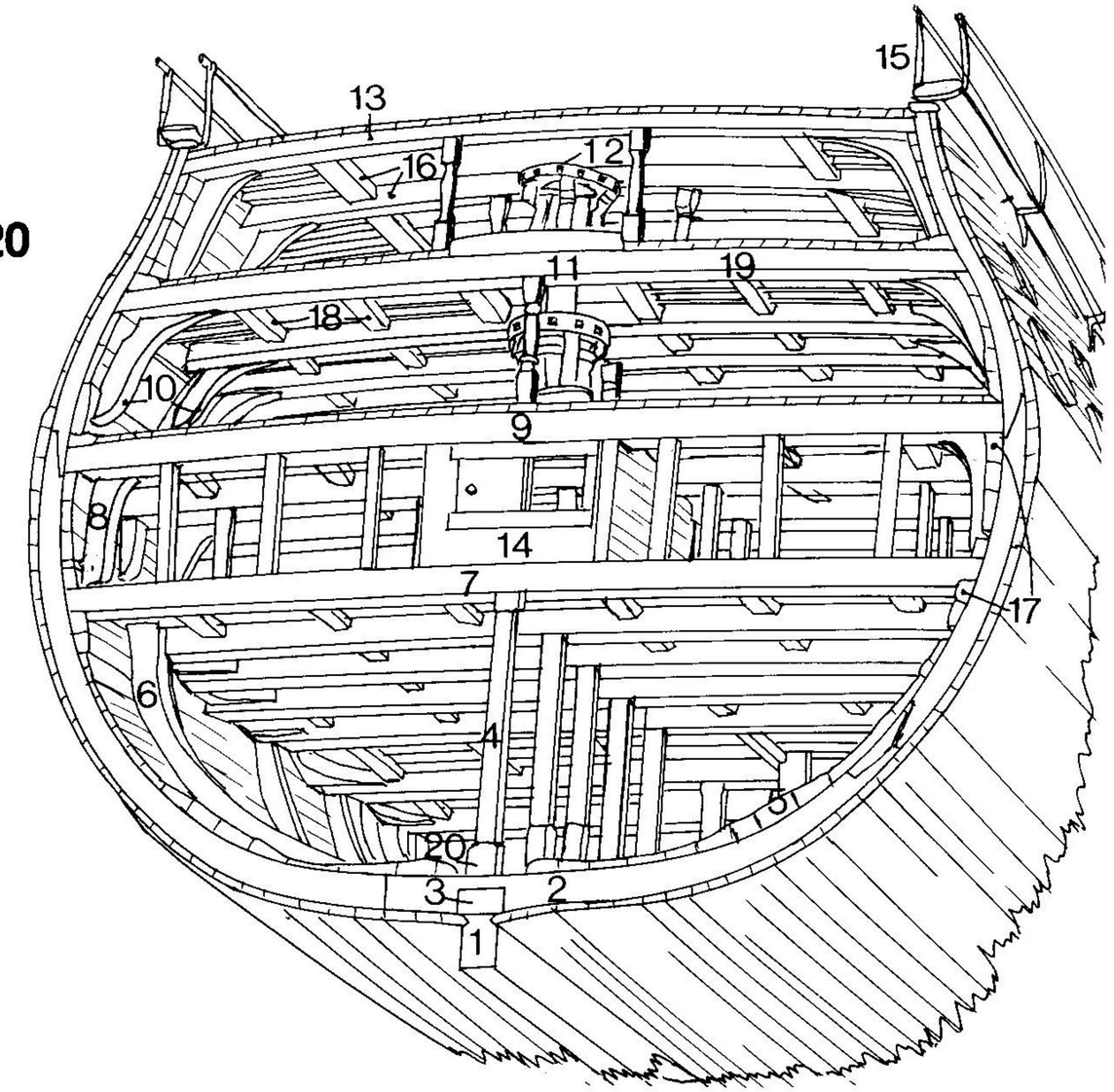
B21 DETAILS OF DECK BEAMS, CARLINES AND LEDGES (no scale)

1. Gratings
2. Deck beams
3. Half beams, curved to avoid hatchways, masts, etc.
4. Carlines
5. Ledges
6. Tenons, to join together carlines, ledges, etc

B22 SCARPHS OF THE DECK BEAMS (no scale)

1. Three-part beam, used in midships
2. Two-part beam, used for about seven beams from the bow and stern, and for the quarterdeck, forecastle and poop
3. Table
4. Coak
5. Bolts, normally eight per scarph

B20



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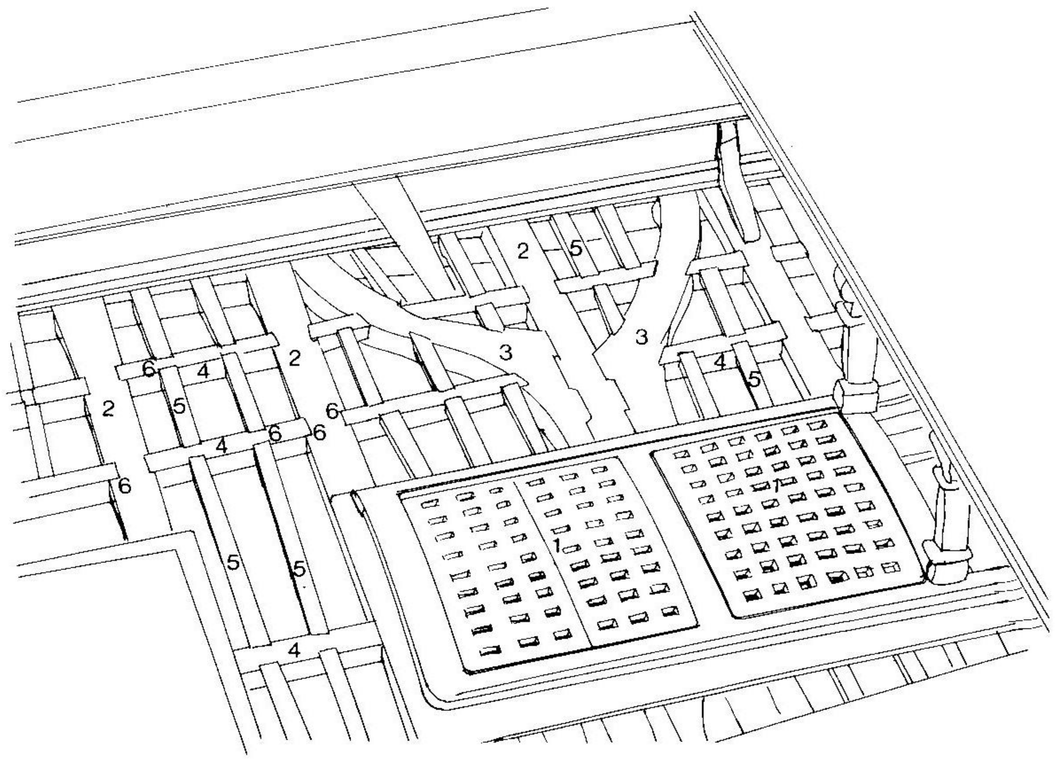

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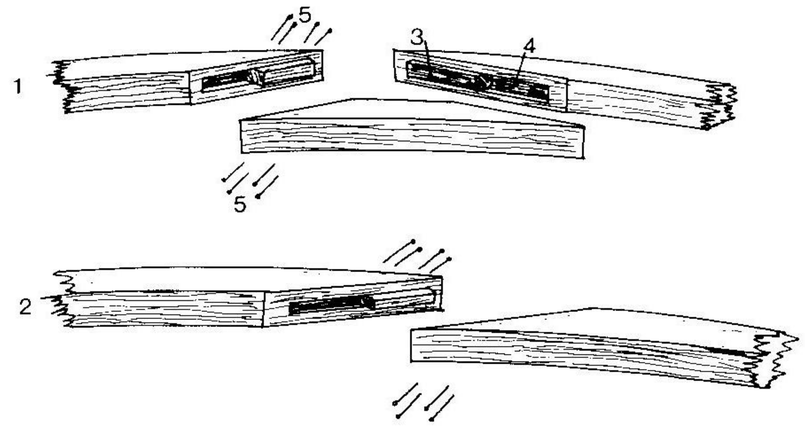


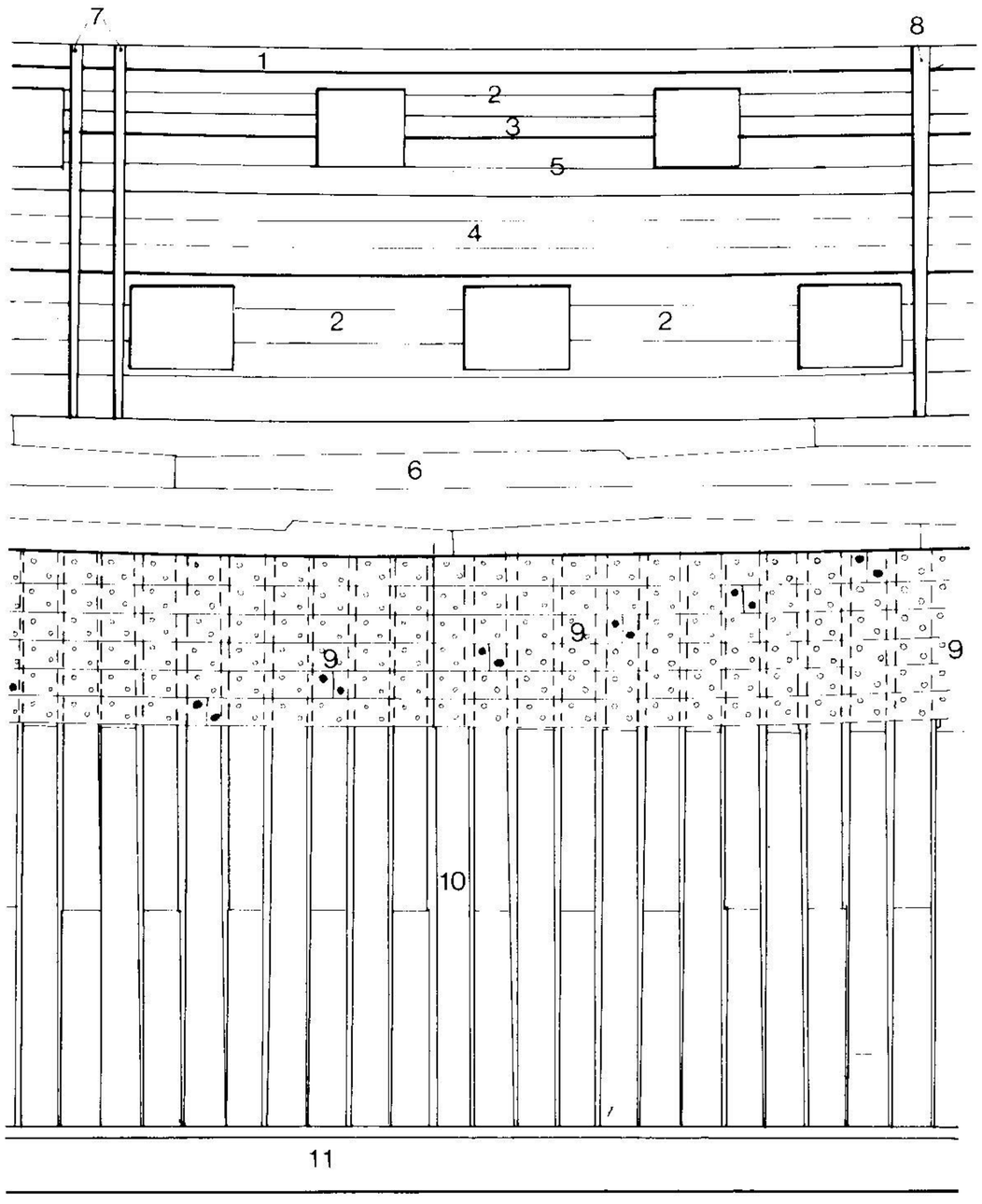
B23 **SYSTEM OF PLANKING IN MIDSHIPS (1/96 scale)**

1. Planksheer
2. Short plank between the ports
3. Rail
4. Channel wale
5. 4in plank
6. Main wale (hook and butt construction)
7. Skid beams
8. Boat beams
9. Standard system of planking: two trenails (drawn as small open circles) in each timber; one metal bolt at each butt end (marked as solid dots), 1in diameter below the wale, 7/8in above the wale
10. Frame timbers
11. Keel

B24 **GENERAL SYSTEM OF WALES AND PLANKING ABOVE AND BELOW THEM (based on a drawing of the 'Montague' of 1779, of the 'Royal Oak' class, and therefore not identical to the 'Bellona'. 1/192 scale)**

1. Keel
2. Wales, of anchor-stock construction
3. Plank below the wale, tapering to the normal thickness of the planking of the bottom
4. Plank above the wale
5. Rabbet

B23



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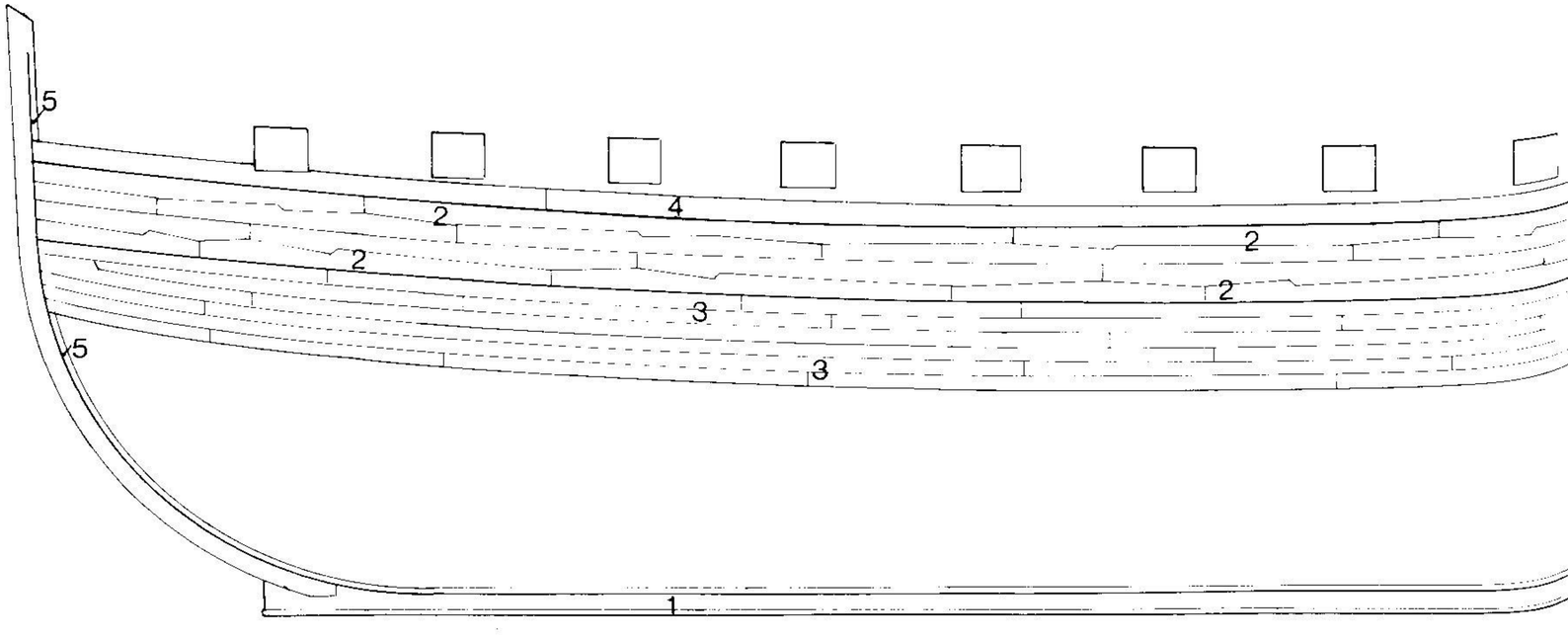
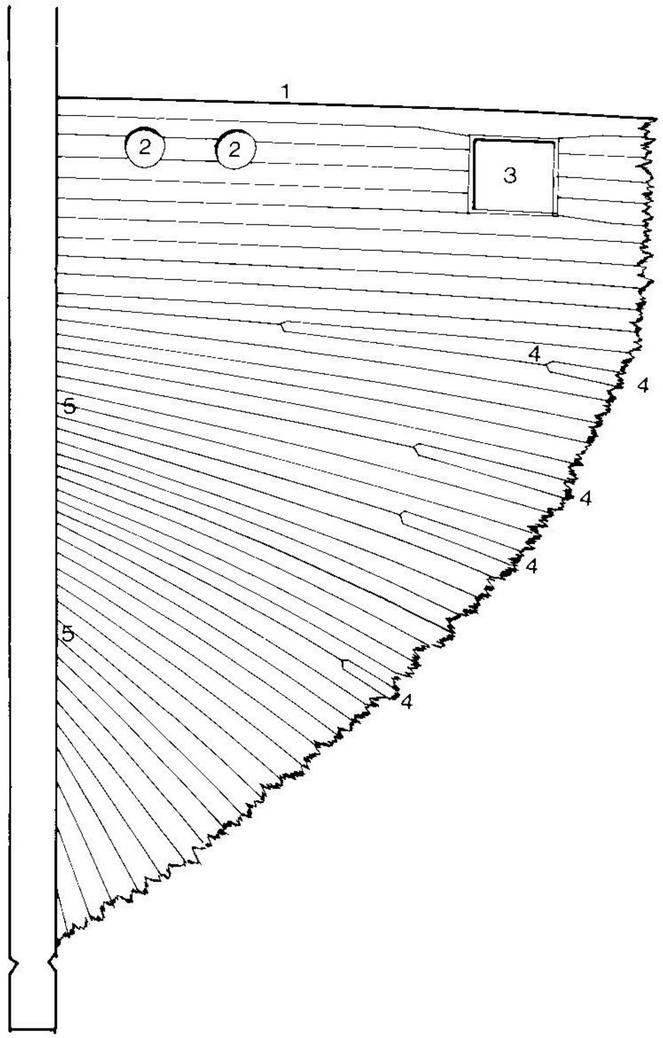


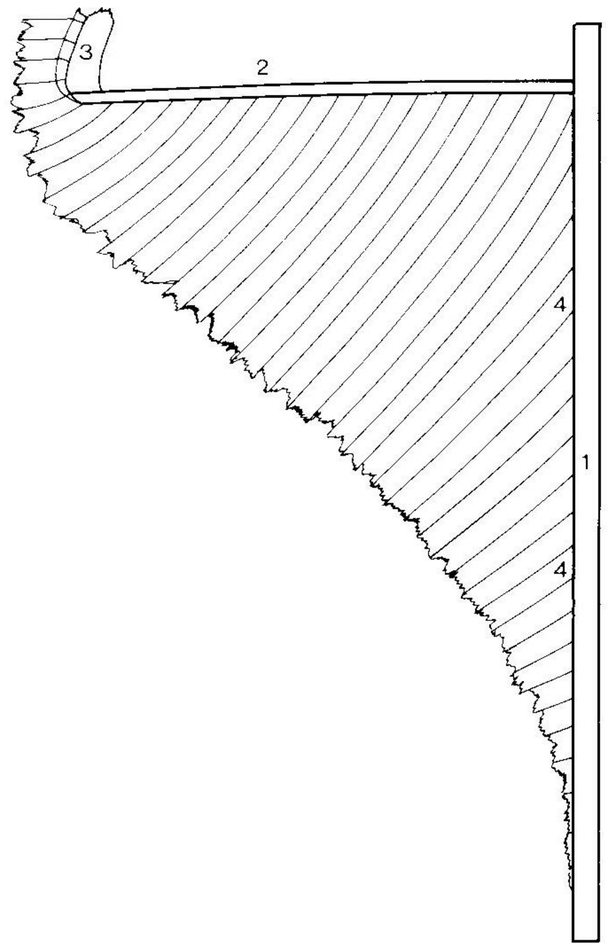
B25 **GENERAL METHOD OF PLANKING BOWS (based on a 110-gun ship of about 1810. No scale)**

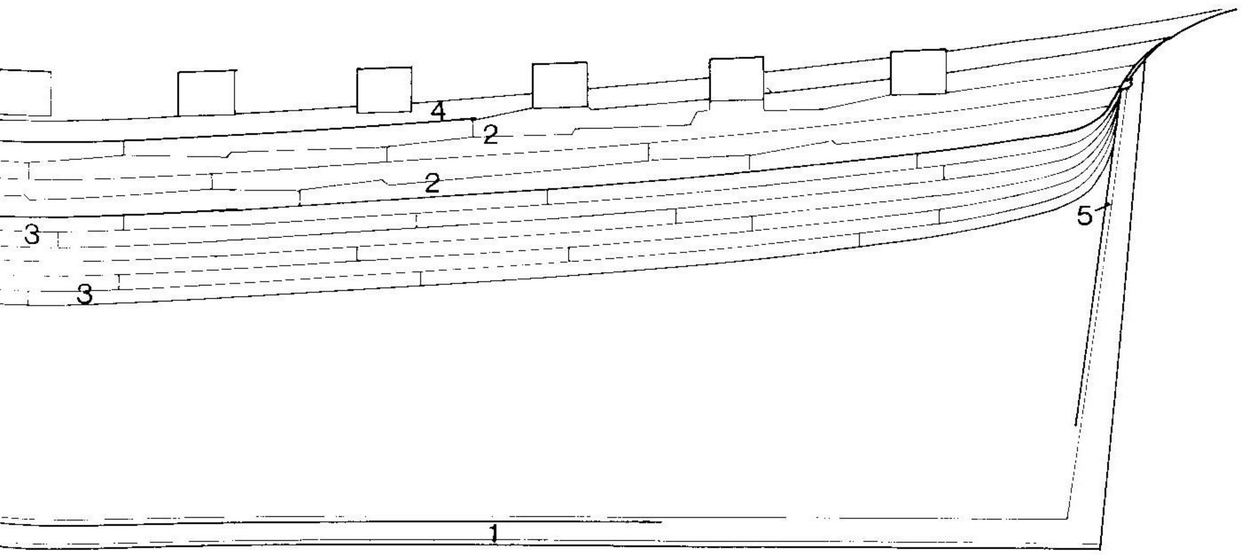
1. Lower edge of lower wale
2. Hawse holes
3. Gunport
4. Stealers
5. Hooding ends

B26 **GENERAL SYSTEM OF PLANKING STERN (no scale)**

1. Sternpost
2. Tuck rail
3. Heel of side counter timber
4. Hooding ends







B27 INTERNAL CONSTRUCTION AND PLANKING (based on a drawing of the 'Arrogant' of 1761. The top left-hand corner of the drawing is missing. 1/192 scale)

1. Lower futtock riders
2. Second futtock riders
3. Deck beams
4. Standards
5. Hanging knees
6. Curved knees, to avoid gunports, etc
7. Clamp
8. Scarphs
9. Spirketting

B28 DETAILS OF DECK PLANKING (Based on a 74-gun ship of 1798. 1/192 scale)

B28/1 Quarterdeck

B28/2 Forecastle

B29 DETAILS OF WAIST AND GANGWAYS (early system, 1760 to 1780. 1/192 scale)

B29/1 Inboard profile

B29/2 Half-breadth plan

B29/3 Athwartship section

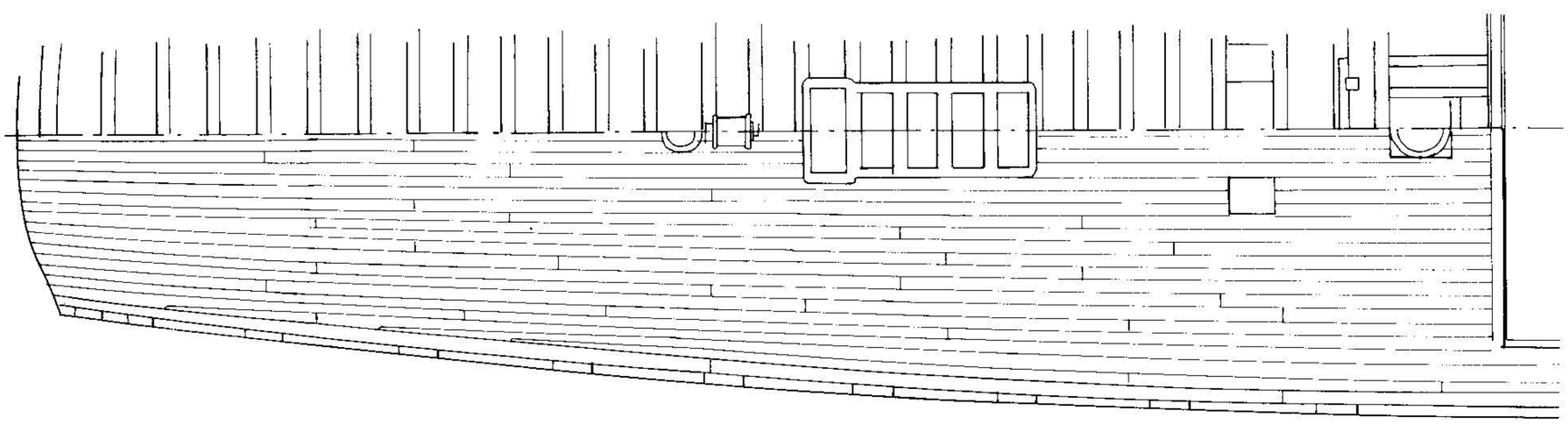
B29/4 Detail of boom crutch

1. Rail
2. Gangway
3. Quarterdeck
4. Forecastle
5. Standards of upper deck
6. Iron knees supporting gangway
7. Boat booms across waist
8. Iron brackets for boat booms
9. Sheave blocks for sheets, etc
10. Cleats
11. Ladderways
12. Stanchions of waist rail
13. Waist rail

B30 SYSTEM OF GANGWAYS AND BOOMS IN THE WAIST (about 1790. Half-breadth plan from below. 1/96 scale)

1. Quarterdeck beam
2. Forecastle beam
3. Boat booms
4. Knees
5. Carline at edge of gangway
6. Ledges
7. Side of ship
8. Planking

B28/1



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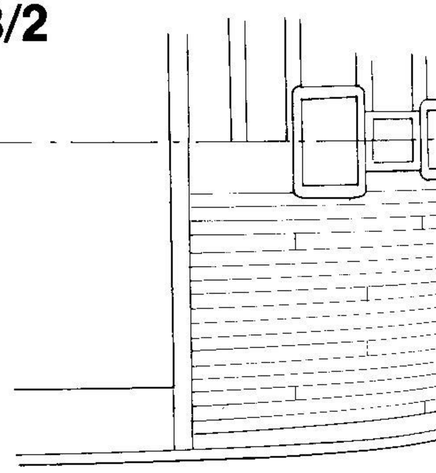

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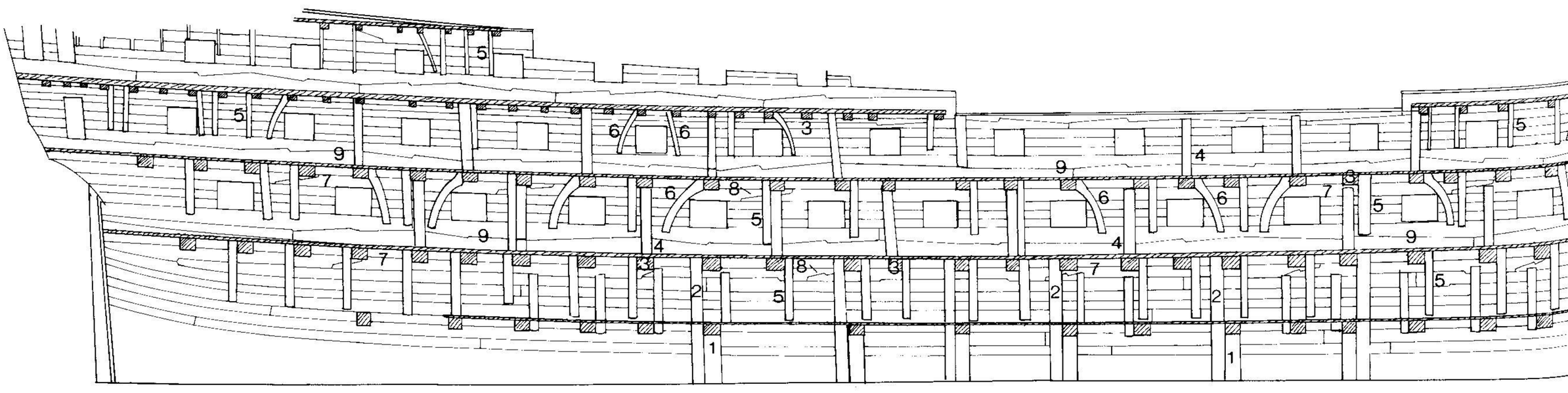

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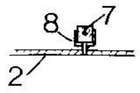

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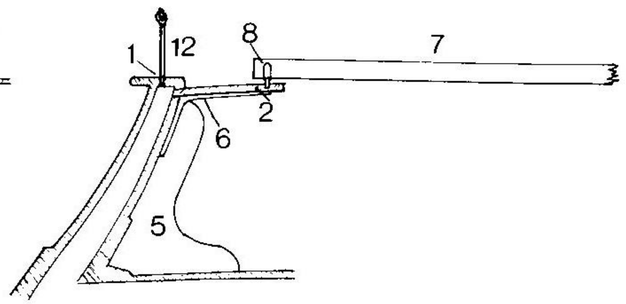

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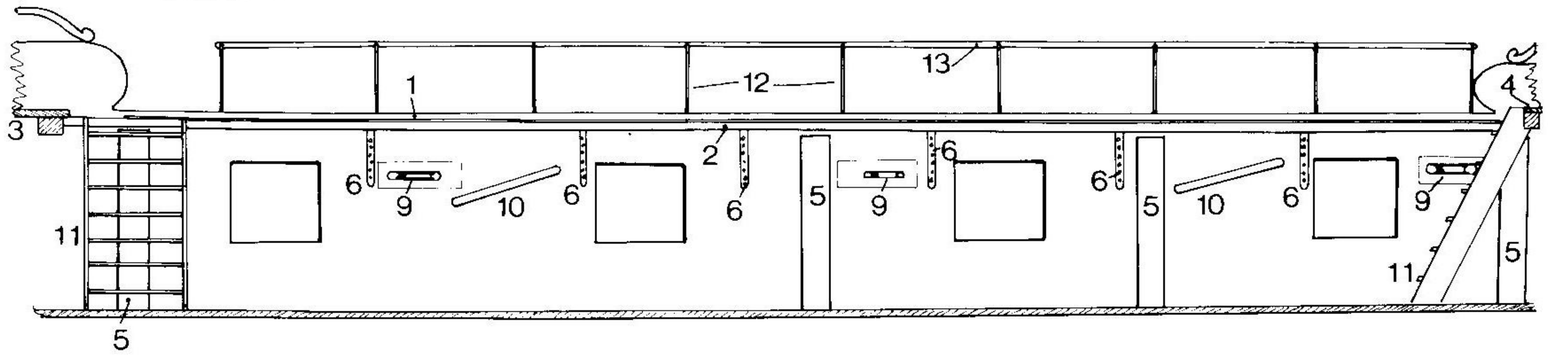

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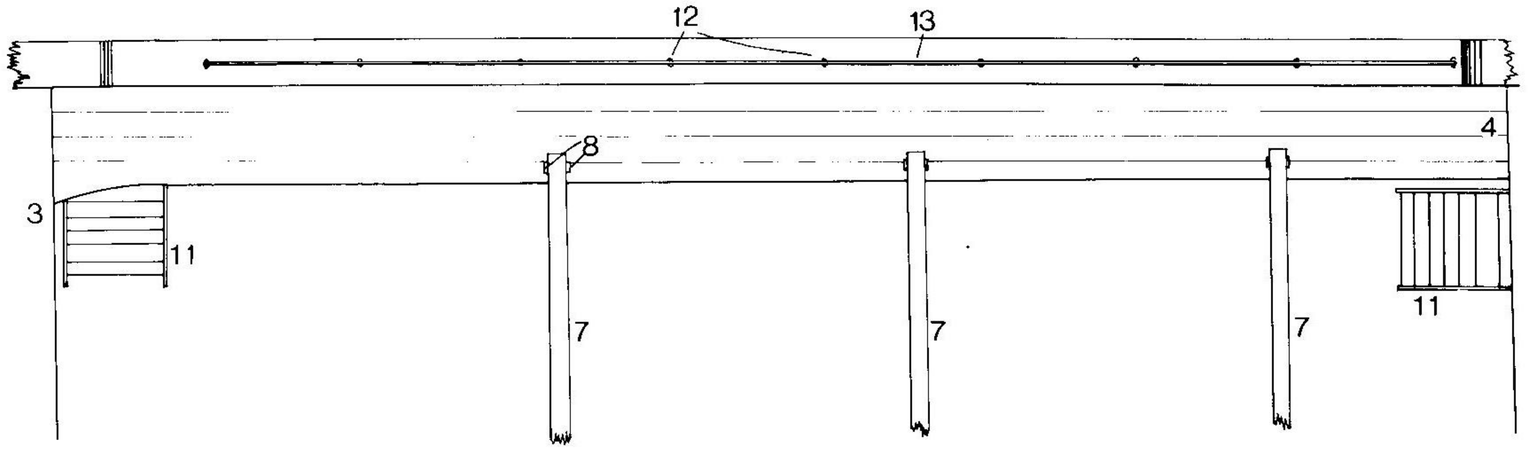

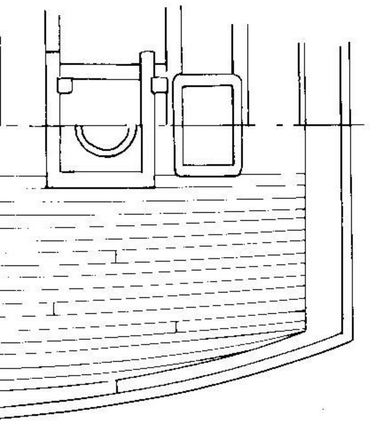

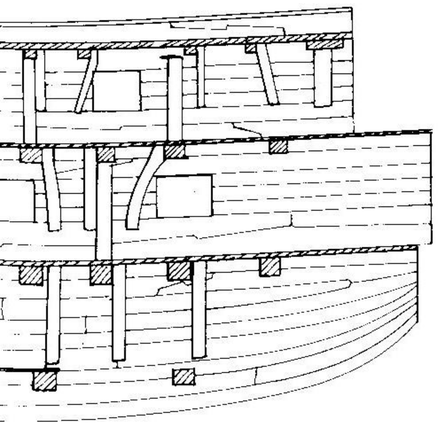

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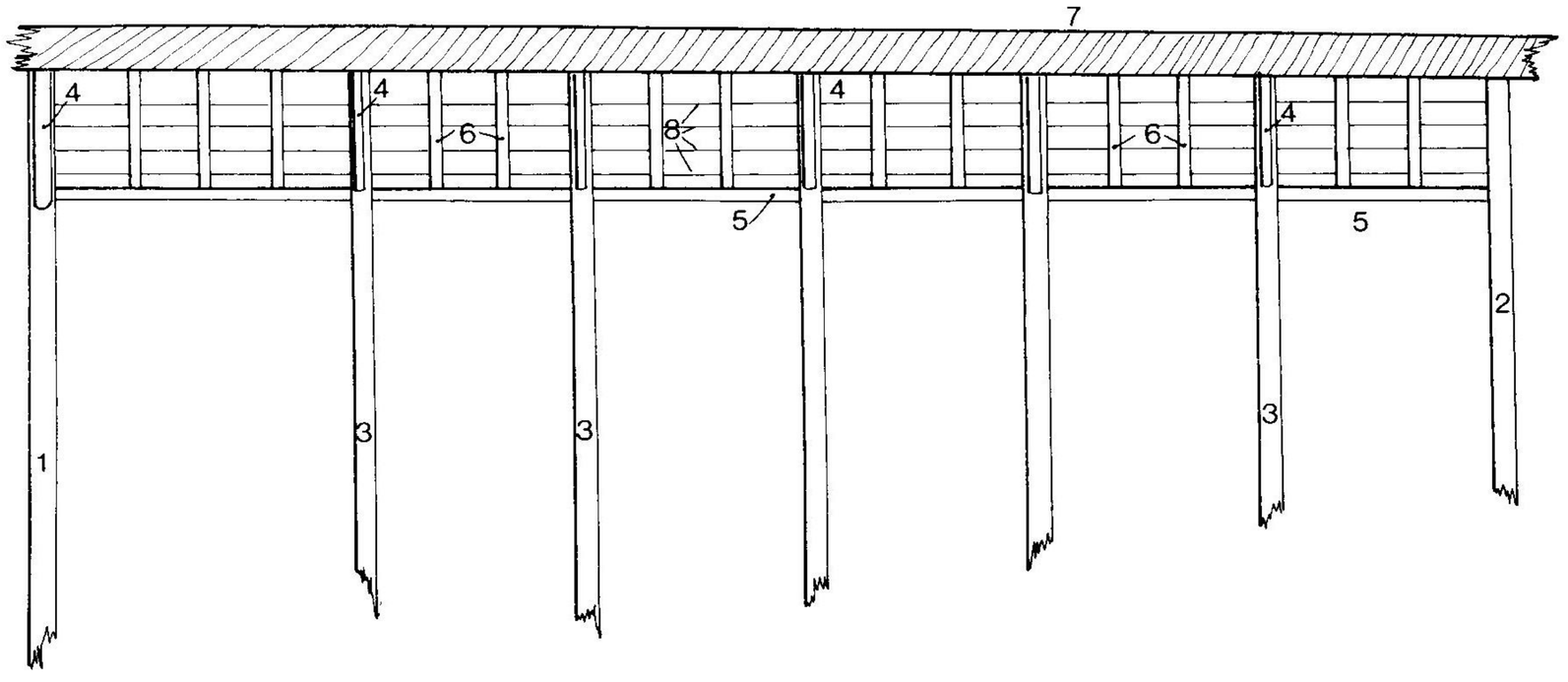


B Hull construction

B31 RIDING BITTS (no scale)

1. Kelson
2. Strakes next the limber boards, providing a secure fixing for the bitt pins
3. Bitt pins: foremost 19½in square below gundeck; aftermost 20in square below gundeck. Both tapering to 12in square at the foot
4. Upper deck beams
5. Gundeck beams
6. Cleats to support pin against deck beams
7. Broad carlines under the standards, 13in wide, 7in thick maximum
8. Deck plank
9. 1½in recess in beams, to take standards
10. Standards to the bitts, 13in wide
11. Cross pieces to the bitts, 18½in broad, 17in deep, extending 2ft 3in beyond the outside of the bitt pins
12. Backing pieces, 6in wide
13. Join between bitt pin and deck beam, 2½in deep

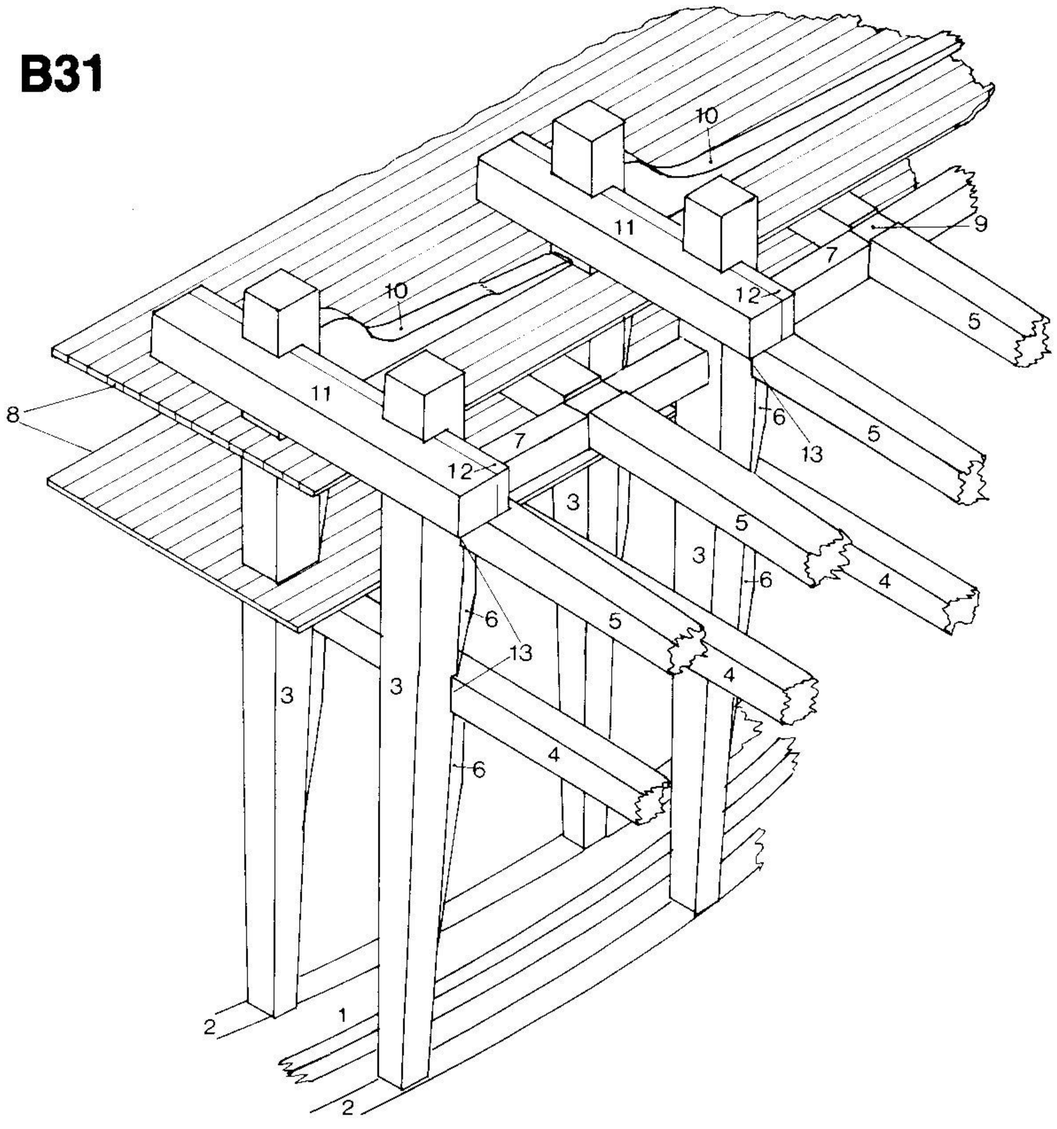
B32 SYSTEM OF DIAGONAL BRACING AS FITTED IN 1805 (1/96 scale)

B32/1 Longitudinal section

B32/2 Athwartship section

1. Kelson
2. Orlop deck beams
3. Braces
4. Floor rider
5. Thick planking under orlop beams, to support brace
6. Block to support end of brace
7. Iron knee
8. Bolts

B31



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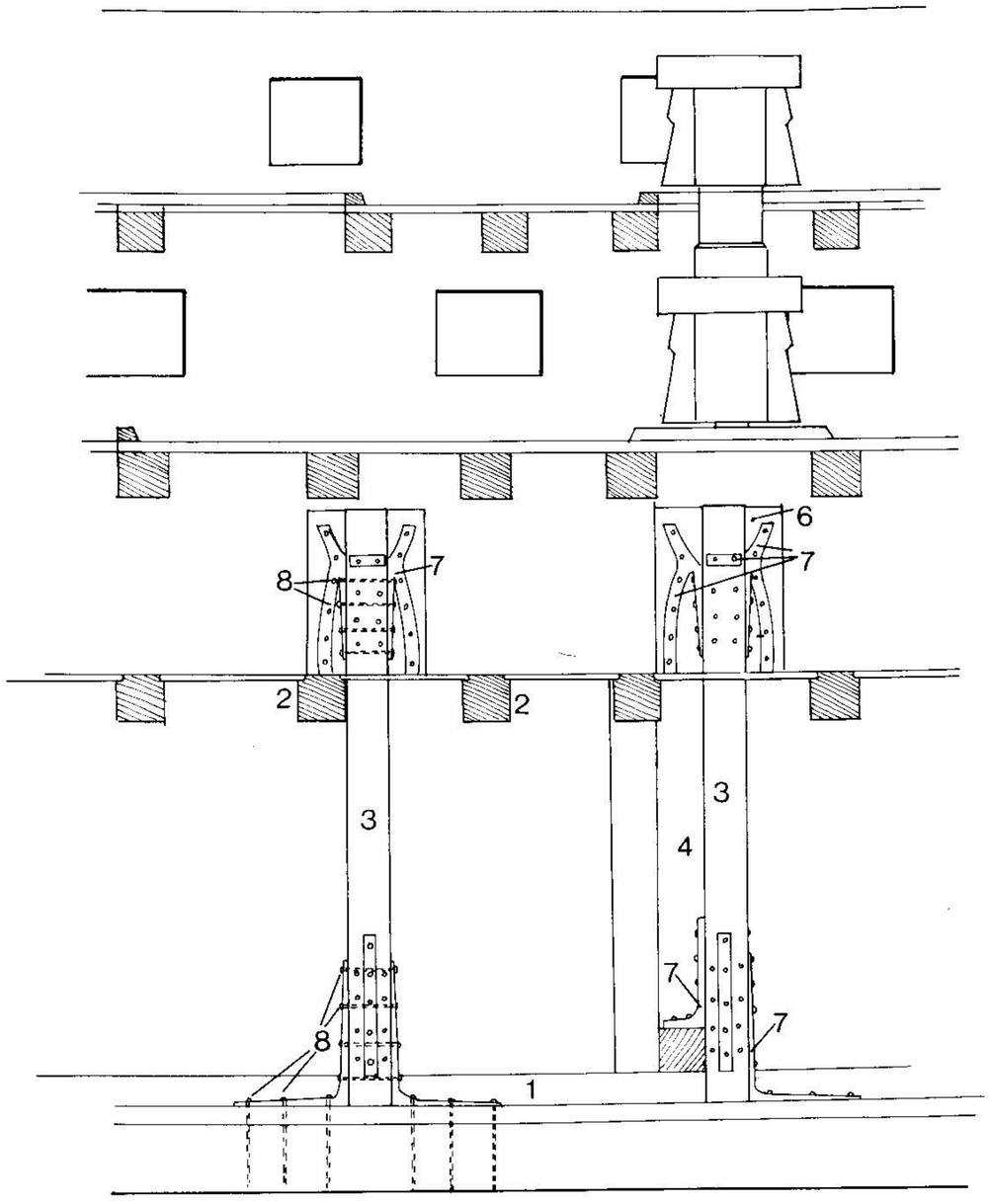

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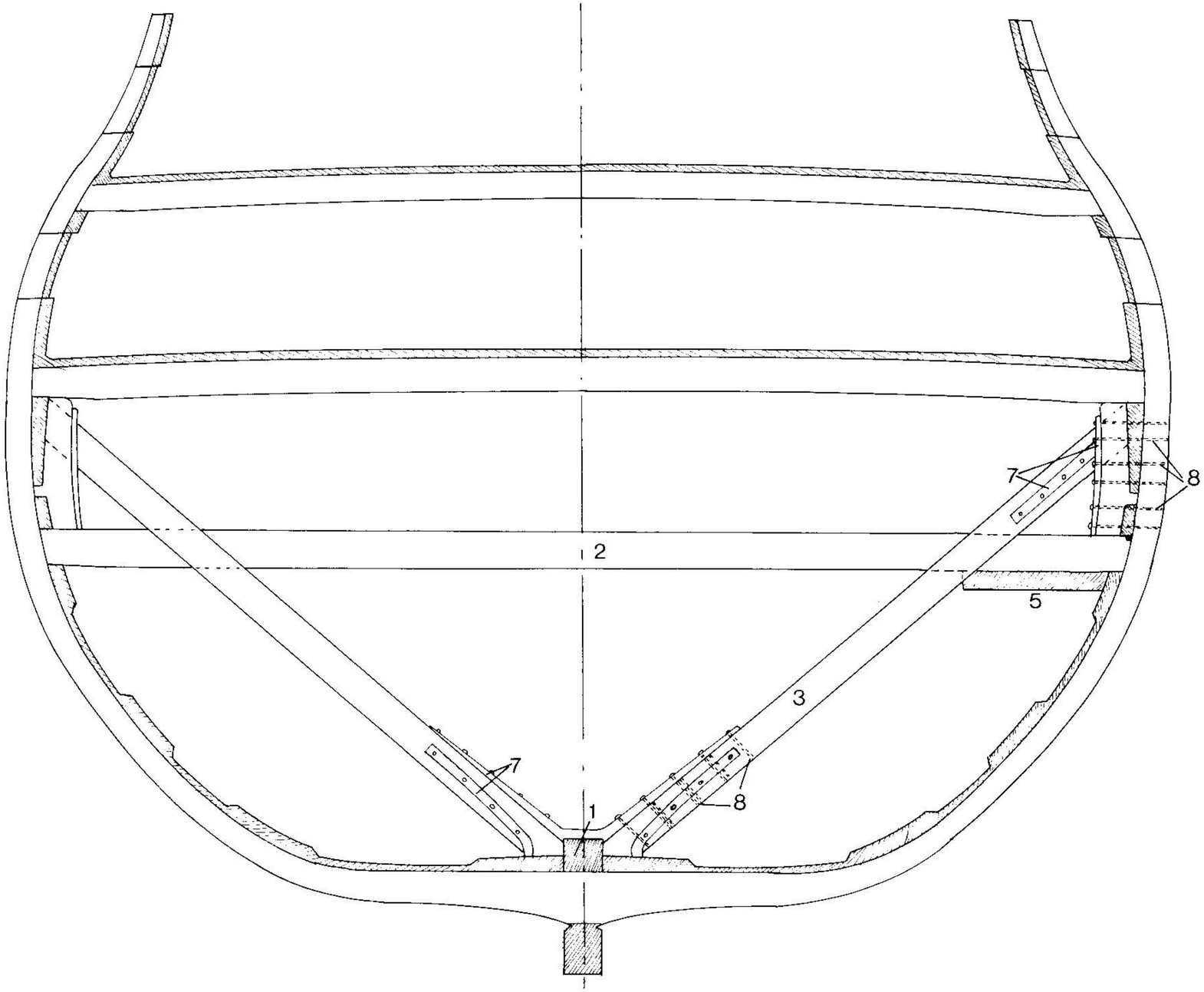
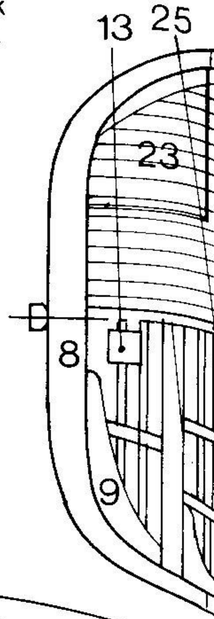
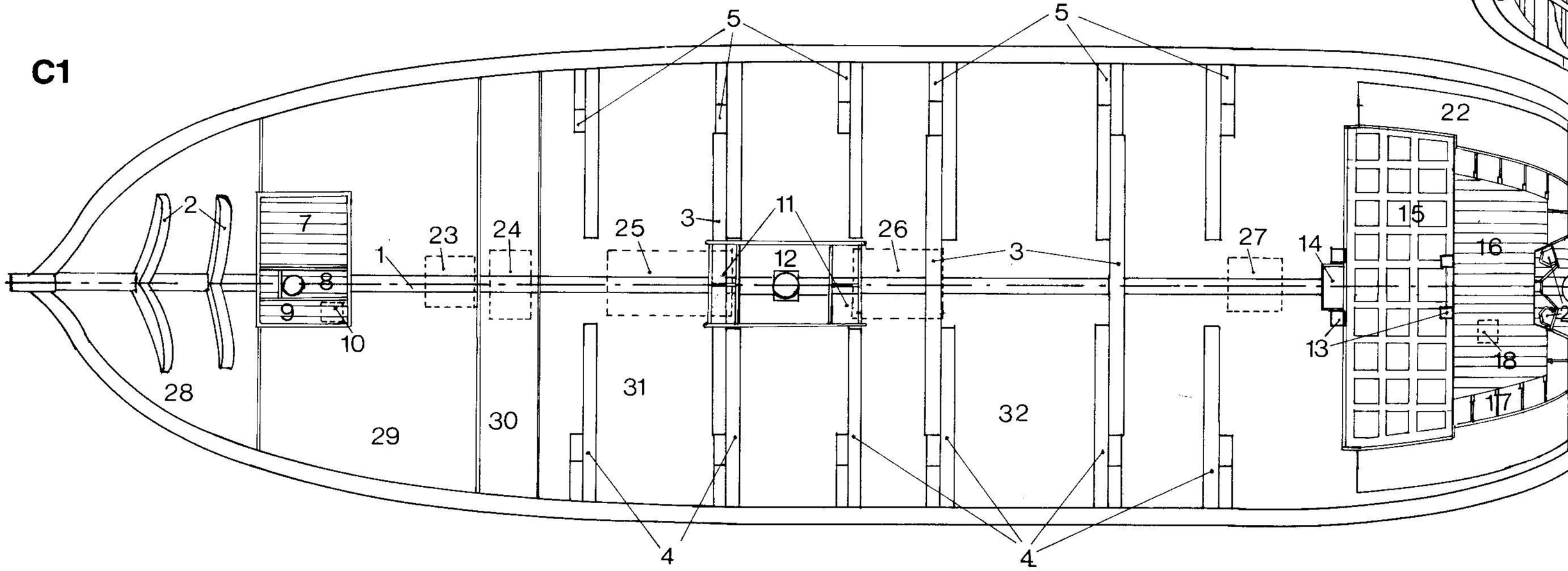
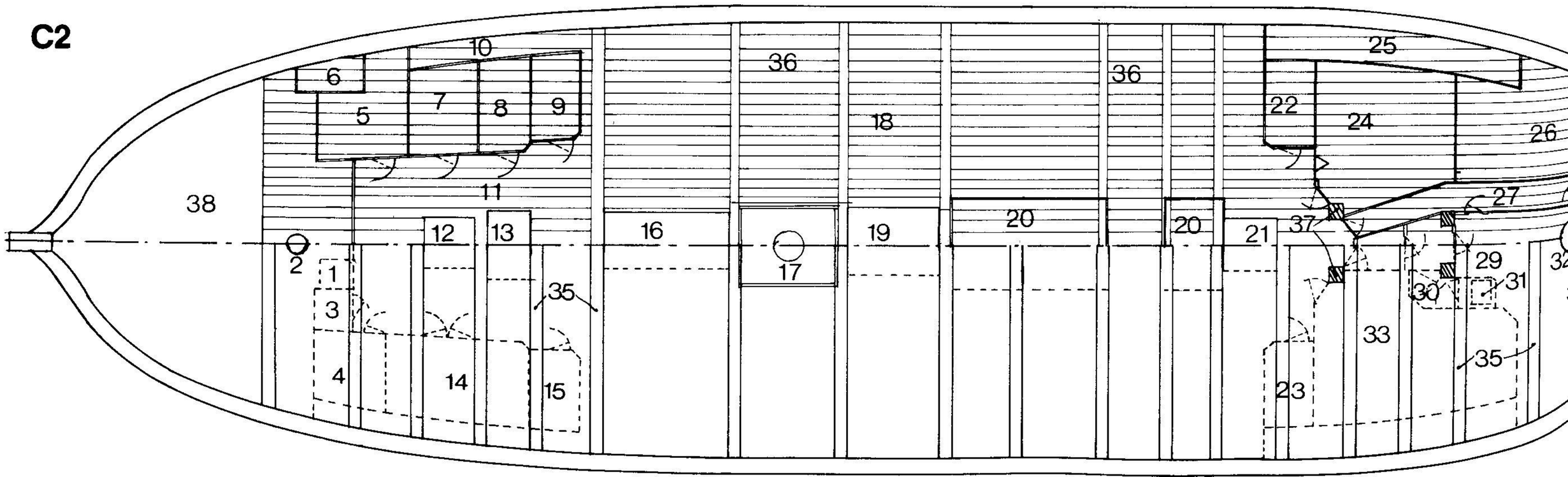


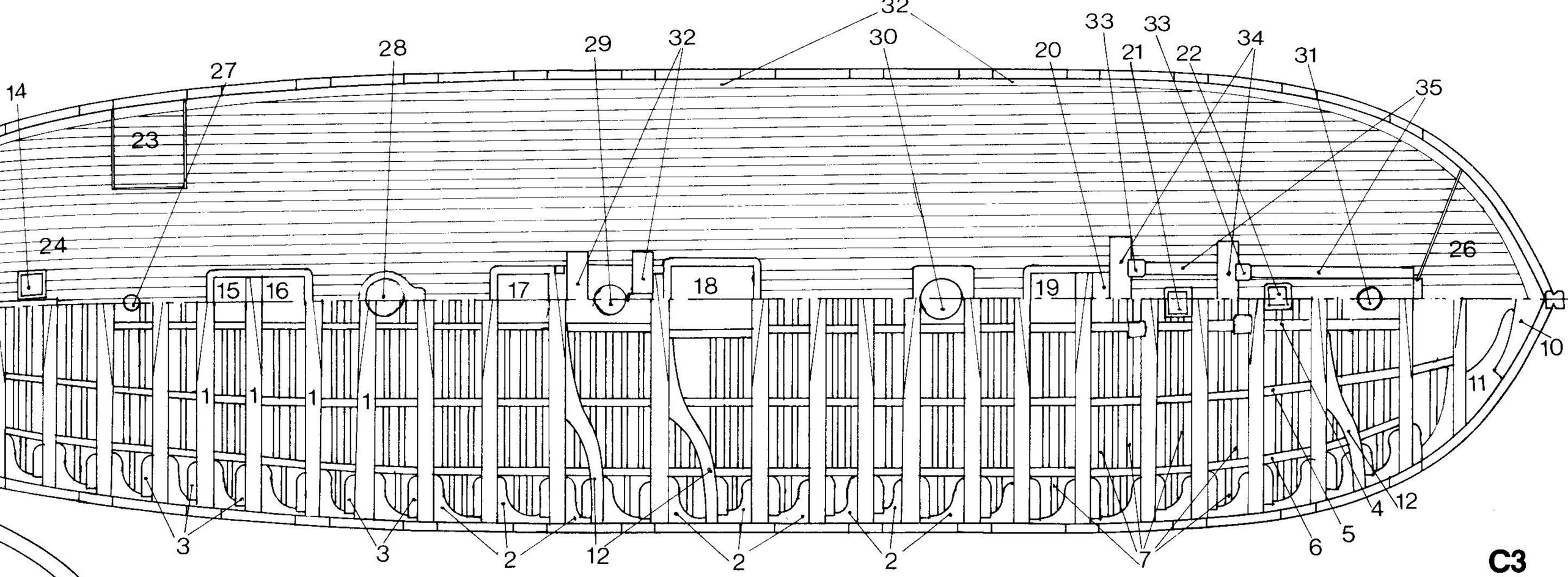
C1 BELOW ORLOP - HOLD AND PLATFORMS (1/192 scale)

1. Kelson, 18in square
2. Crutches
3. Floor riders, 17in thick
4. First futtock riders, 16in thick
5. Second futtock riders, 14in thick
6. Breast hooks
7. After powder room
8. Light room
9. Passage to powder room
10. Hatch to powder room, on orlop deck
11. Shot lockers
12. Pump well, 10ft × 8ft
13. Bitt pins
14. Shot lockers, 2ft 2in × 8ft, each divided down the middle and fitted with lids
15. Magazine, with pallating flat
16. Filling room
17. Racks for filled cartridges
18. Scuttle for filled cartridges
19. Light room
20. Lights
21. Scuttle from orlop deck to light room
22. Wings
23. Fish room hatch, on the orlop deck
24. Spirit room hatch, on the orlop deck
25. After hatch on the orlop deck
26. Main hatch on the orlop deck
27. Fore hatch on the orlop deck
28. Bread room
29. Fish room
30. Spiritous liquour room
31. After hatch
32. Main hold
33. Fore peak

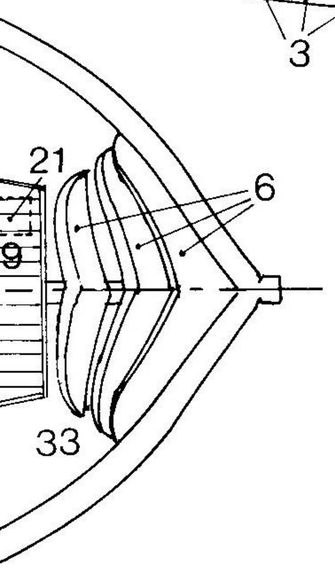


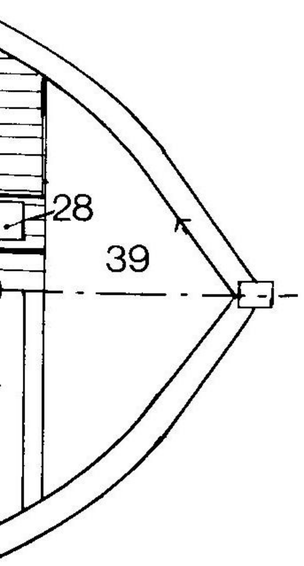






C3





C2 ORLOP DECK (1/192 scale)

1. Hatch to after powder room
2. Mizzen mast
3. Dispensary
4. Surgeon's cabin
5. Steward's room
6. Bedplace
7. Purser's cabin
8. Slop room
9. Marine's clothing store
10. Wings
11. Cockpit
12. Fish room hatch
13. Spirit room hatch
14. Captain's store room
15. Lieutenant's store room
16. After hatch
17. Main mast
18. Cable tier
19. Main hatch
20. Sail room
21. Fore hatch
22. Block room
23. Pitch and tar room
24. Boatswain's store room
25. Wings
26. Sail room
27. Passage to light room
28. Hatch
29. Passage to gunner's store room
30. Passage to filling room
31. Hatch
32. Fore mast
33. Carpenter's store room
34. Gunner's store room
35. Deck beams
36. Short removeable planking in cable tier, to allow wet cables to dry
37. Riding bitts

C3 GUNDECK (1/192 scale)

1. Deck Beams, 16½in square
2. Lodging knees, 9½in thick
3. Hanging knees, 10in thick
4. First tier of carlines, 9in broad, 8½in deep
5. Second tier of carlines
6. Third tier of carlines
7. Ledges, 5½in broad, 5in deep; 9in to 12in apart
8. Deck transom, 12½in deep
9. Transom knee
10. Deck hook, 14in deep
11. Knee
12. Spur beams, to avoid interfering with masts, hatchways, etc
13. Scuttle to lady's hole
14. Scuttle to bread room
15. Ladderway to store rooms and cockpit
16. Fish room hatch
17. After hatch, 4ft 8in square
18. Main hatch, 8ft 4in × 6ft 4in
19. Fore hatch, 4ft 9in × 4ft 8in
20. Ladderway
21. Scuttle for powder room
22. Scuttle to gunner's store room
23. Officer's cabins
24. Gun room
25. Gundeck knee
26. Manger, lined with 4in plank
27. Mizzen mast
28. Main capstan
29. Main mast
30. Fore jeer capstan
31. Fore mast
32. Waterways, 5½in thick
33. Riding bitts, 1ft 8in square from 1in below the underside of the gundeck beams
34. Cross pieces of the bitts, 18½in =

C Decks

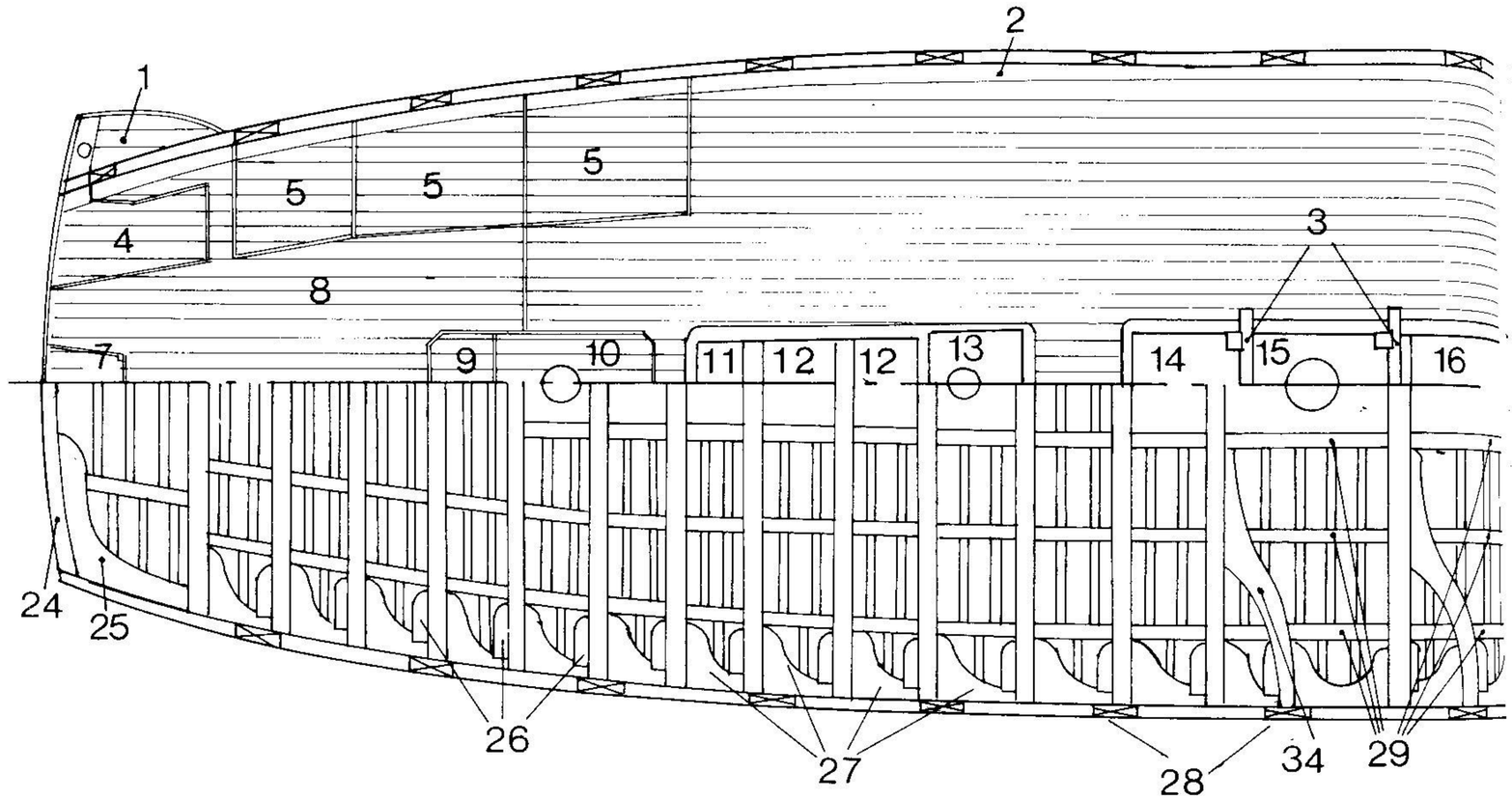
C4 UPPER DECK (1/192 scale)

1. Quarter gallery
2. Waterway
3. Bitts
4. Master's cabin (first lieutenant's, starboard)
5. Canvas cabins for officers
6. Boatswain's cabin (carpenter's, starboard)
7. Rudder head
8. Wardroom
9. Wardroom pantry
10. Captain's pantry
11. Ladderway
12. Grating
13. Capstan
14. After hatch
15. Main mast
16. Main hatch
17. Fore hatch
18. Galley stove
19. Cook room
20. Bitts
21. Fore mast
22. Beakhead bulkhead
23. Roundhouse
24. Upper deck transom, 10in deep
25. Knee
26. Hanging knees, 8½in wide
27. Lodging knees, 7¾in
28. Gunports
29. Carlines, 8in = 6in
30. Ledges, 4½in = 4in
31. Deck hook, 13in deep
32. Knee
33. Deck beams, 14in = 12in
34. Curved deck beams, to avoid mast, hatches, capstans, etc

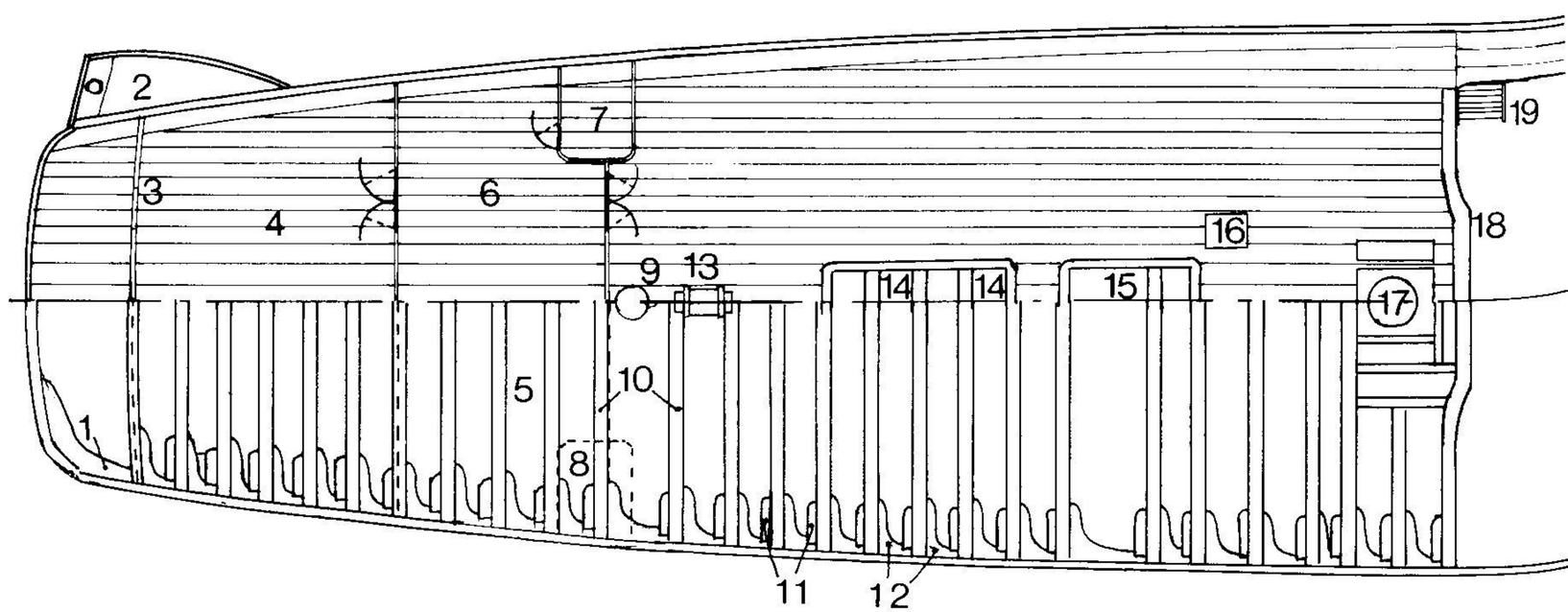
C5 QUARTERDECK AND FORECASTLE (1/192 scale)

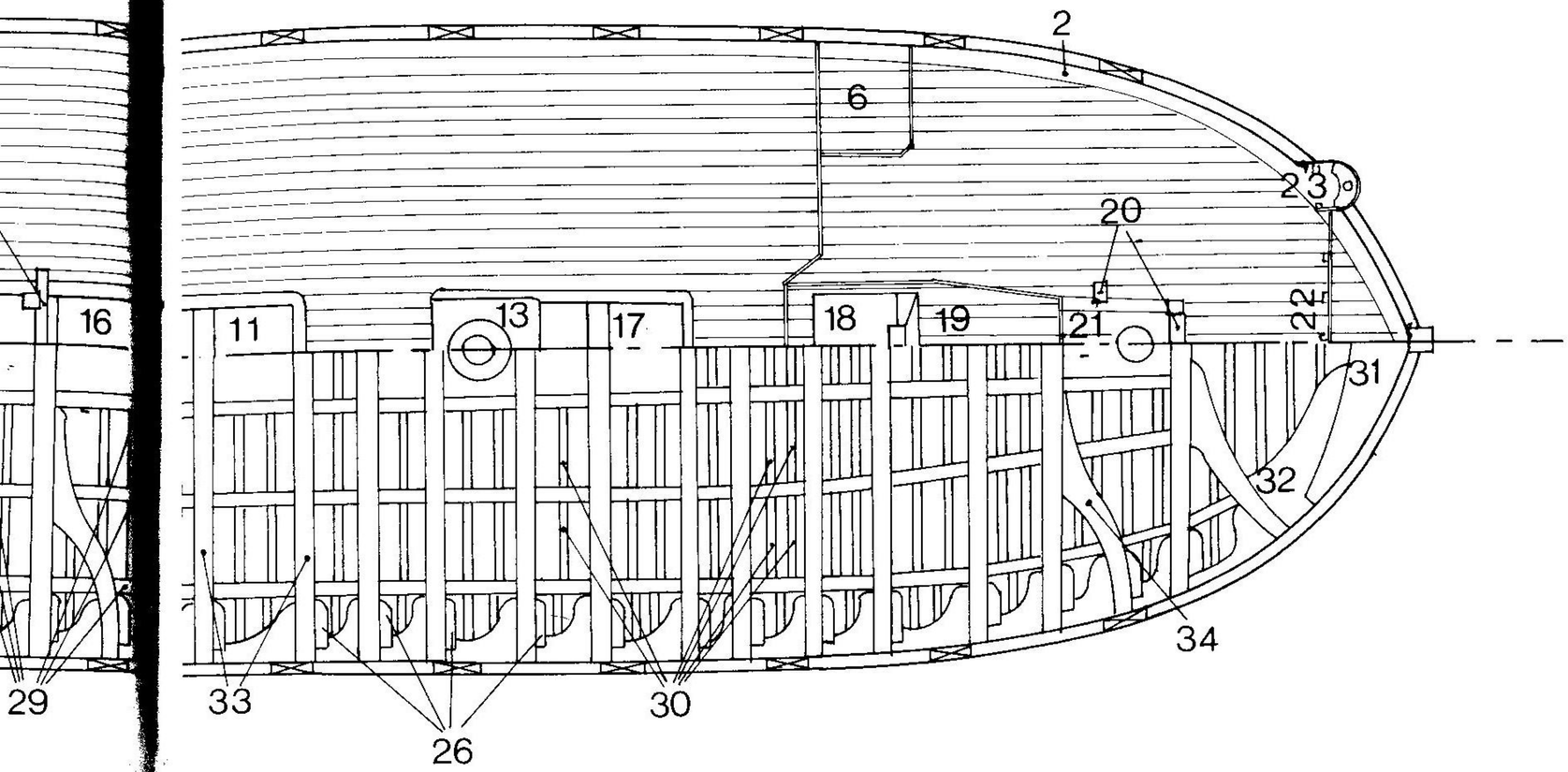
1. Transom knee
2. Quarter gallery
3. Screen bulkhead
4. Great cabin
5. Captain's bedplace
6. Lobby
7. Clerk's cabin
8. Master's sea cabin
9. Mizzen mast
10. Deck beams, 8½in × 9½in
11. Hanging knees, 6½in thick
12. Lodging knees, 6in thick
13. Steering wheel
14. Gratings
15. Ladderway
16. Scuttle for top tackle
17. Main mast
18. Quarterdeck rail
19. Ladder
20. Gangway
21. Boat booms
22. Knees of gangway
23. Forecastle rail
24. Deck beams, 9½in = 8in
25. Hanging knees, 6½in thick
26. Lodging knee, 6in thick
27. Gratings
28. Chimney for galley stove
29. Jeer bitts
30. Ladderway
30. Beakhead bulkhead

C4



C5

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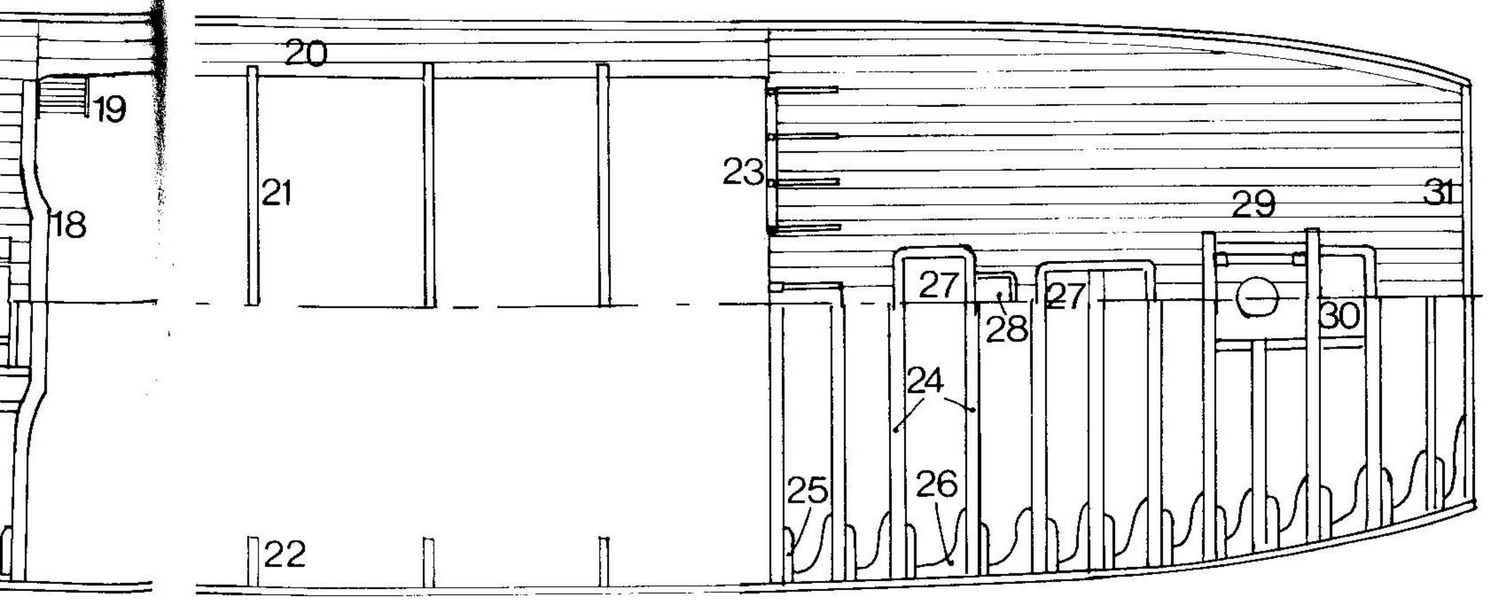
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D Decoration

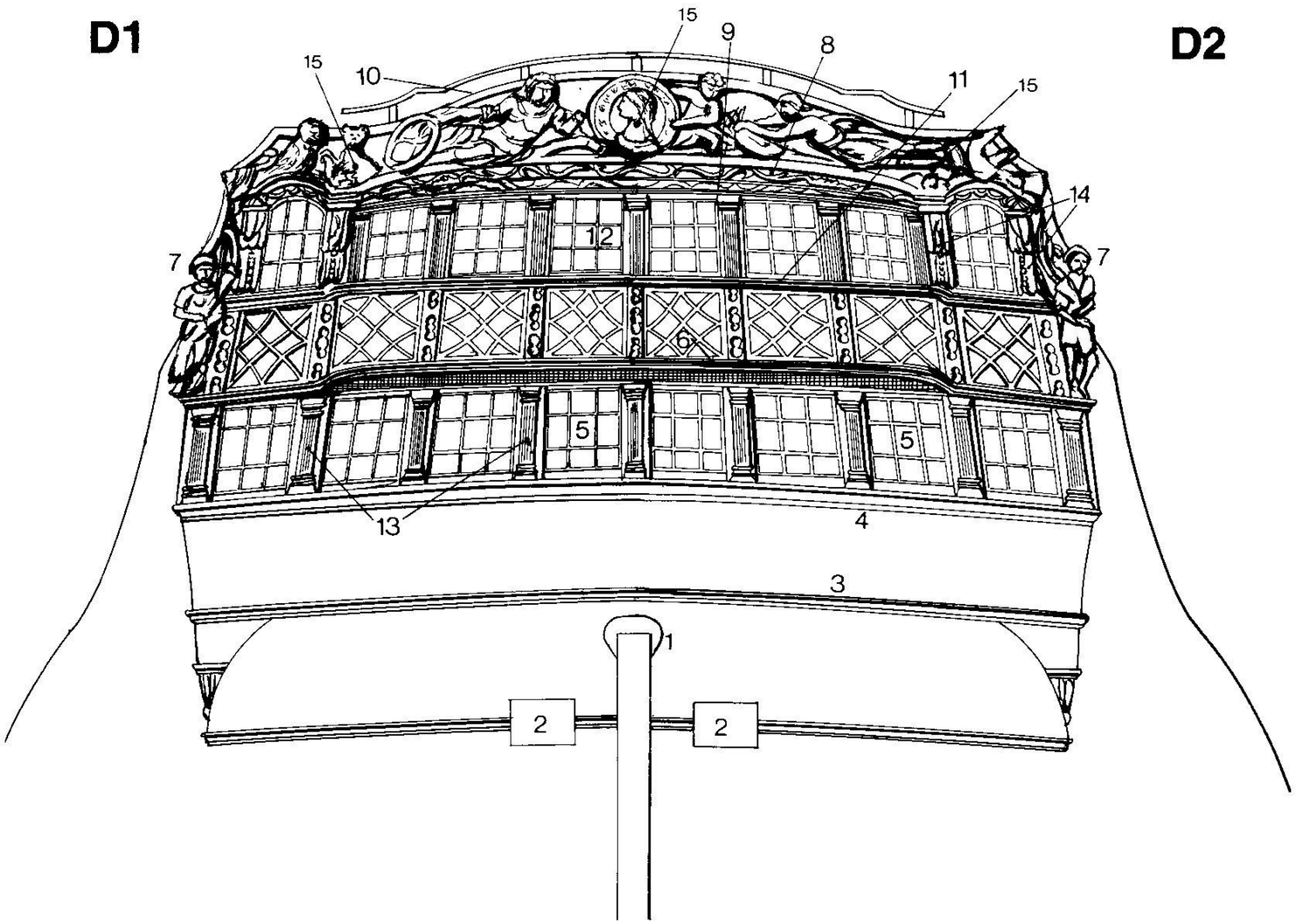
D1 DECORATIONS OF STERN (1/96 scale)

1. Helm port
2. Ports
3. Lower counter rail
4. Upper counter rail
5. Wardroom lights
6. Foot space rail
7. Quarter pieces
8. Cove
9. Necking
10. Taffrail
11. Breast rail
12. Screen bulkhead
13. Pilasters
14. Brackets
15. Positions for stern lanterns

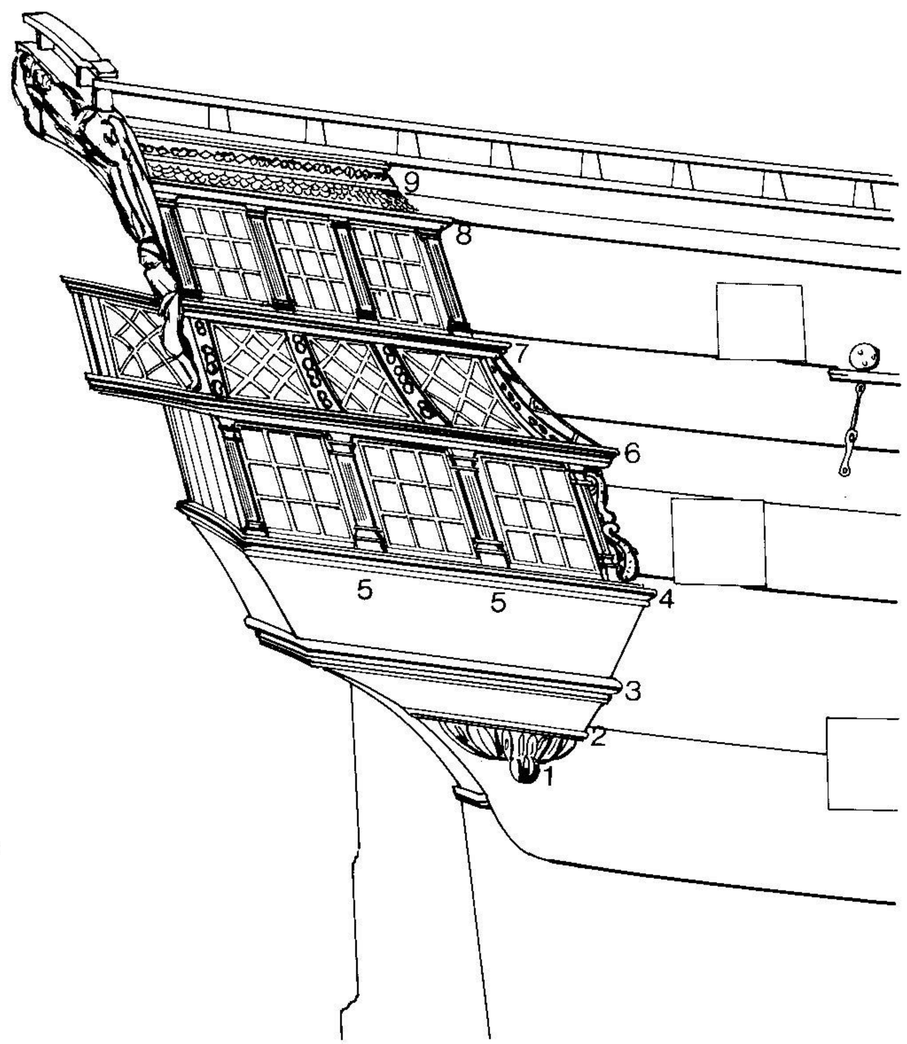
D2 QUARTER GALLERIES (1/96 scale)

1. Drop
2. Lower finishing
3. Lower stool rail
4. Lower gallery rim
5. Pilasters
6. Middle stool rail
7. Upper gallery rim
8. Upper stool rail
9. Upper finishing

D1



D2



D3 **DETAILS OF DECORATIONS ROUND QUARTERPIECES AND TAFFRAIL (D3/1–D3/6 clockwise, starting from port quarter piece. No scale)**

D4 **DETAILS OF PILASTERS, MUNNIONS, LIGHTS AND RAILS (no scale)**

D4/1 **Bracket**

D4/2 **Quarter place**

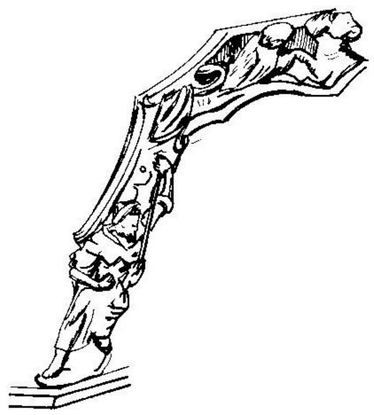
D4/3 **Rail**

D4/4 **Wardroom lights**

D5 **DETAILS OF CARVINGS ON COVE, UNDER TAFFRAIL (no scale)**

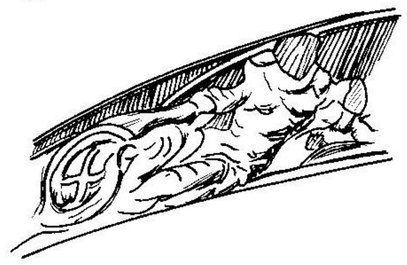
1. Taffrail
2. Necking of taffrail
3. Under side of poop deck
4. Stern gallery rail
5. Carving in cove under taffrail

D3/1

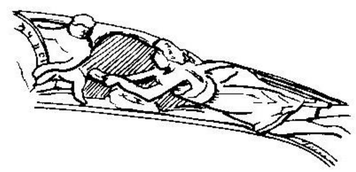


D3/2

D3/3



D3/4



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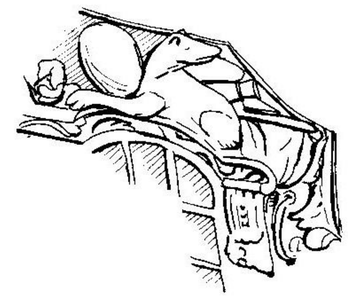

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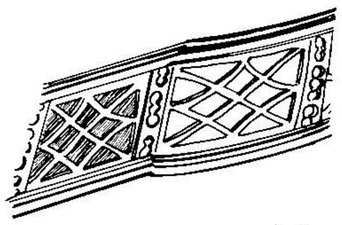
D4/1

D4/2

D4/3



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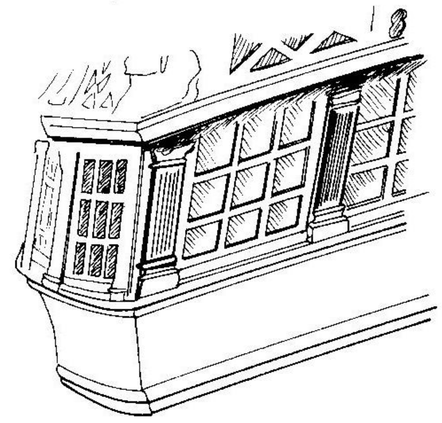

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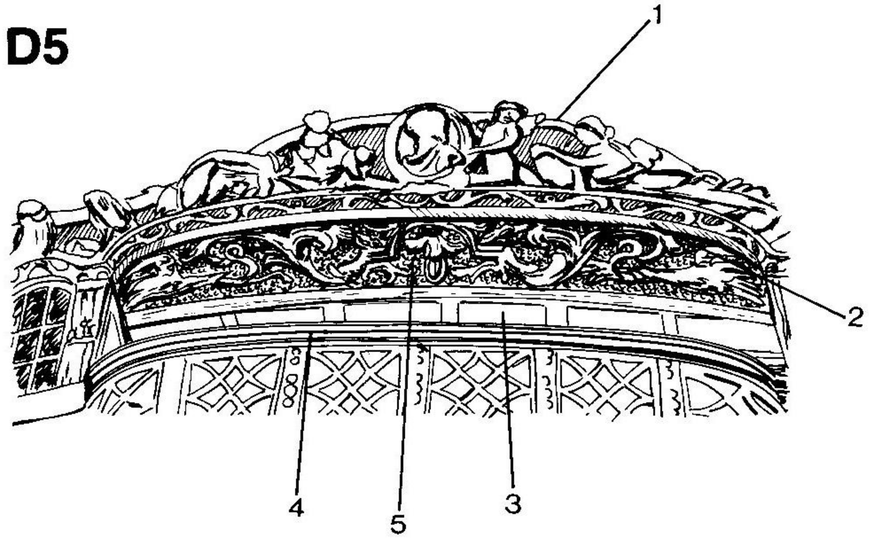


D6 PLAN OF SCREEN BULKHEAD, QUARTER GALLERIES AND STERN RAIL (1/96 scale)

1. Screen bulkhead
2. Door to gallery
3. Quarter galleries
4. Quarter gallery doors
5. Gallery rail

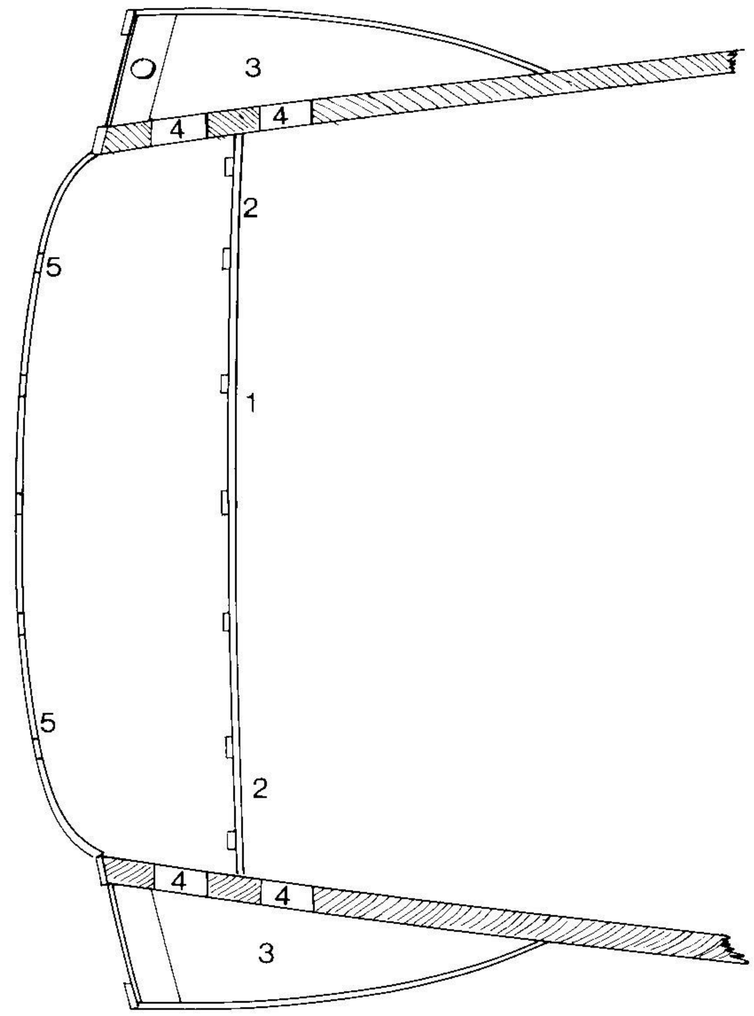
D7 SIDE VIEW OF HEAD (1/96 scale)

1. Bowsprit
2. Cathead
3. Main rail head
4. Cat block
5. Figurehead
6. Knighthead
7. Cathead supporter
8. Ekeing
9. Main rail
10. Middle rail
11. Lower rail
12. Upper cheek
13. Lower cheek
14. Trailboard
15. Hawse holes
16. Main bracket
17. Iron frame to support boomkin

D8 FRONT VIEW OF HEAD (1/96 scale)

1. Main rail
2. Figurehead
3. Lower rail
4. Cheeks
5. Hawse holes
6. Main rail head
7. Cathead
8. Roundhouse
9. Knee of the head
10. Door to beakhead
11. Knighthead

D6



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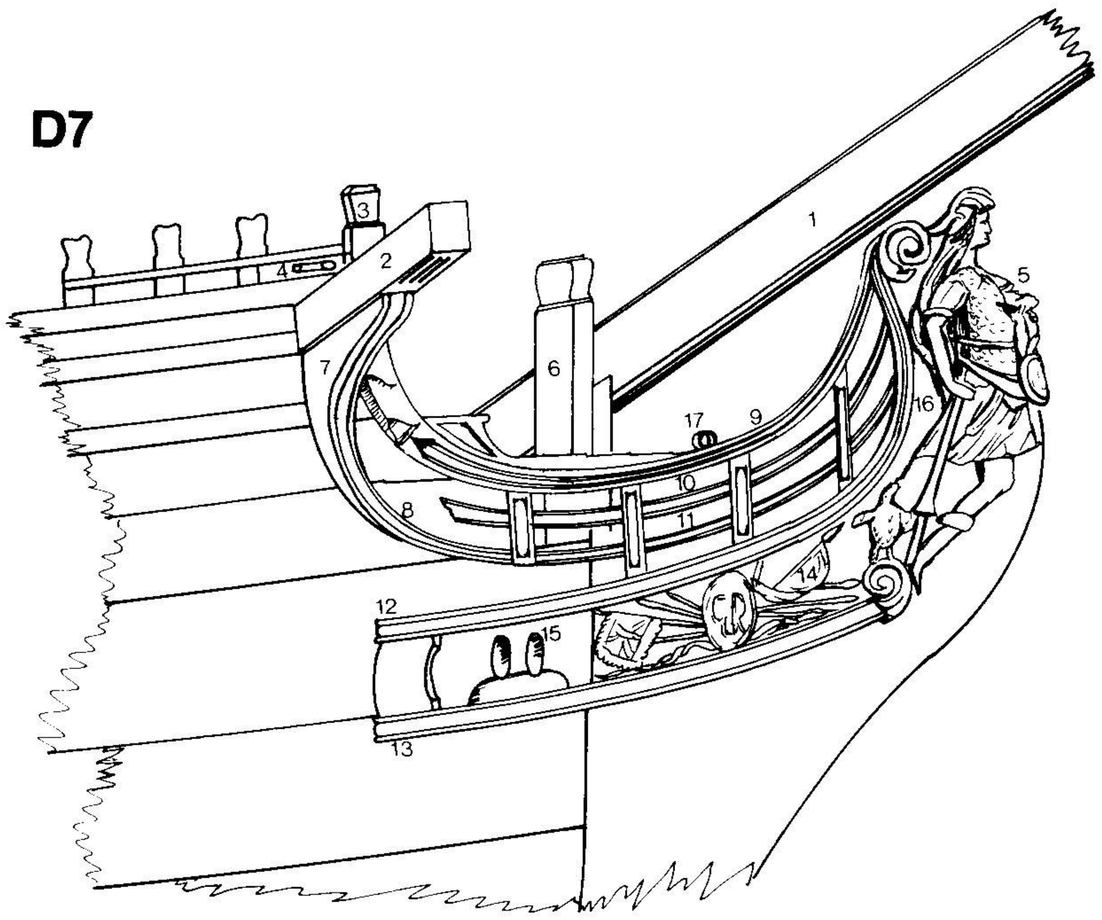

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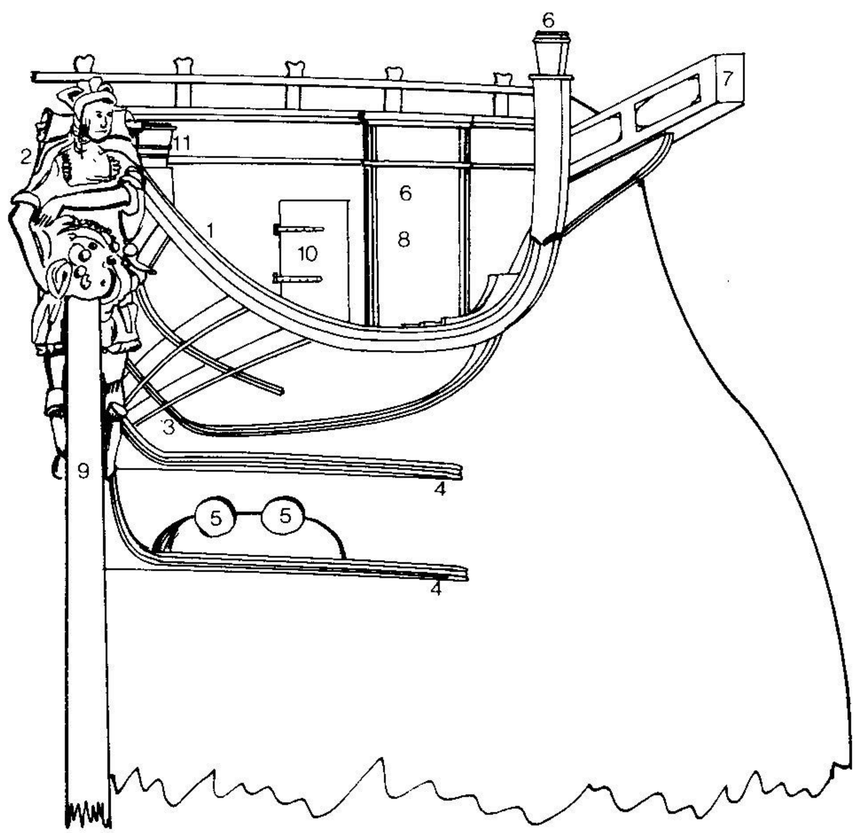


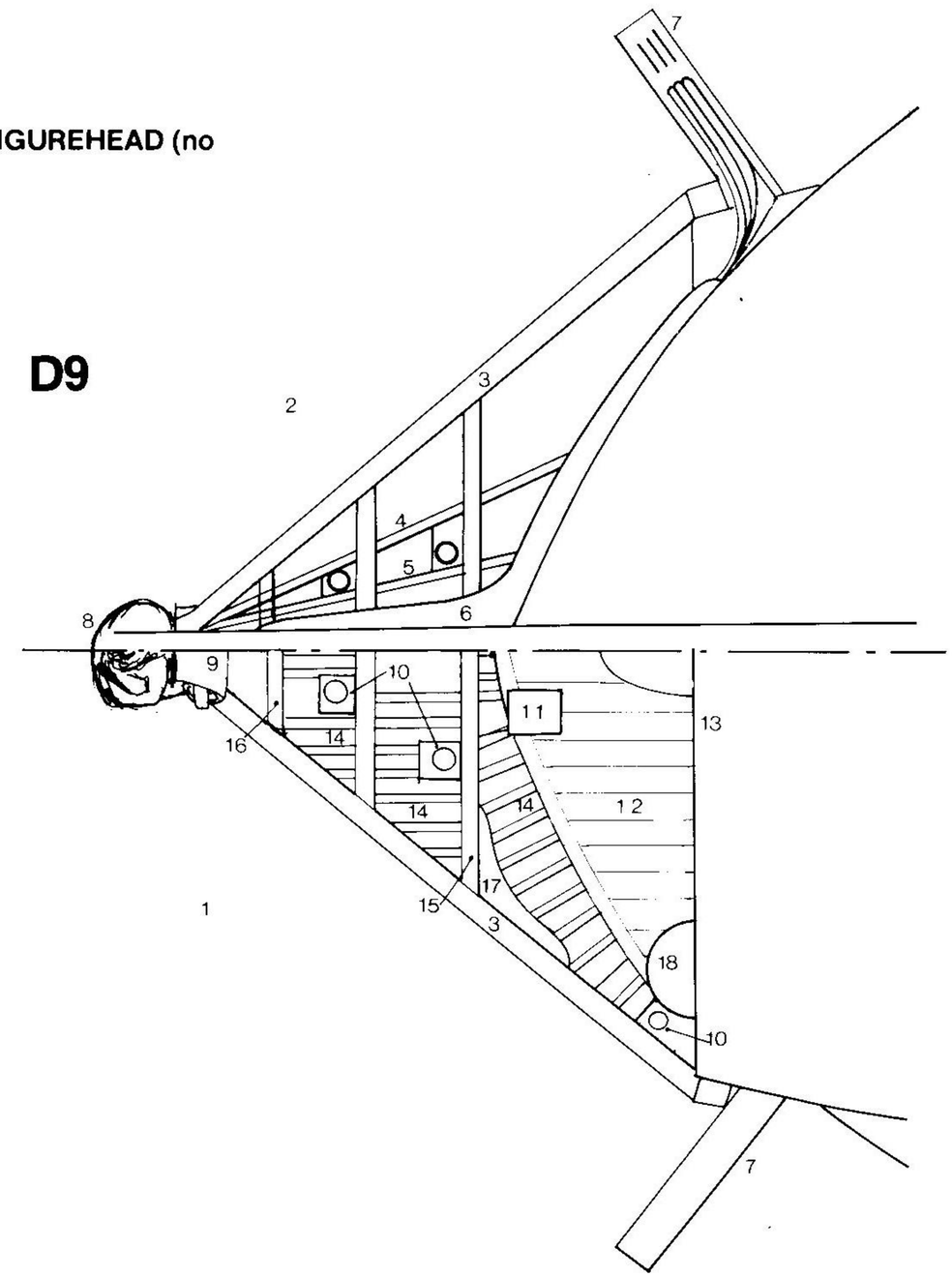
D9 HEAD, FROM ABOVE AND BELOW (1/96 scale)

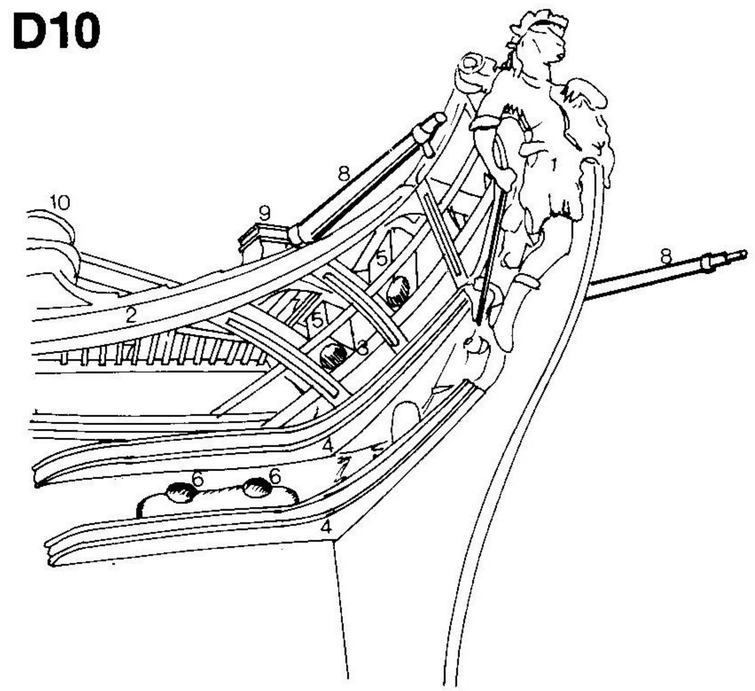
1. From above
2. From below
3. Main rail
4. Middle rail
5. Lower rail
6. Cheeks
7. Cathead
8. Figurehead
9. Scroll
10. 'Seats of ease'
11. Knighthead
12. Part of upper deck
13. Beakhead bulkhead
14. Gratings
15. Head beam
16. Cross beam
17. Knee
18. Roundhouse

D10 HEAD FROM BELOW (no scale)

1. Figurehead
2. Upper rail
3. Lower rail
4. Cheeks
5. Discharge pipes from seats of ease
6. Hawse holes
7. Gratings
8. Boomkins
9. Knighthead
10. Roundhouse

D11 DETAILS OF FIGUREHEAD (no scale)





E1 **POOP RAIL AS FITTED BEFORE 1780 (1/120 scale)**

1. Poop deck
2. Rail
3. Taffrail
4. Stanchions of hammock netting

E2 **POOP RAIL AS FITTED AFTER 1780, WITH PORTS FOR CARRONADES (1/120 scale)**

1. Rail
2. Belaying kevels
3. Carronade ports
4. Poop deck

E3 **RAIL AT THE BREAK OF THE POOP (1/120 scale)**

1. Deck beam
2. Top of the side
3. Stanchions of hammock netting

E4 **QUARTERDECK RAIL (1/120 scale)**

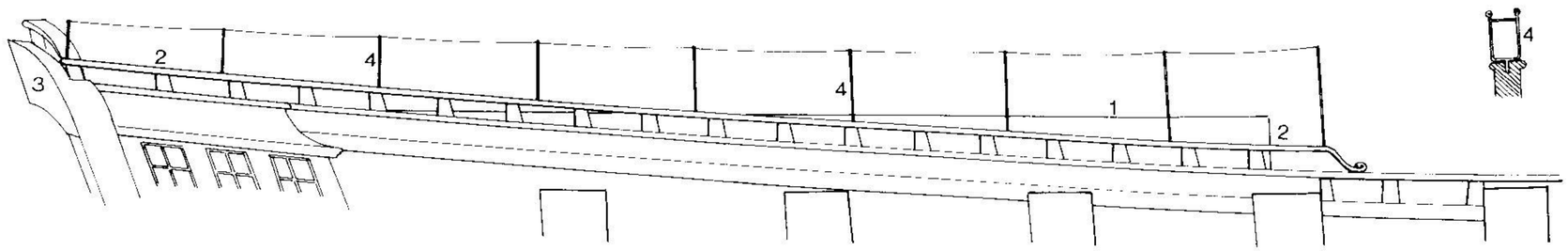
1. Quarterdeck
2. Staghorns
3. Kevels
4. Stanchions of hammock netting

E5 **RAIL AT THE BREAK OF THE QUARTERDECK (1/120 scale)**

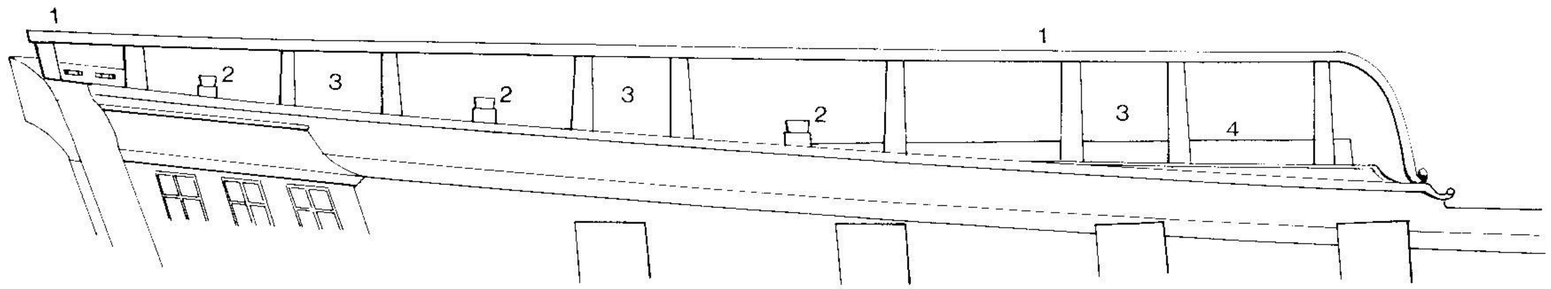
1. Cross section
2. Plan view
3. Rails
4. Stanchions of the rails
5. Quarterdeck beam
6. Stanchions of hammock netting

E6 **DETAILS OF HAMMOCK NETTING (no scale)**

1. Metal stanchions, or hammock cranes
2. Cross bar
3. Pin, to fit into hole in rail
4. Rope
5. Netting
6. Hammocks
7. Cover (tarred before 1780, painted afterwards)



E1



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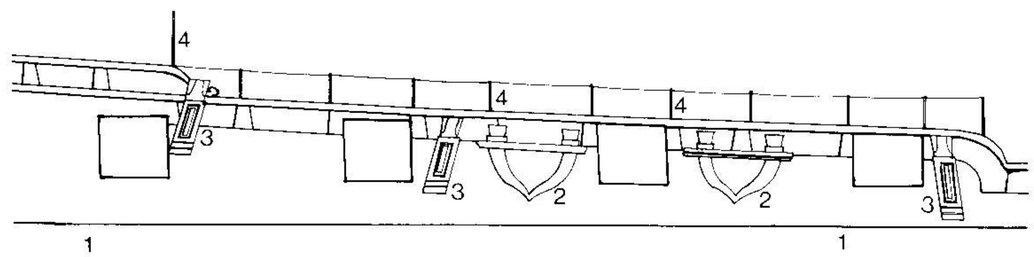

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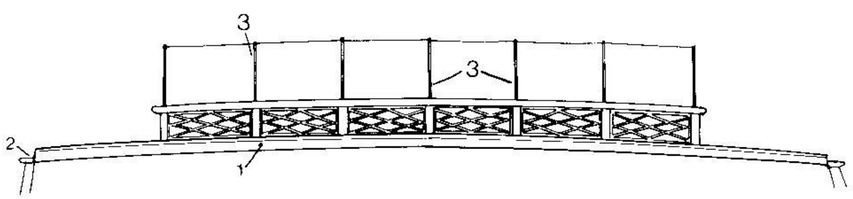
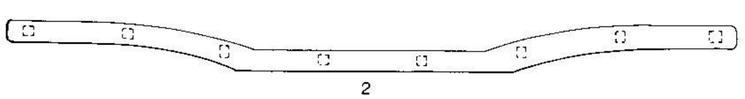
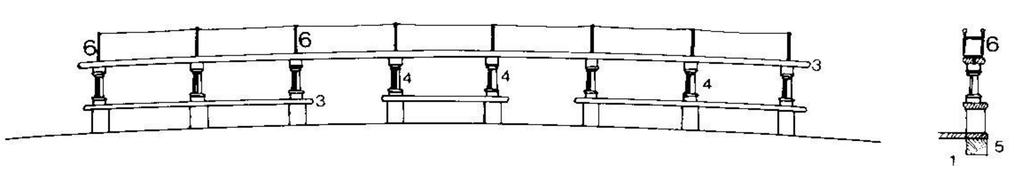


E3

E5





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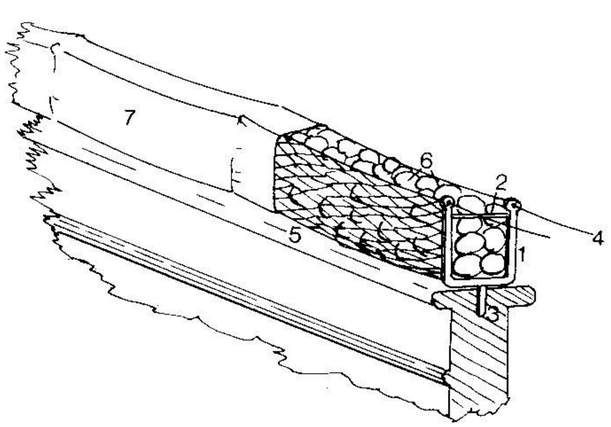


E7 **RAIL AT THE BREAK OF THE POOP, AND BELFRY (1/120 scale)**

1. Belfry
2. Bell
3. Side view of belfry
4. Arm for ringing bell
5. Rotating beam
6. Stanchions, with belaying points at their heads
7. Section of the rail
8. Rail
9. Knee

E8 **FORECASTLE RAIL (1/120 scale)**

1. Timberheads
2. Cat block
3. Main rail head
4. Gunports

E9 **DETAILS OF TAFFRAIL**

E9/1 **Section (1/120 scale)**

E9/2 **Inboard view (no scale)**

1. Poop deck
2. Taffrail
3. Screen bulkhead
4. Quarter gallery doors
5. Arch above gallery
6. Knees
7. Rail
8. Fixings for ensign staff
9. Ensign staff

E10 **COMPANION ON POOP DECK (1/120 scale)**

E11 **DETAILS OF HATCHES AND GRATINGS (forward hatch on quarterdeck illustrated. 1/60 scale)**

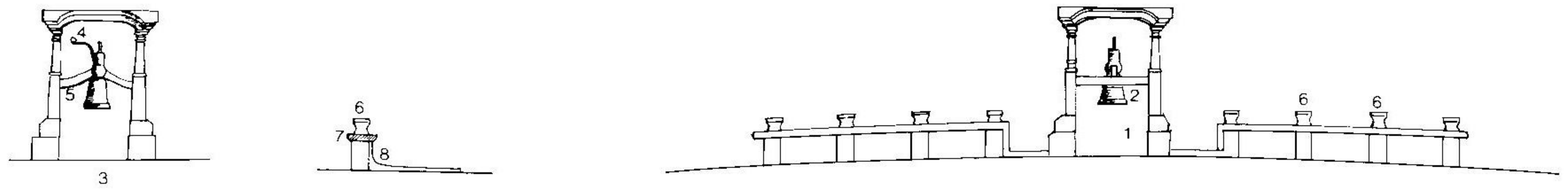
E11/1 **Plan view**

E11/2 **Longitudinal section**

E11/3 **Arthwartship section**

1. Deck beams
2. Coaming (3in above deck plank)
3. Head ledges (rounding of 1½in more than deck)
4. Ledges of gratings (3in × 3½in)
5. Battens of gratings (3in × 3¾in)
6. Deck plank

E7



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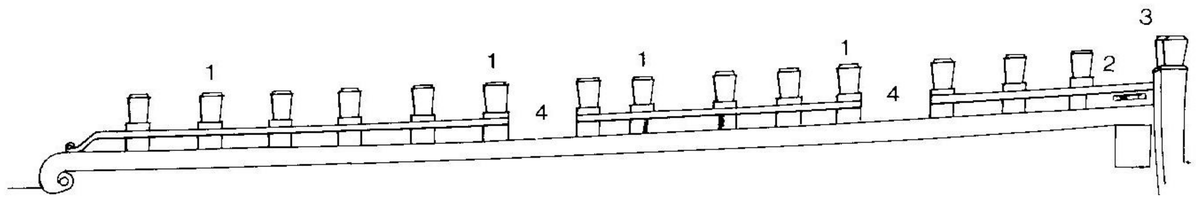

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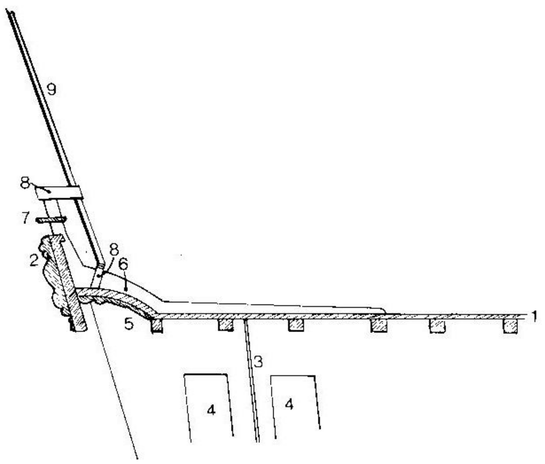

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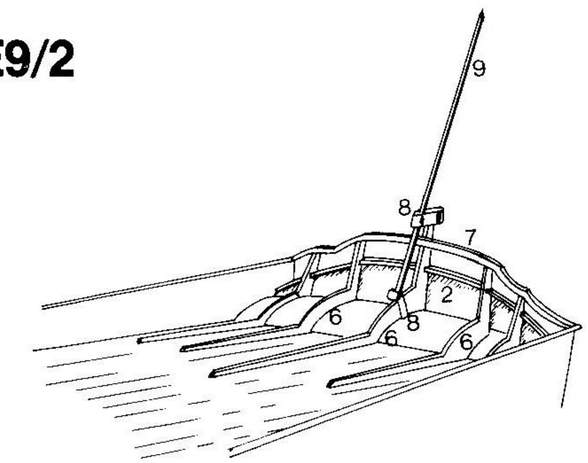

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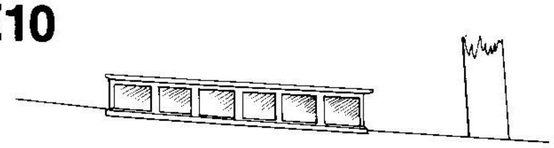

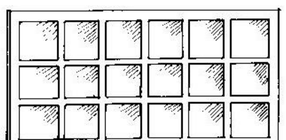

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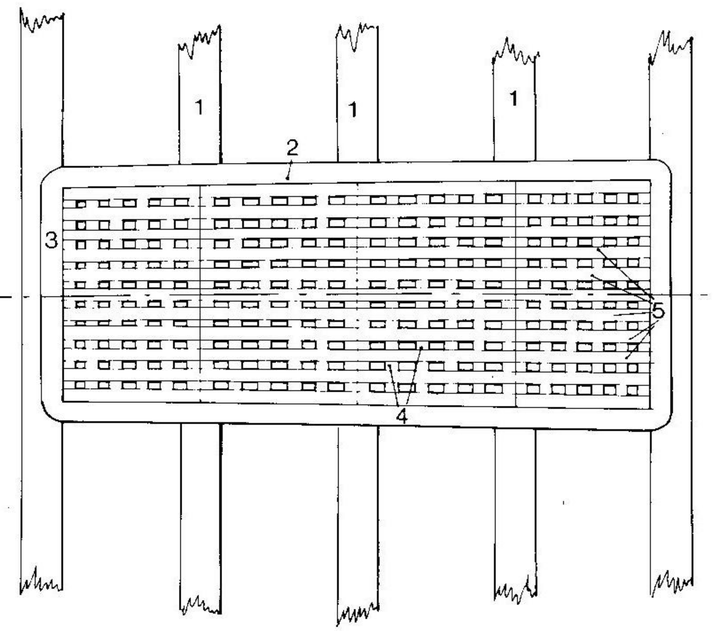

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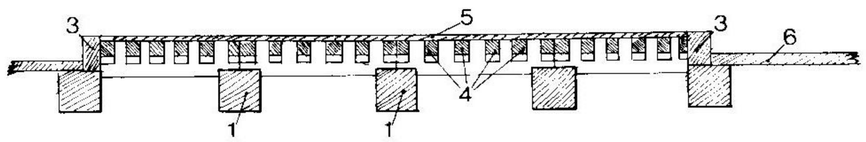

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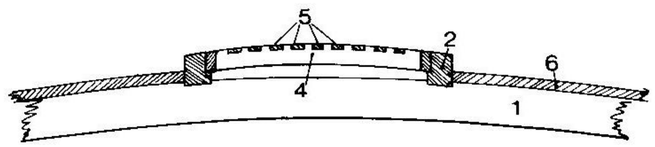


E External details

E12 DETAILS OF SKID BEAMS AND SIDE STEPS (1/120 scale)

1. Cross section at a - a
2. Cross section at b - b
3. Steps
4. Skid beams, for raising barrels, etc, and to protect sides against boats being raised, in combination with the forward beam, called the boat beam

E13 SCREEN BULKHEAD (1/120 scale)

1. Doors to stern gallery
2. Side view, showing door to quarter gallery
3. Door to quarter gallery

E14 BULKHEAD OF THE POOP (1/120 scale)

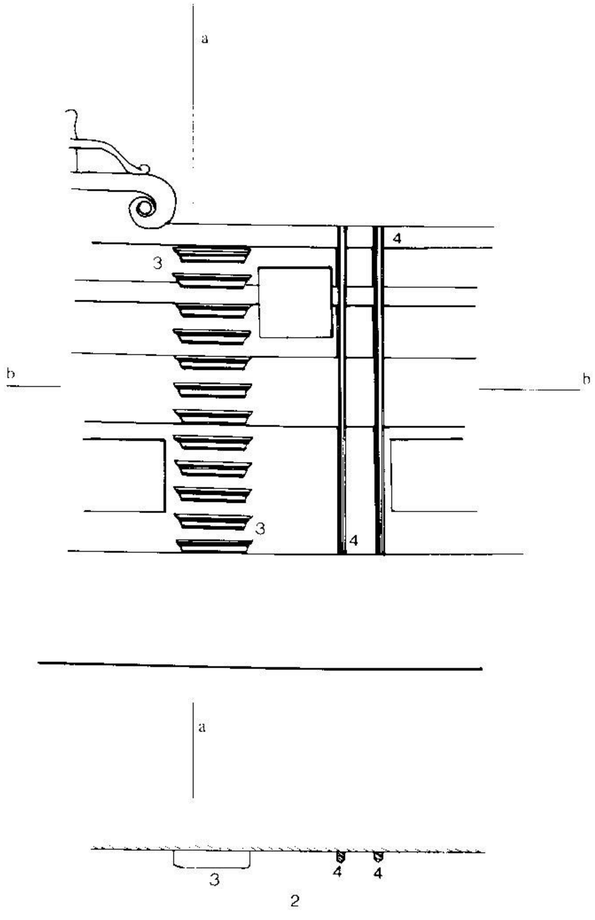
E14/1 Front view

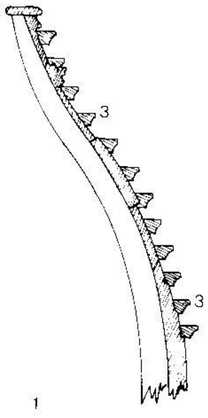
E14/2 Sectional view

E14/3 Plan view

1. Quarterdeck
2. Poop beams
3. Doors to captain's cabin
4. Master's sea cabin
5. Captain's clerk's cabin
6. Door
7. Master's cabin side

E12





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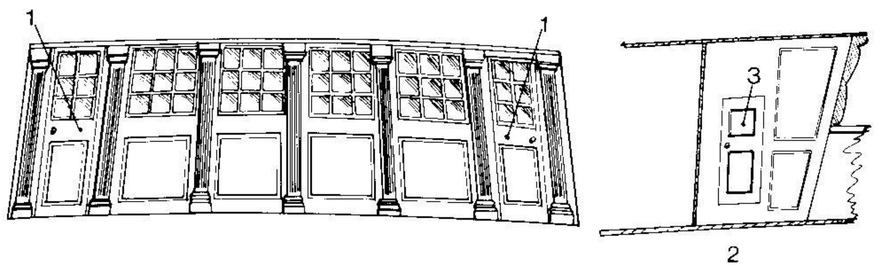

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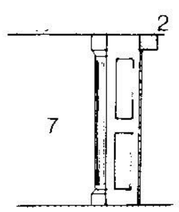

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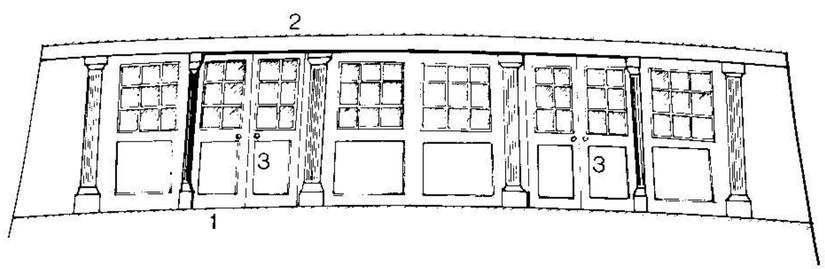

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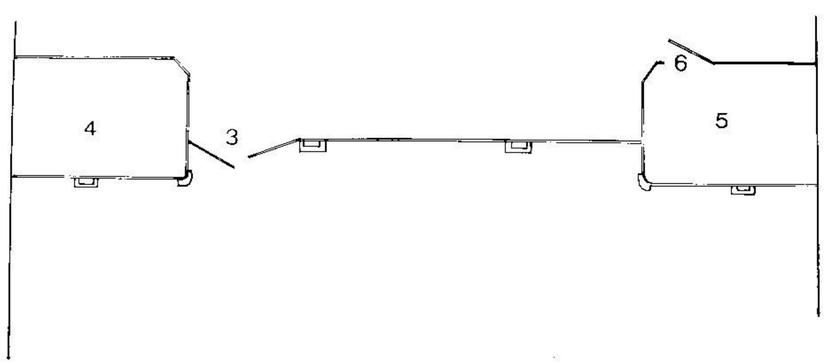


E15 BULKHEAD OF FORECASTLE (1/120 scale)

E15/1 Front view

E15/2 Plan view

1. Galley stove
2. Boatswain's cabin
3. Carpenter's cabin
4. Doors
5. Windows
6. Forecastle beams

E16 MIZZEN BITTS (1/120 scale)

E16/1 Front view

E16/2 Side view

1. Mizzen mast
2. Quarterdeck beams
3. Bitt pins
4. Cross piece

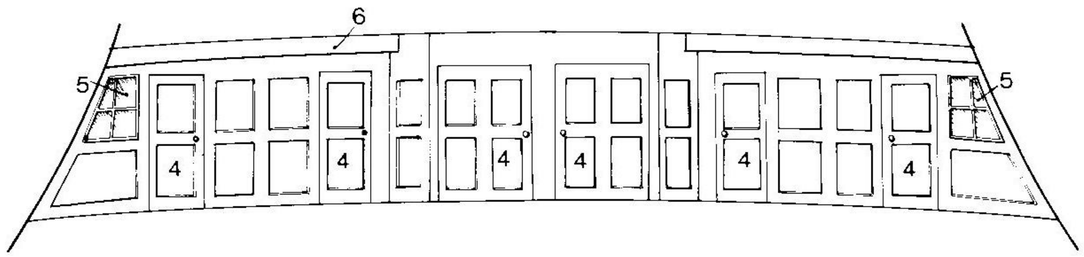
E17 MAIN BITTS (1/120 scale)

E17/1 View from aft

E17/2 Side view

1. Main mast
2. Quarterdeck beams
3. Upper deck beams
4. Lower deck beams
5. Jeer bitts
6. Topsail sheet bitts
7. Bitt pin
8. Cross piece
9. Sheaves
10. Brace bitts

E15/1



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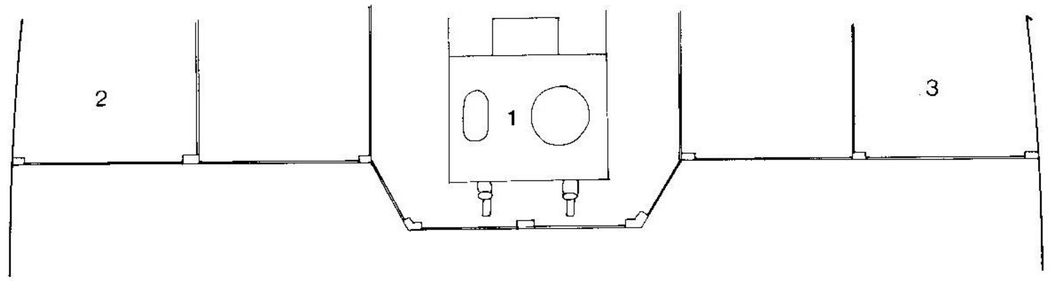

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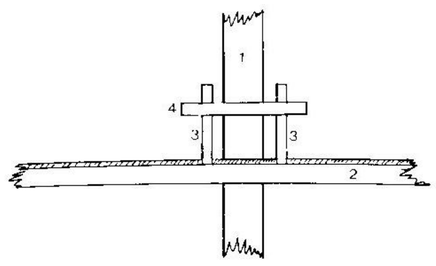

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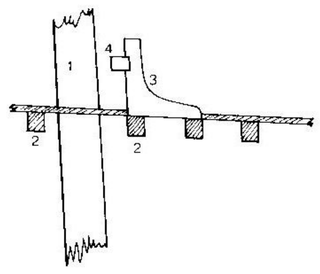

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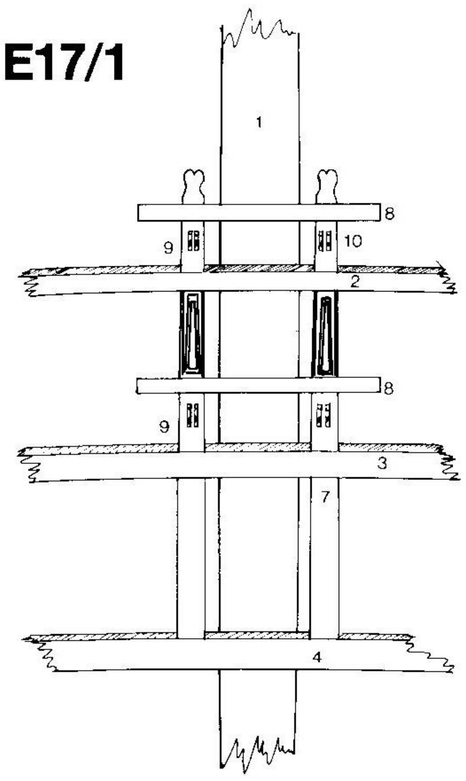

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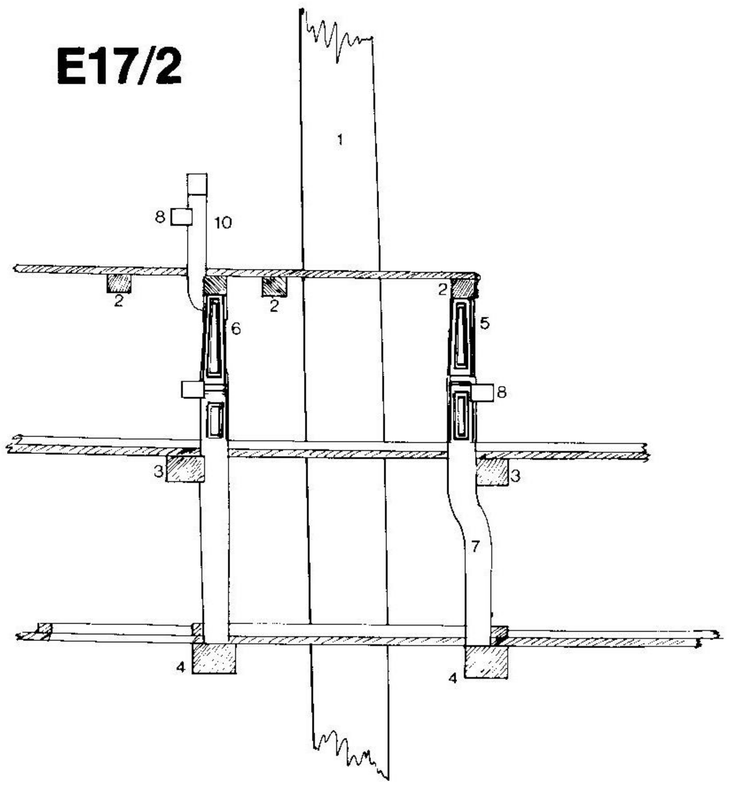


E External details

E18 FORE MAST BITTS (1/120 scale)

E18/1 View from aft

E18/2 Side view

1. Fore mast
2. Forecastle beams
3. Upper deck beams
4. Fore jeer bitts
5. Fore topsail sheet bitts
6. Bitt pin
7. Cross piece
8. Sheaves

E19 LADDER FROM QUARTERDECK TO POOP, AND RAIL ROUND HATCHWAY (1/120 scale)

E19/1 Side view

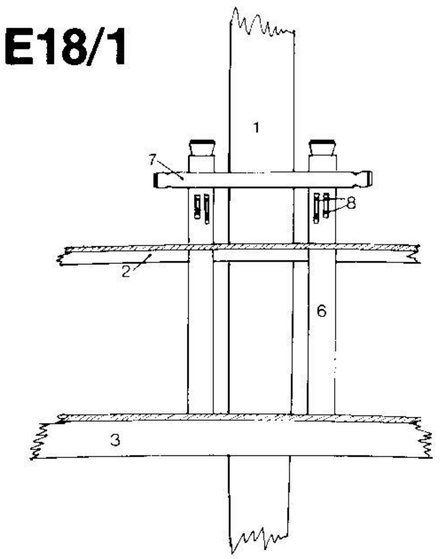
E19/2 View from forward

E20 STERN LANTERNS (1/30 scale)

E20/1 End view

E20/2 Side view of lantern and bracket

E18/1



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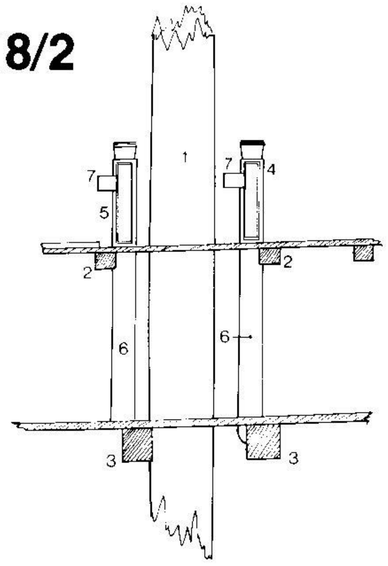

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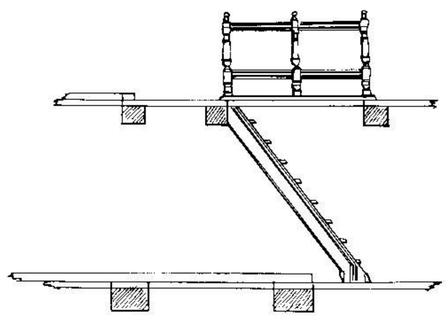

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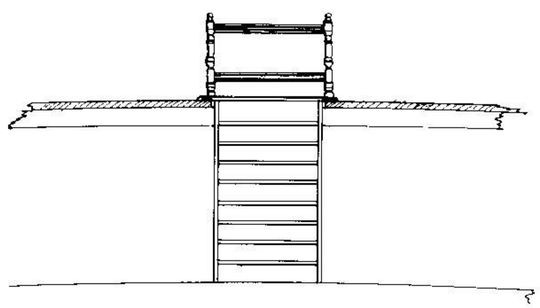
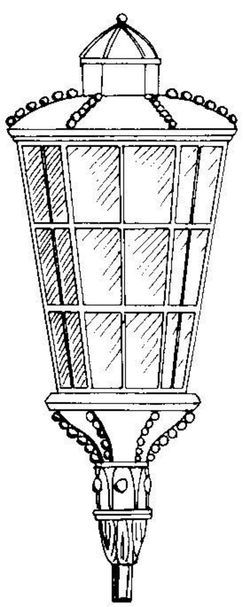


E20/1



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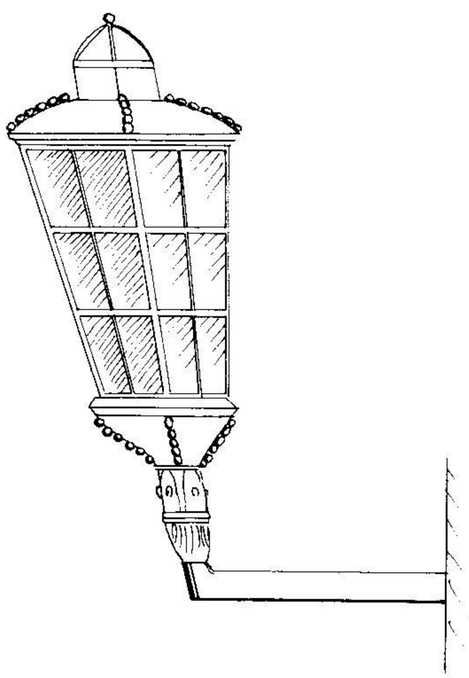


F Fittings

F1 **STEERING WHEEL (1/72 scale)**

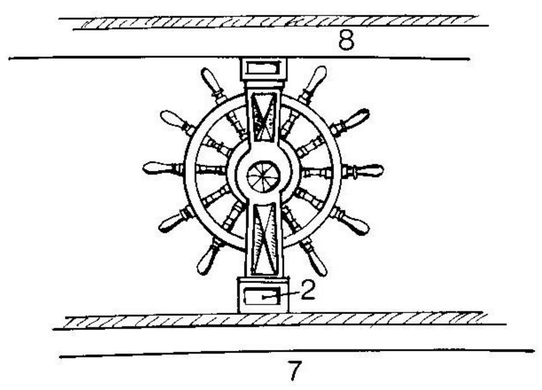
F1/1 **Athwartship view**

F1/2 **Side view**

1. Roll of wheel
2. Stanchions supporting wheel
3. Pillars
4. Tiller rope
5. Hole to lead tiller rope below to tiller
6. Binnacle
7. Quarterdeck beams
8. Poop deck beams
9. Mizzen mast

F2 **DETAIL OF WHEEL (1/36 scale)**

F1/1



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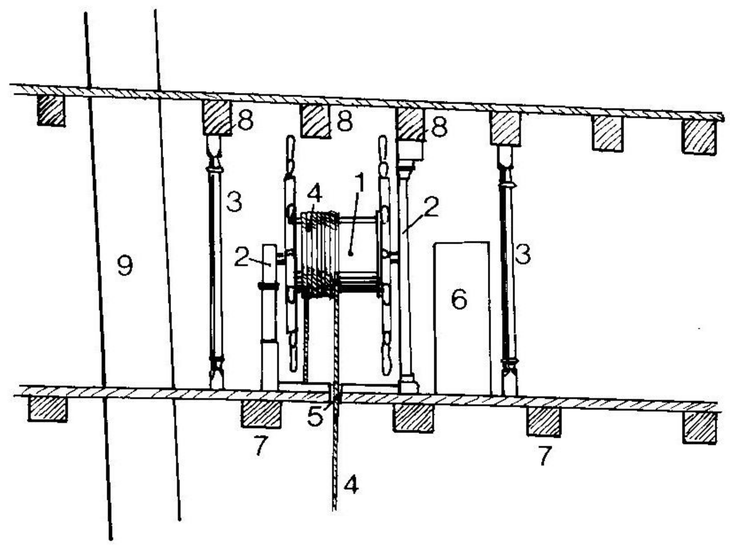

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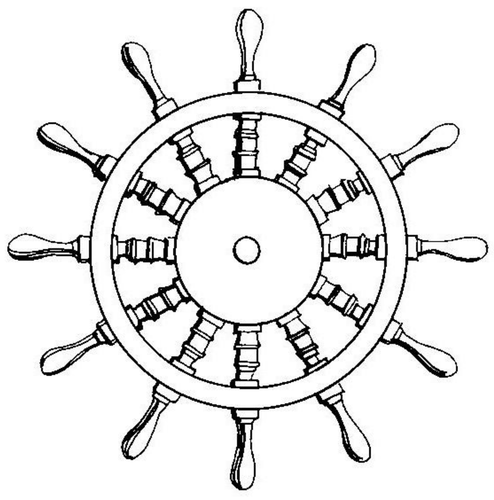


F Fittings

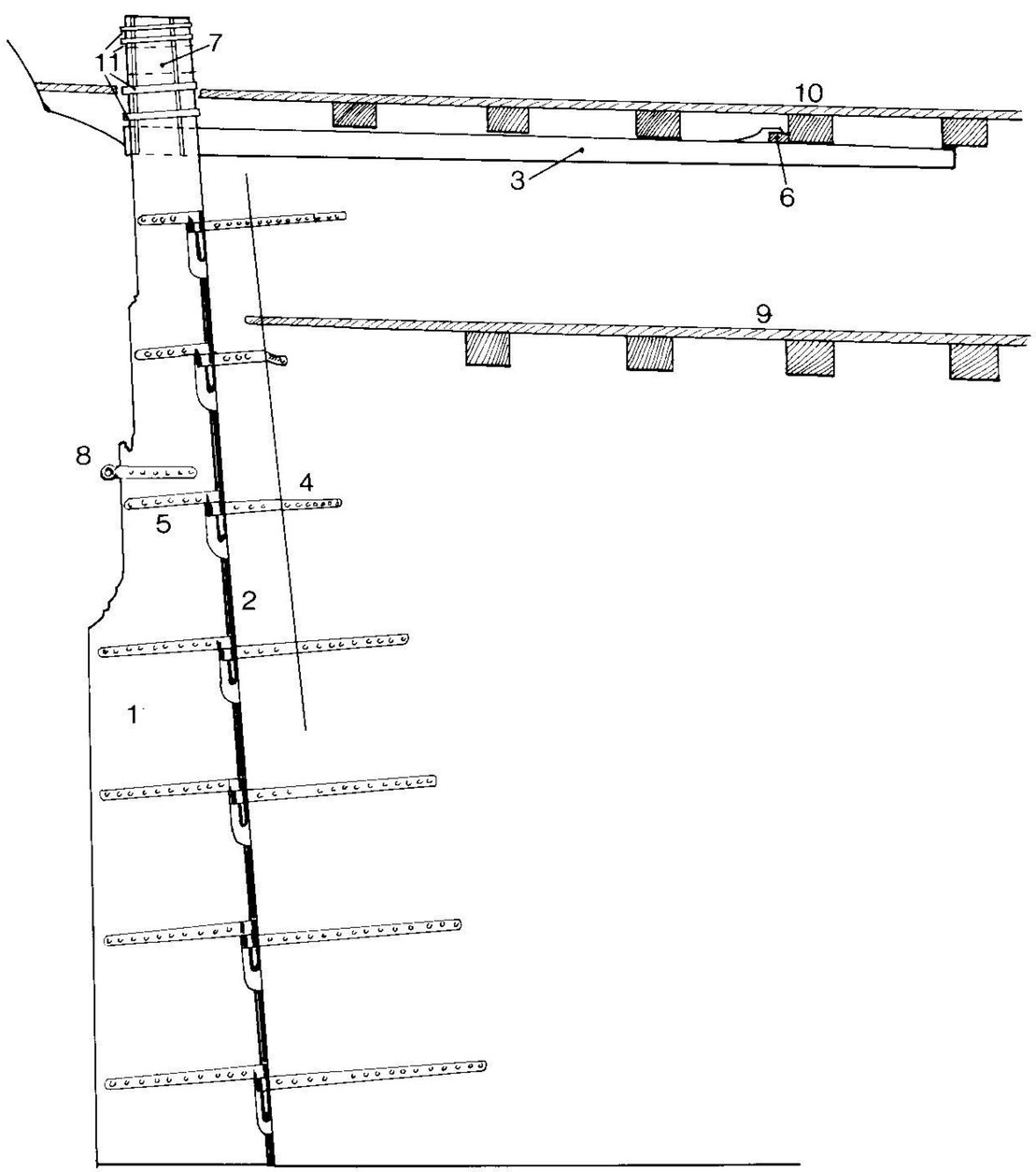
F3 RUDDER AND TILLER (1/96 scale)

F3/1 Side view

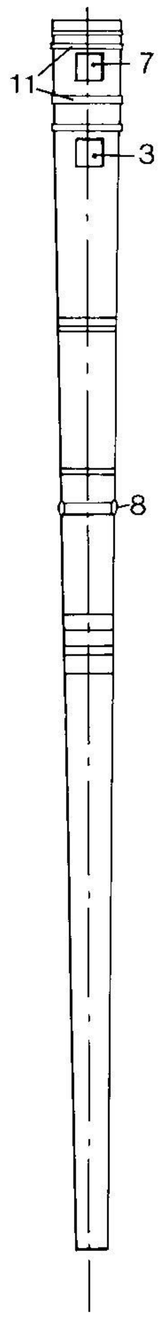
F3/2 End view of rudder

1. Rudder
2. Sternpost
3. Tiller
4. Gudgeons
5. Pintles
6. Sweep
7. Hole for emergency tiller
8. Point for fixing emergency steering chains
9. Gundeck
10. Upper deck
11. Iron reinforcement at head of rudder

F3/1



F3/2



F4 **TILLER AND SWEEP AS SEEN FROM UNDER THE UPPER DECK (1/96 scale)**

1. Tiller
2. Rudder
3. Sweep
4. Tiller ropes
5. Block
6. Tackle for tightening tiller ropes
7. Hole in upper deck for rudder
8. Upper deck beam

F5 **CROSS SECTION PLAN OF RUDDER AND PINTLE (1/96 scale)**

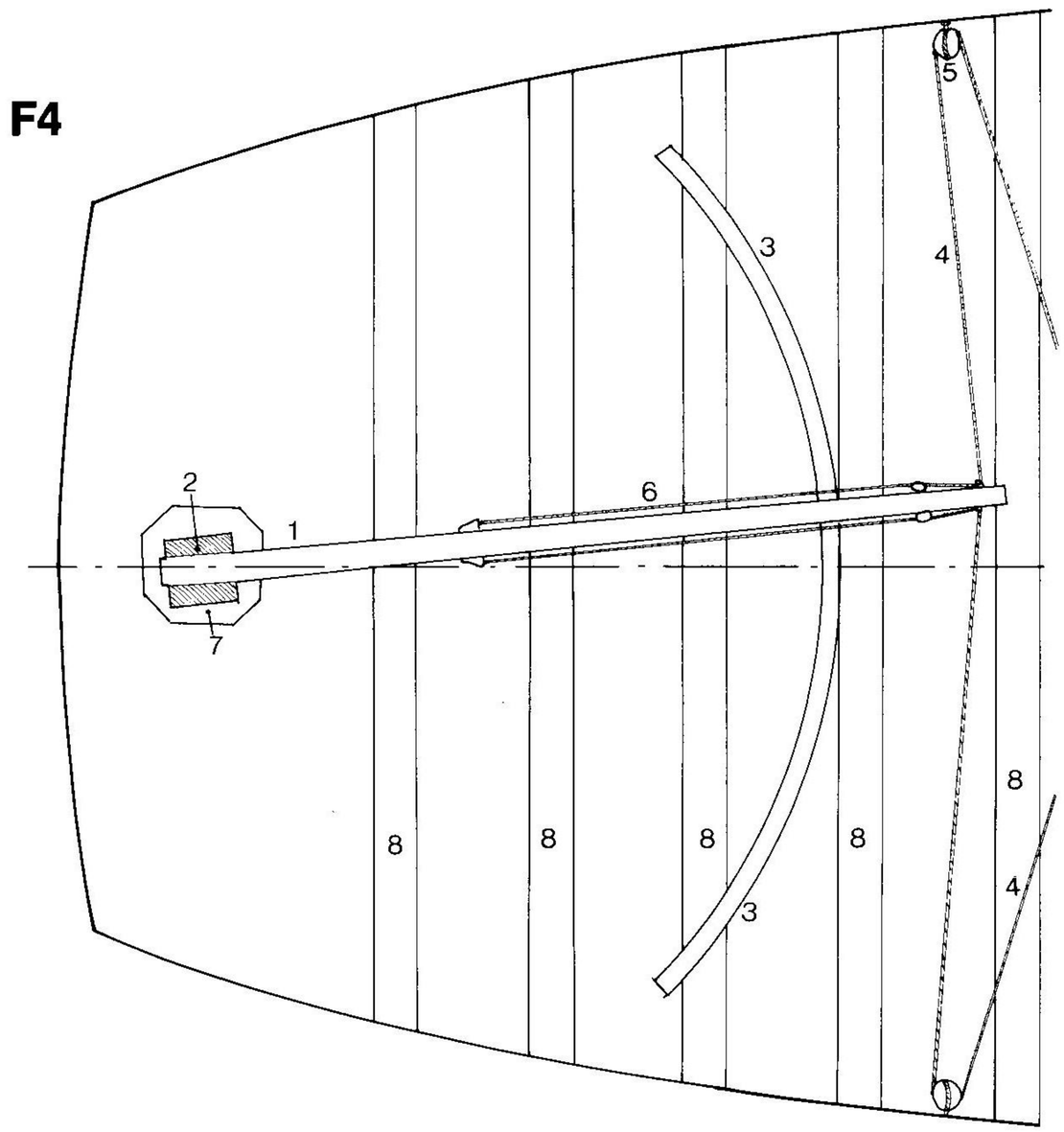
F5/1 **At second gudgeon from bottom**

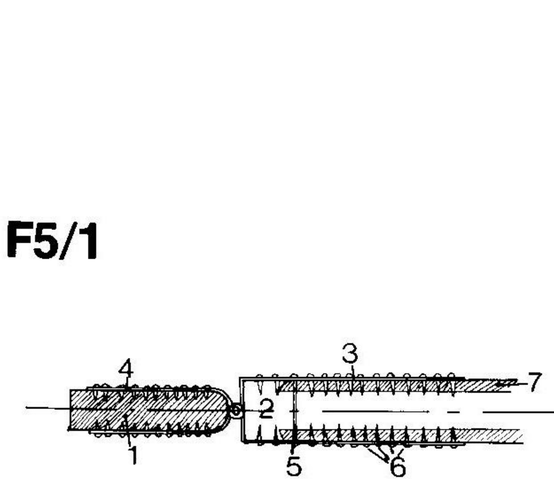
F5/2 **At fifth from bottom**

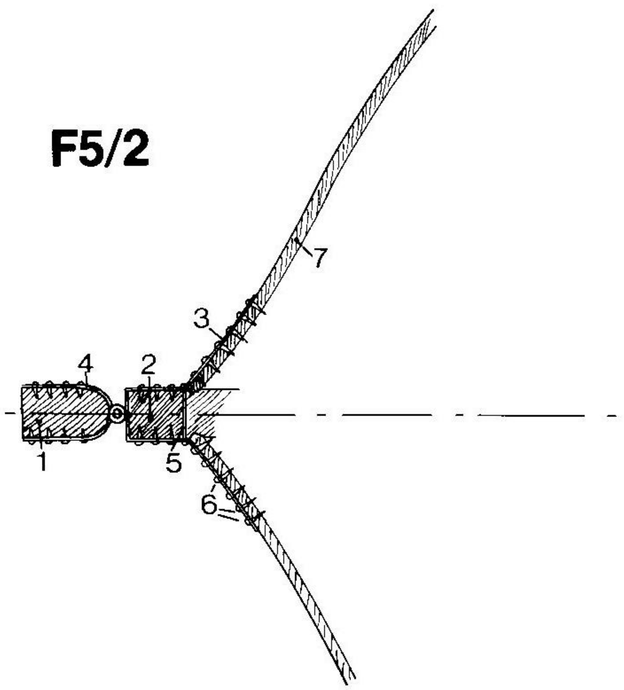
1. Rudder
2. Sternpost
3. Gudgeon
4. Pintle
5. Bolts
6. Nails
7. Planking of hull

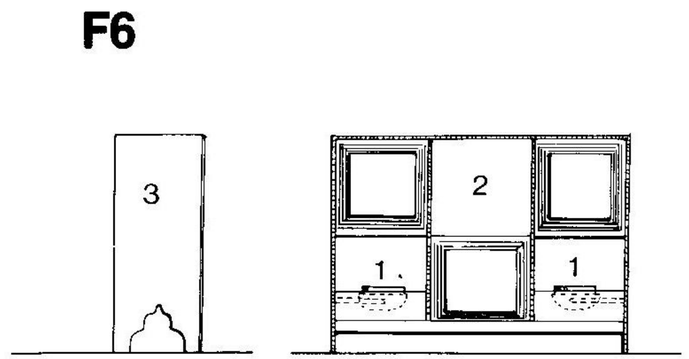
F6 **BINNACLE (1/48 scale)**

1. Compasses
2. Centre section, containing light
3. Side view



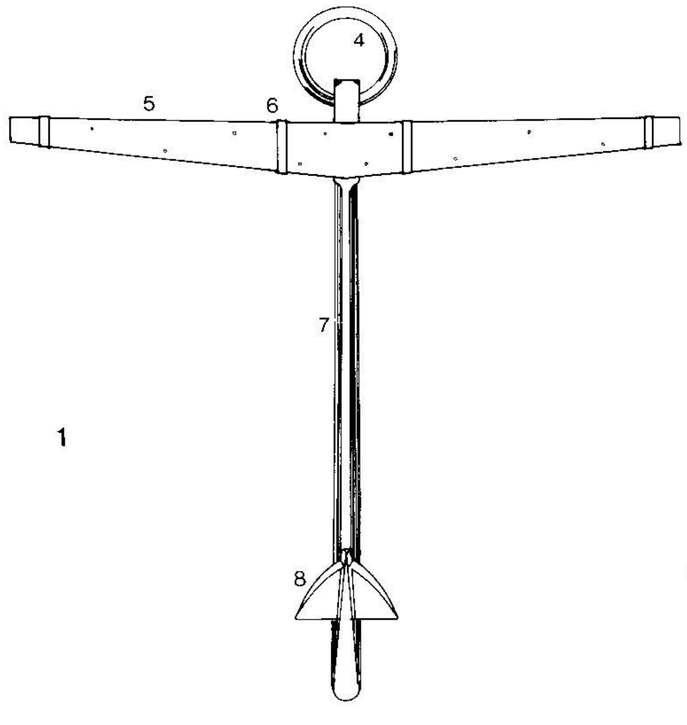






F7 ANCHORS (1/96 scale)

1. Sheet and bower anchors (two of each carried, total of four): weight 71cwt each; length of shank, 18ft 5in; length of arms, 6ft 1in
2. Stream anchor (one carried): weight 17½cwt; length of shank, 12ft 6in; length of arms, 4ft 2in
3. Kedge anchor (one carried); weight 8½cwt; length of shank, 9ft 6in; length of arms, 3ft 2in
4. Ring
5. Stock, iron on kedge, wooden on others, constructed in two halves and held together by hoops
6. Hoops
7. Shank
8. Palm
9. Arm
10. Snape
11. Crown
12. Puddening of anchor ring



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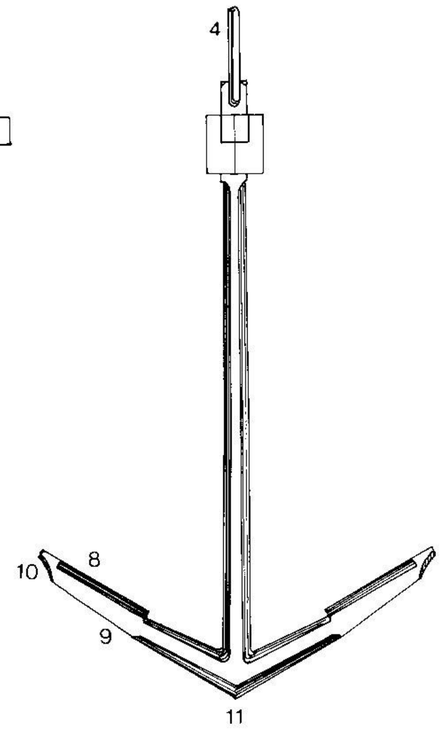

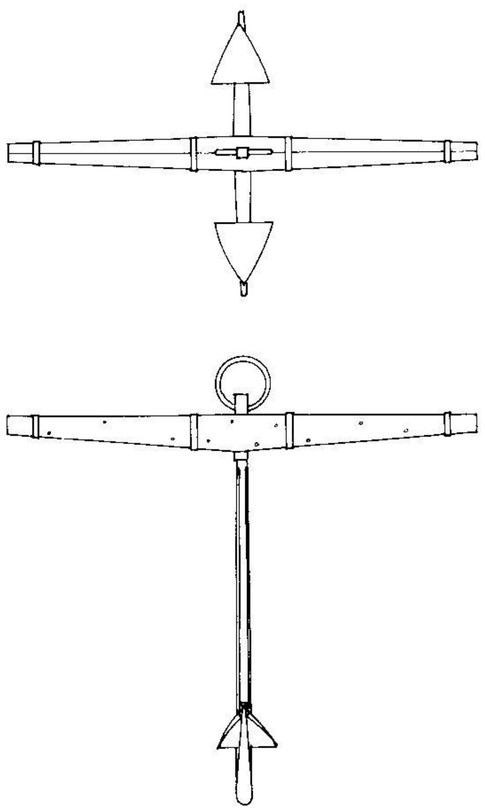

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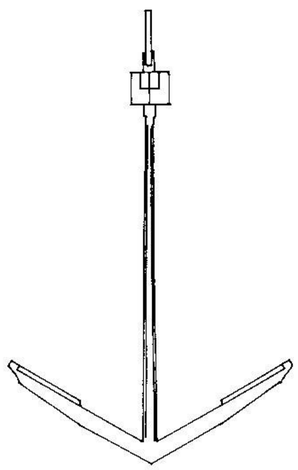

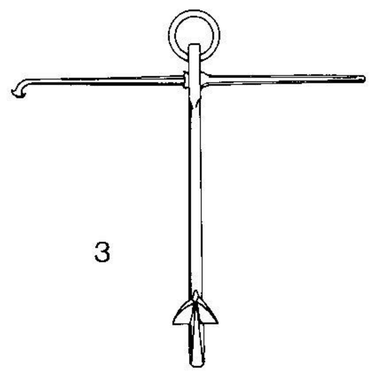

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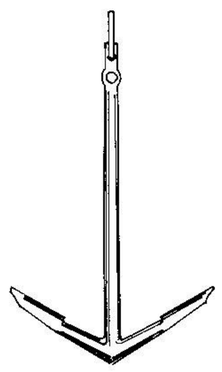
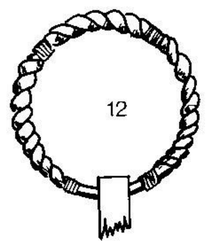
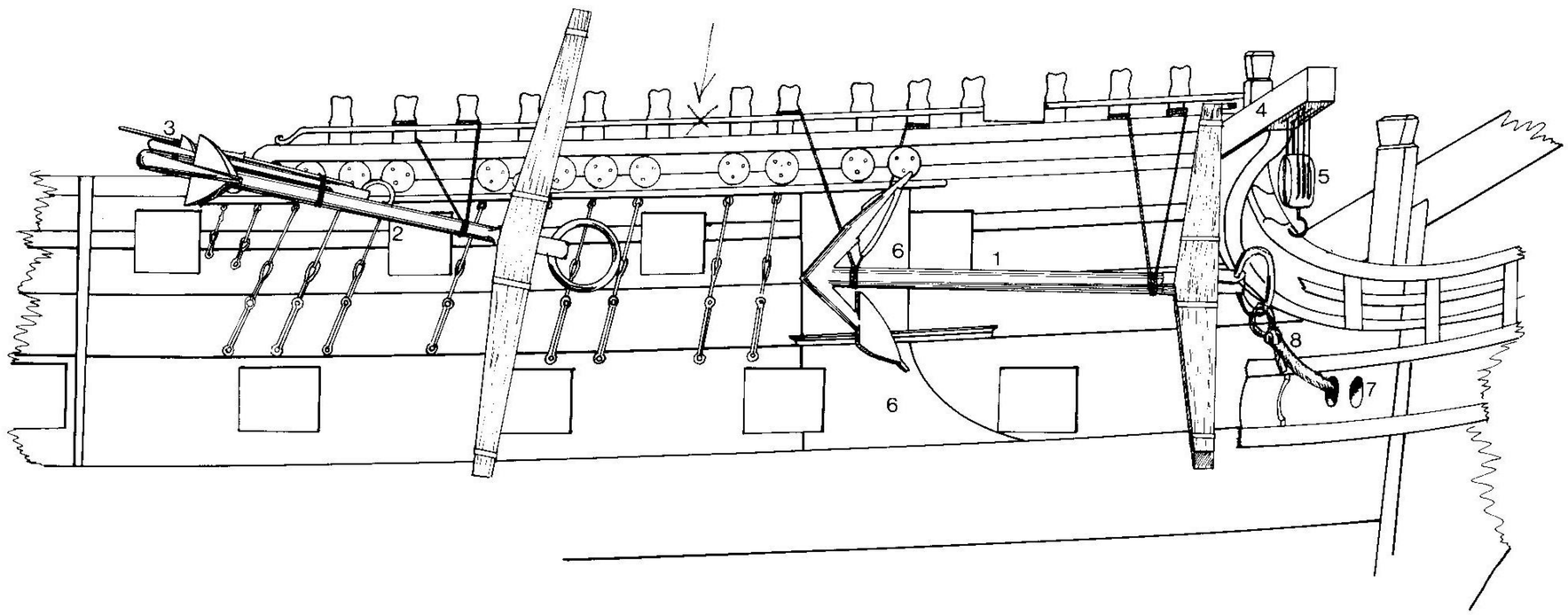




F8 **METHOD OF STOWING ANCHORS (1/120 scale)**

1. Bower anchor
2. Sheet anchor
3. Kedge anchor, lashed to sheet anchor
4. Cathead
5. Cat block and tackle
6. Bolster, to protect planking from flukes of anchors
7. Hawse hole
8. Cable



F Fittings

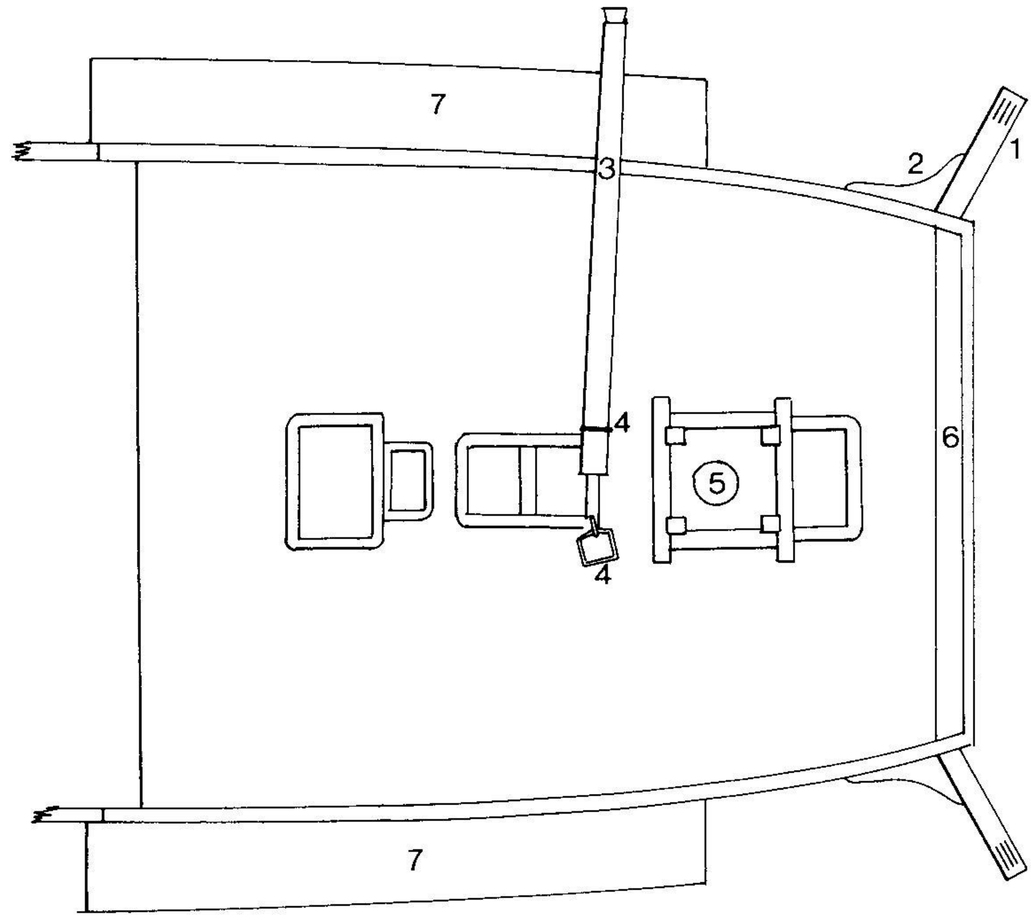
F9 ANCHOR TACKLE ON THE FORECASTLE (1/240 scale)

1. Catheads
2. Cathead knee (not fitted on the coppered model)
3. Fish davit, removeable from one side to the other
4. Spanshackles, one on each side to allow transfer of davit
5. Fore mast
6. Arm of cathead, bolted to forecastle beam
7. Channels

F10 DETAILS OF LINING AND BOLSTER, TO PROTECT SIDES FROM ANCHOR (no scale)

F11 DETAILS OF CATHEAD ON COPPERED MODEL (no scale)

F9



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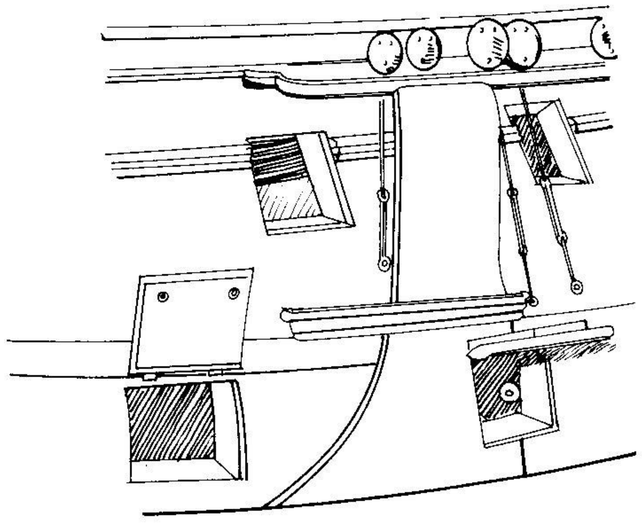

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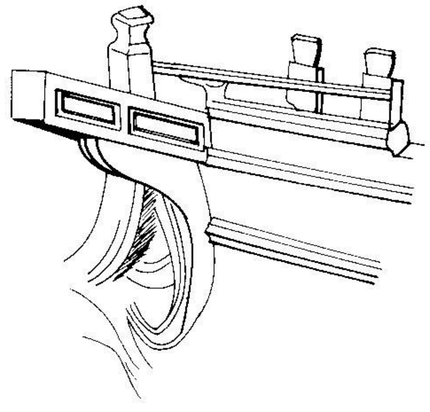


F12 MAIN JEER CAPSTAN (1/96 scale)

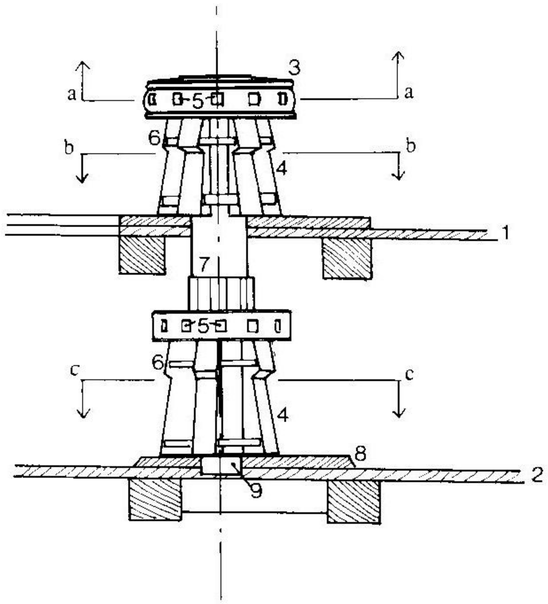
F12/1 Side view

F12/2 Sectional plan view

1. Upper deck
2. Gundeck
3. Drumhead
4. Whelps
5. Holes for bars
6. Cheeks
7. Barrel
8. Partners, 7in thick
9. Step
10. Bar, 11ft 6in long

F13 FORE JEER CAPSTAN (1/96 scale)

1. Kelson
2. Pillars in hold
3. Floor rider
4. Capstan room, used for boatswain's stores



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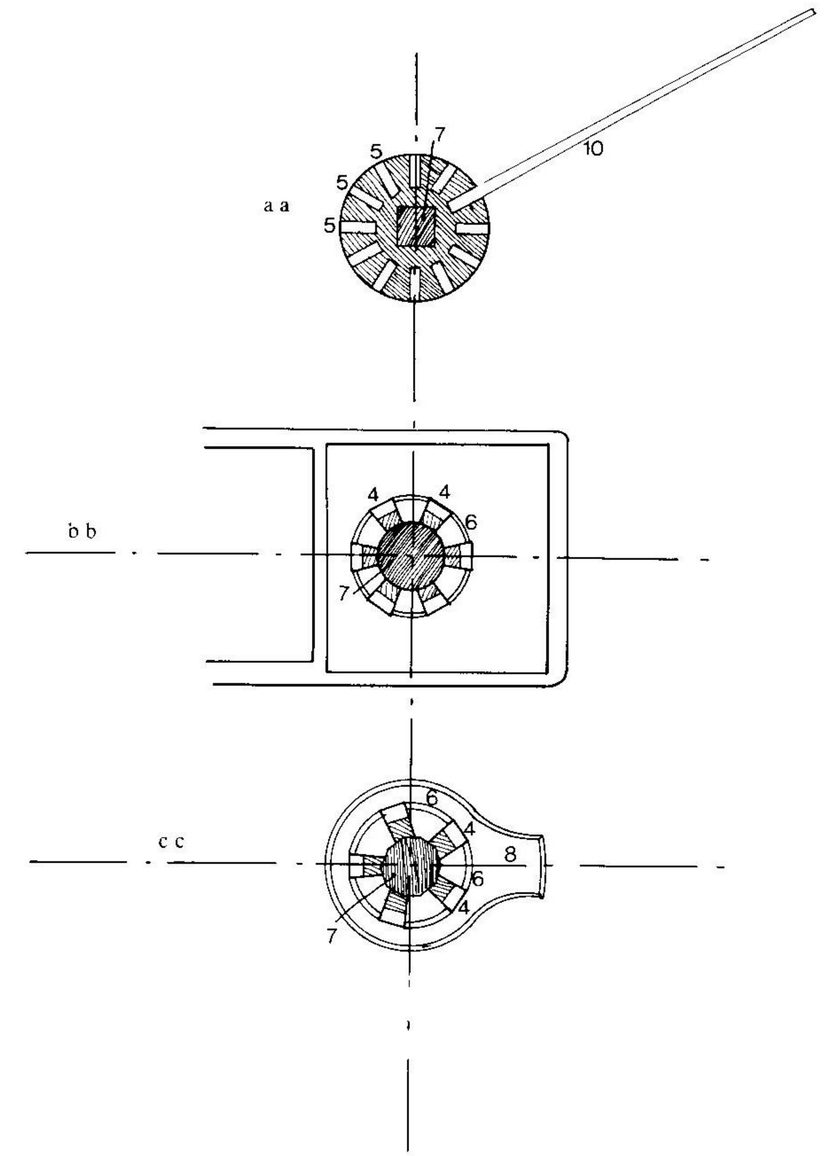
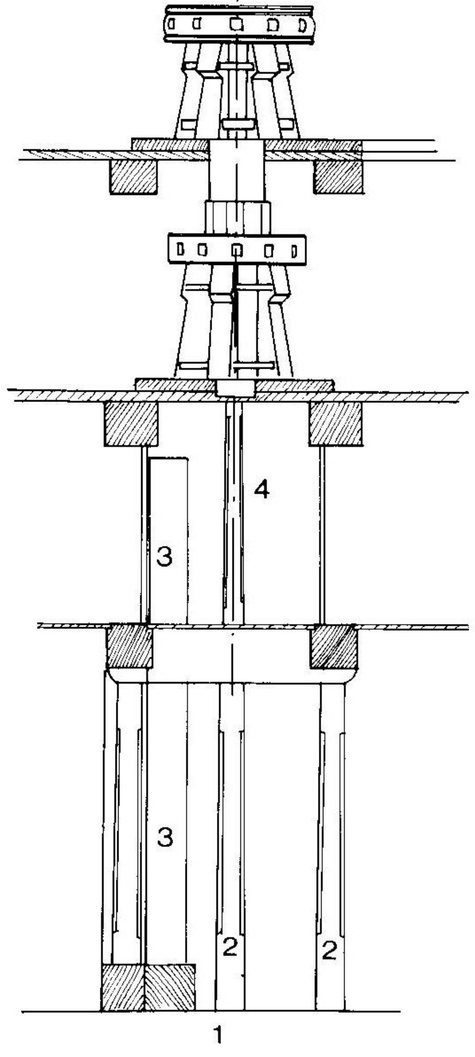


F12/2

F13

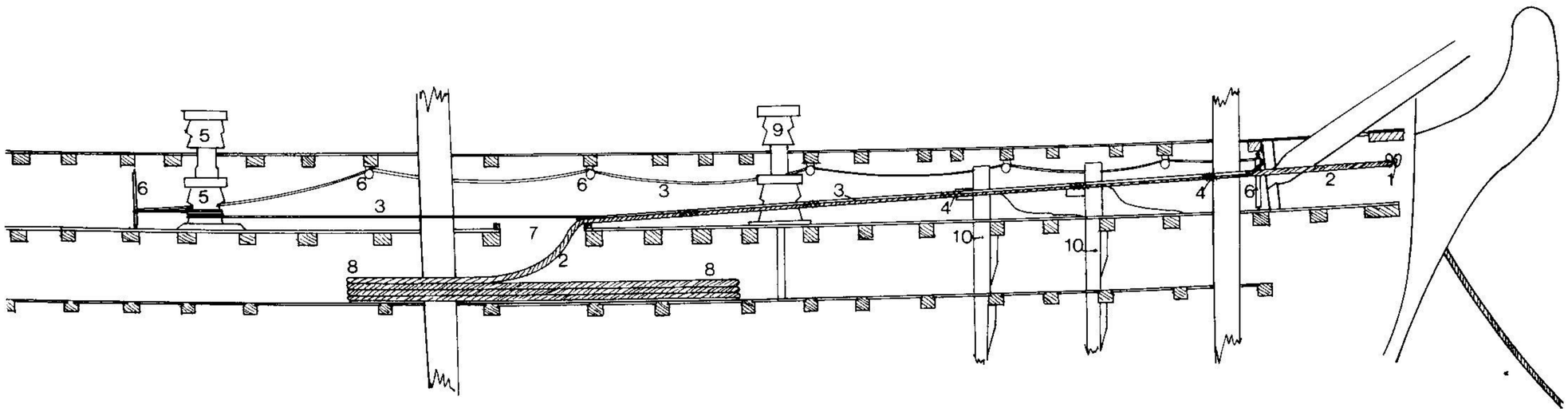


F Fittings

F14 METHOD OF RAISING ANCHOR (1/240 scale)

1. Hawse holes
2. Cable, 21in circumference
3. Messenger, used to pull cable to capstan, as cable itself was too thick, and likely to be covered in mud, weed, etc.
4. Nippers, to hold cable to messenger
6. Rollers, to aid return of messenger, which is endless
7. Main hatch on gundeck
8. Cable stowed on orlop deck; this part of the deck does not have continuous planking, but short removeable lengths to allow the water from the cable to drain into the hold
9. Fore jeer capstan, not normally used in this operation
10. Riding bitts, to which the cable is secured when the ship is at anchor

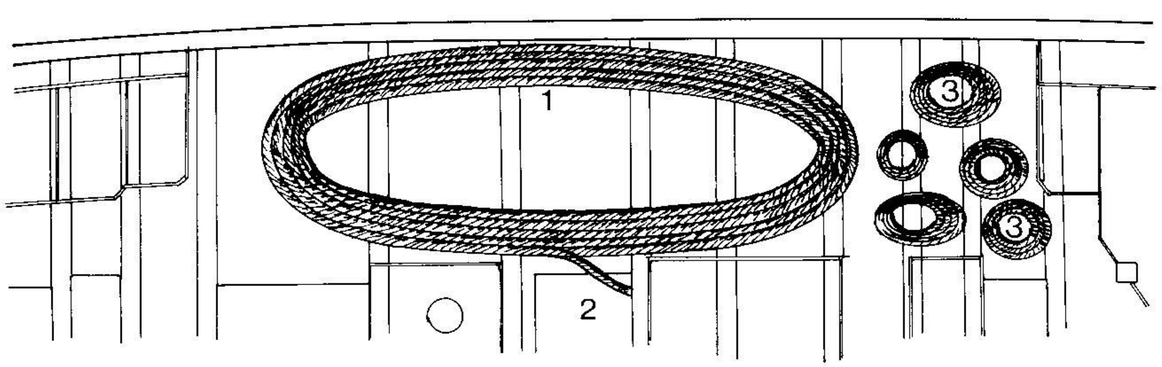
F14



F15

F15 STOWAGE OF CABLES ON ORLOP DECK (1/240 scale)

1. Main cables
2. Main hatch
3. Smaller cables, messengers, etc



F16 GENERAL LAYOUT OF PUMPS (1/120 scale)

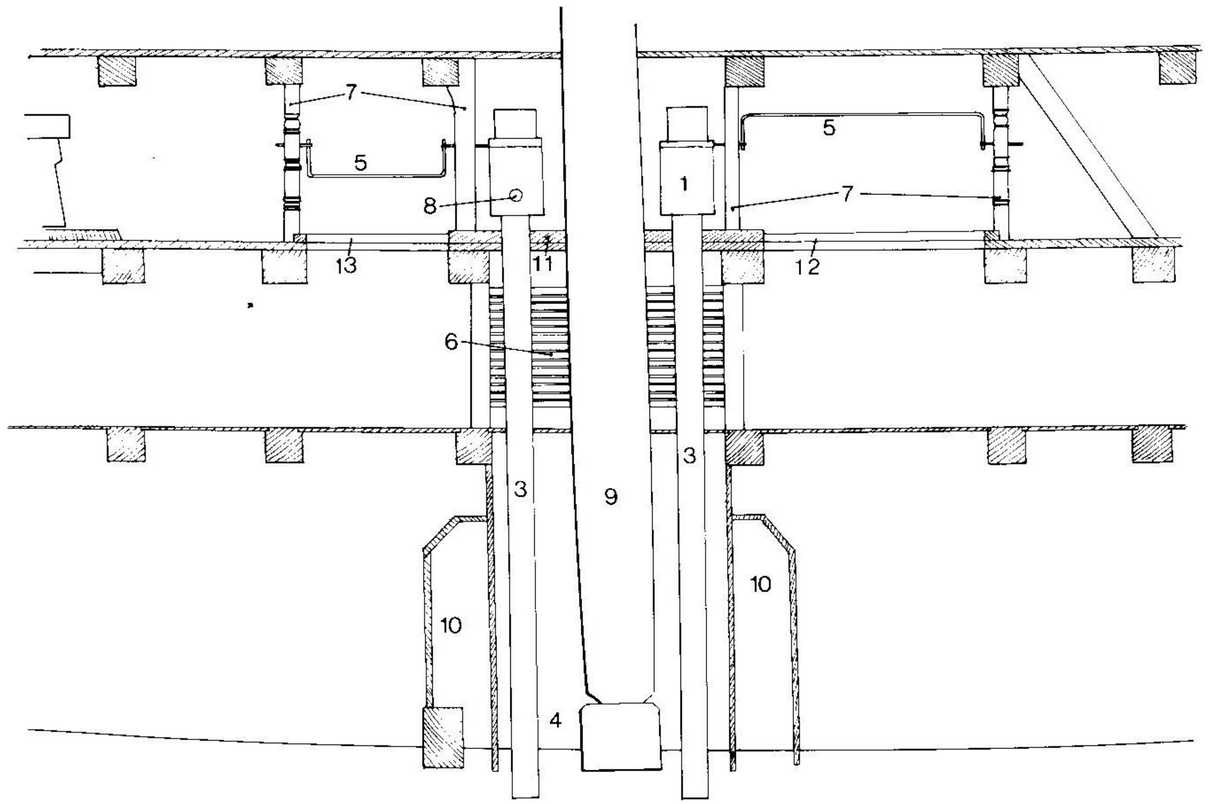
F16/1 Longitudinal section

F16/2 Athwartship section

F16/3 Plan view

1. Cistern
2. Dale
3. Tubes
4. Well
5. Handles
6. Weatherboarding round well
7. Stanchions to support weatherboarding
8. Hole for dale
9. Main mast
10. Shot lockers
11. Partners of main mast
12. Main hatch
13. After hatch

F16/1



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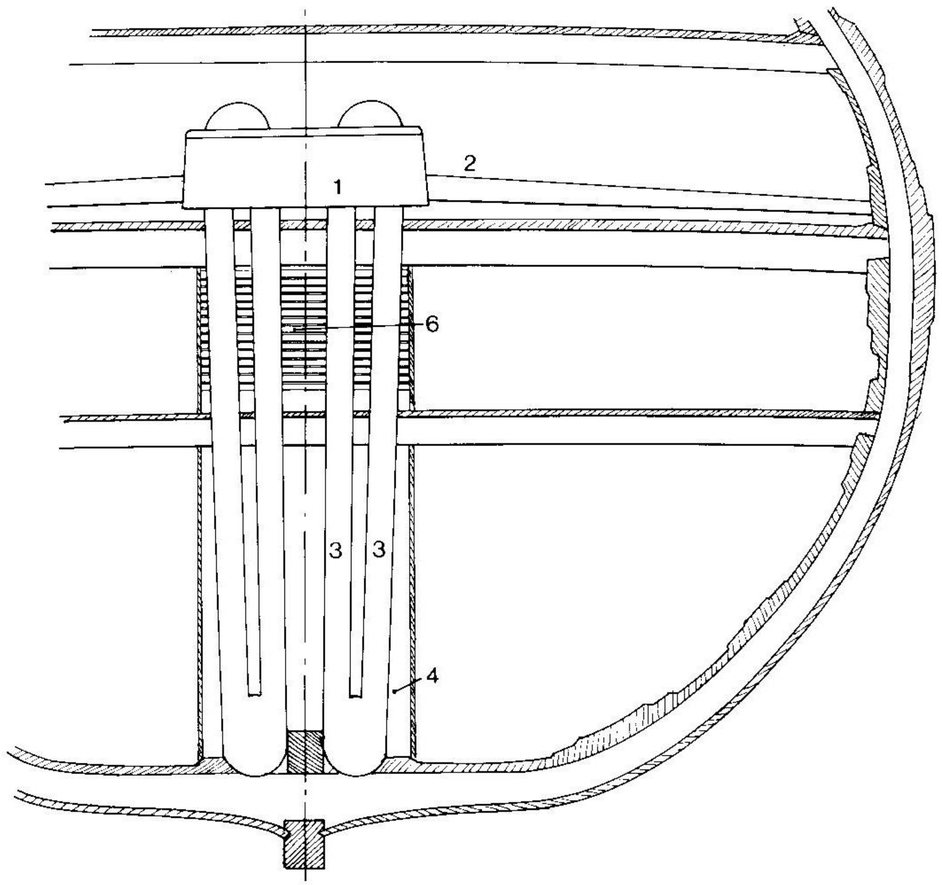

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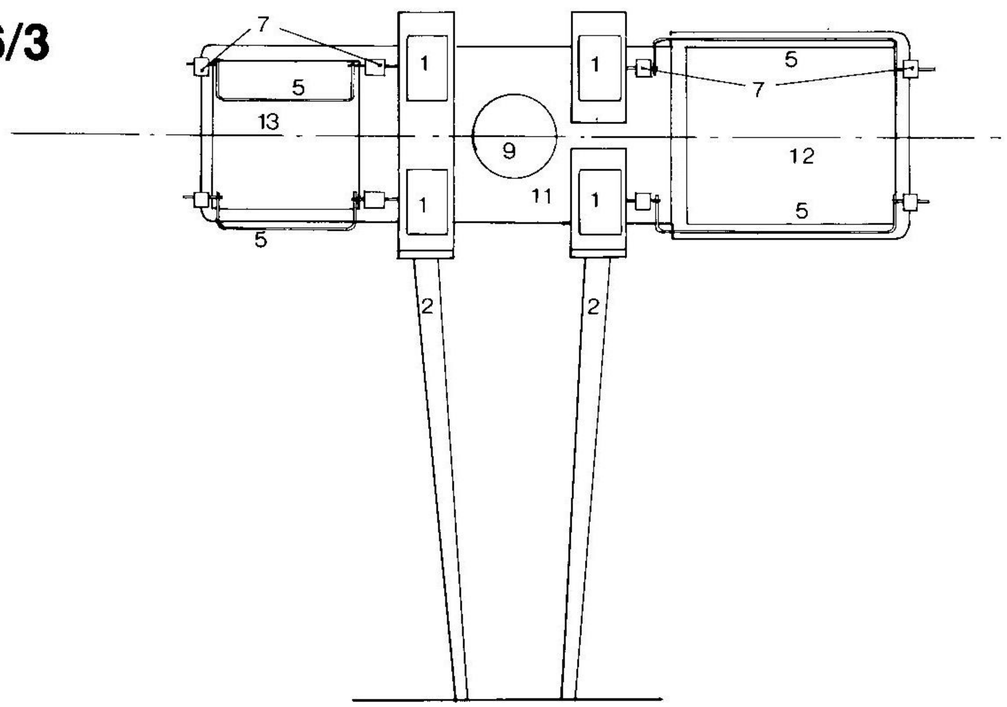


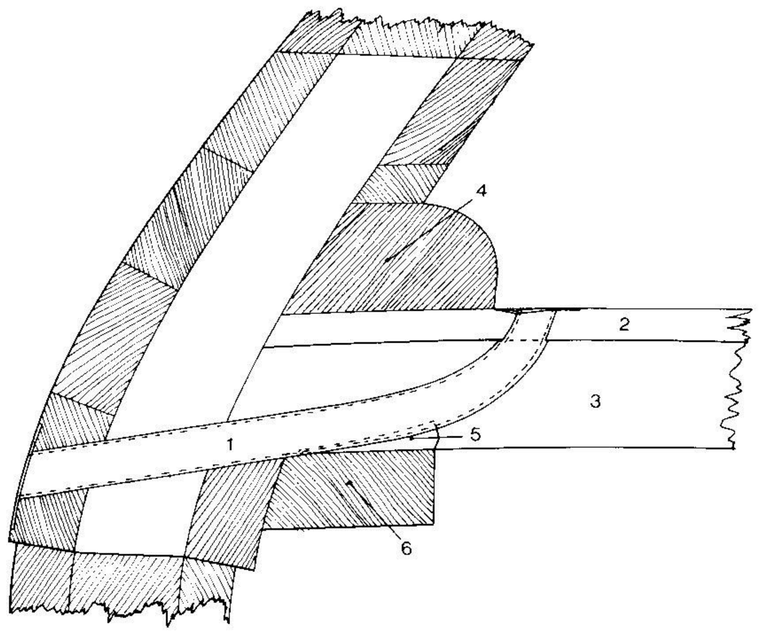
F17 SCUPPERS (1/24 scale)

1. Lead scuppers, six per side on gundeck, seven per side on upper deck
2. Flat of deck
3. Deck beams
4. Waterway
5. Chock to protect scuppers
6. Shelf piece

F18 DETAILS (SIMPLIFIED) OF COLES PUMP AS FITTED TO SHIPS OF THE LINE AFTER 1771 (no scale)

1. Cistern
2. Part of dale
3. Chocks to support the cistern on the deck
4. Screw hoops
5. Pin of bottom roller
6. Kelson
7. Hood
8. Slide for fitting dale
9. Part of handle
10. Sprocket wheel
11. Cross section of hood

F17



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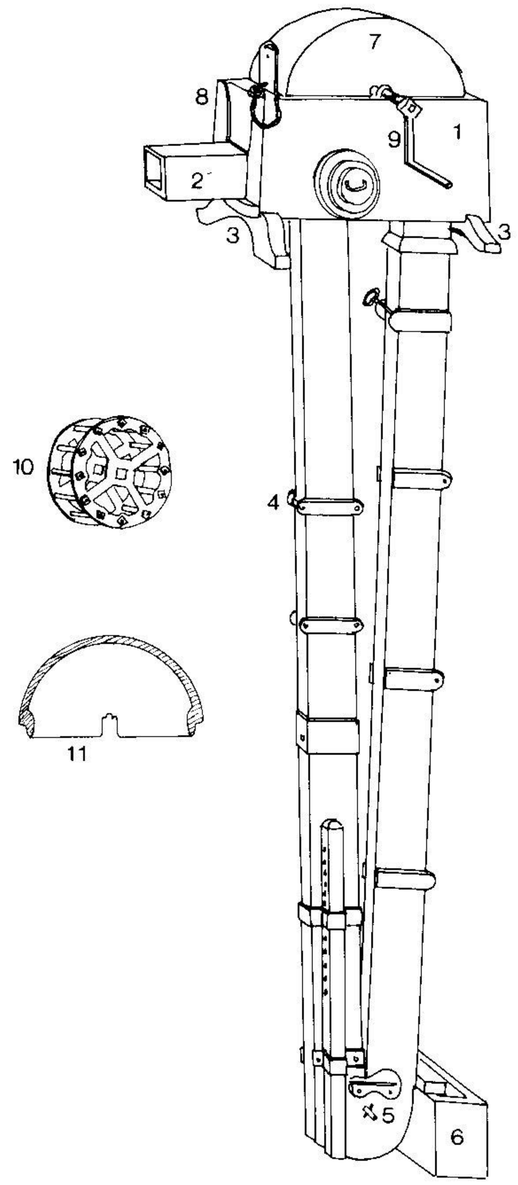


F19 **HEAD OF COLES PUMP (1/24 scale)**

1. Cistern
2. Sprocket wheel

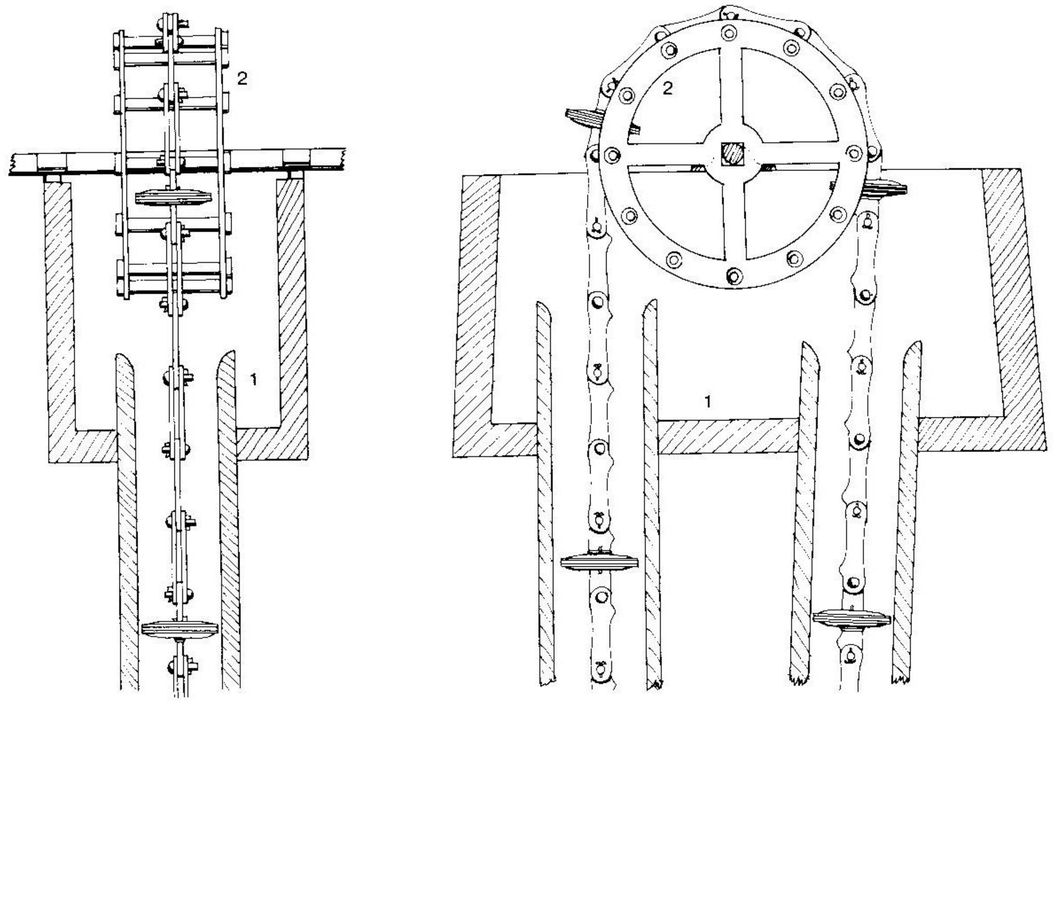
F20 **SECTION OF THE CYLINDER OF A COLES PUMP (1/24 scale)**

1. Side view
2. Front view
3. Panels removeable for maintenance
4. Brackets
5. Pins
6. Rings to facilitate removal
8. Sectional plan view
9. Chain
10. Saucer and leather

F21 **LOWER END OF COLES PUMP (1/24 scale)**

1. Longitudinal section of uptake side
2. Thwartships section
3. Kelson
4. Floor timbers
5. Roller of cast iron
6. Chain links
7. Pins
8. Uptake side, with close fitting saucer
9. Saucer, above and under leather
10. Leather, to form semi-watertight seal

F19



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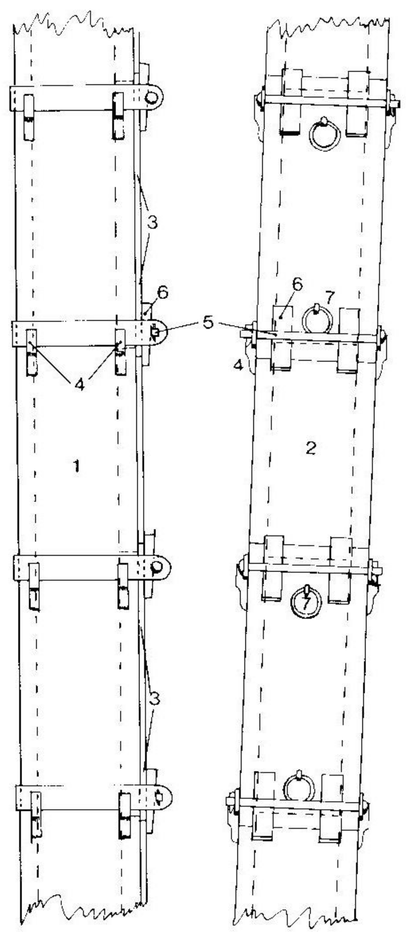

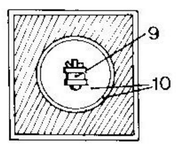

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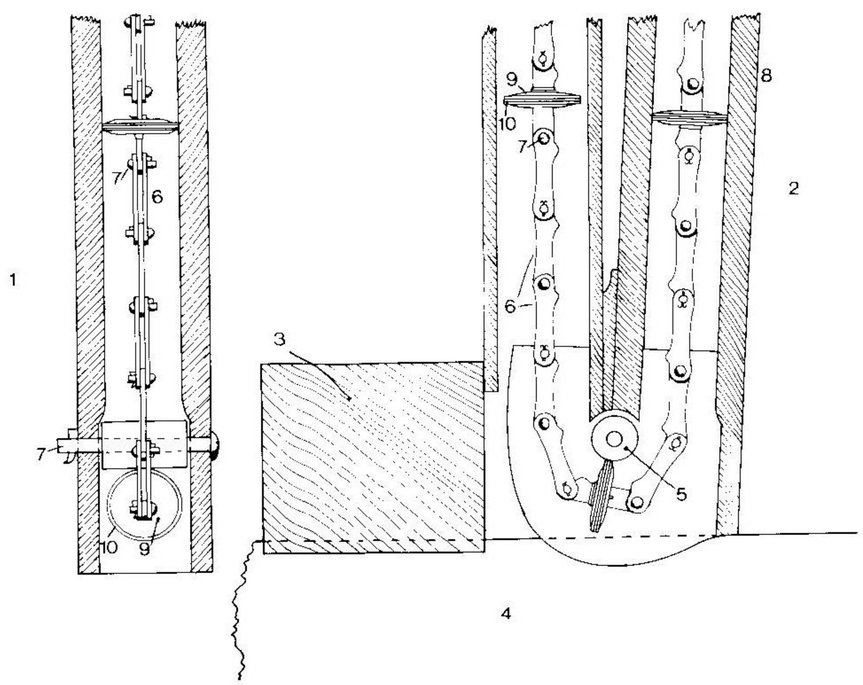
F21



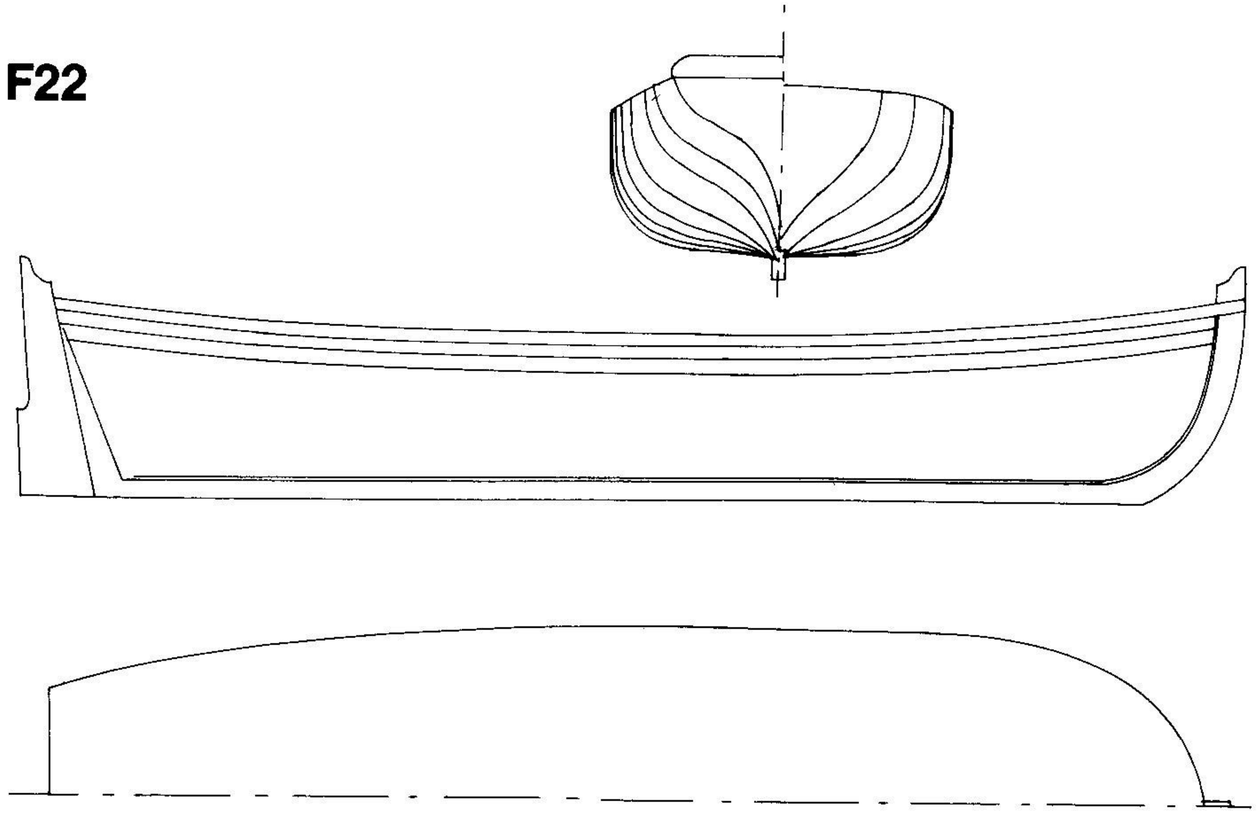
F Fittings

F22 **CARVEL BUILT LONGBOAT OF ABOUT 1760 (1/96 scale)**
Length 36~~in~~ ft
Breadth 10ft 4in
Depth 4ft 5in

F23 **CARVEL BUILT LAUNCH, AS USED AFTER 1780 (1/96 scale)**
Length 31ft
Breadth 8ft 11in
Depth 3ft 5in
1. Windlass, used in moving anchors, etc
2. Hole for mast

F24 **CLINKER BUILT SMALL CUTTER (1/96 scale)**
Length 18ft
Breadth 6ft 6½in
Depth 2ft 3in
1. Hole for mast

F22



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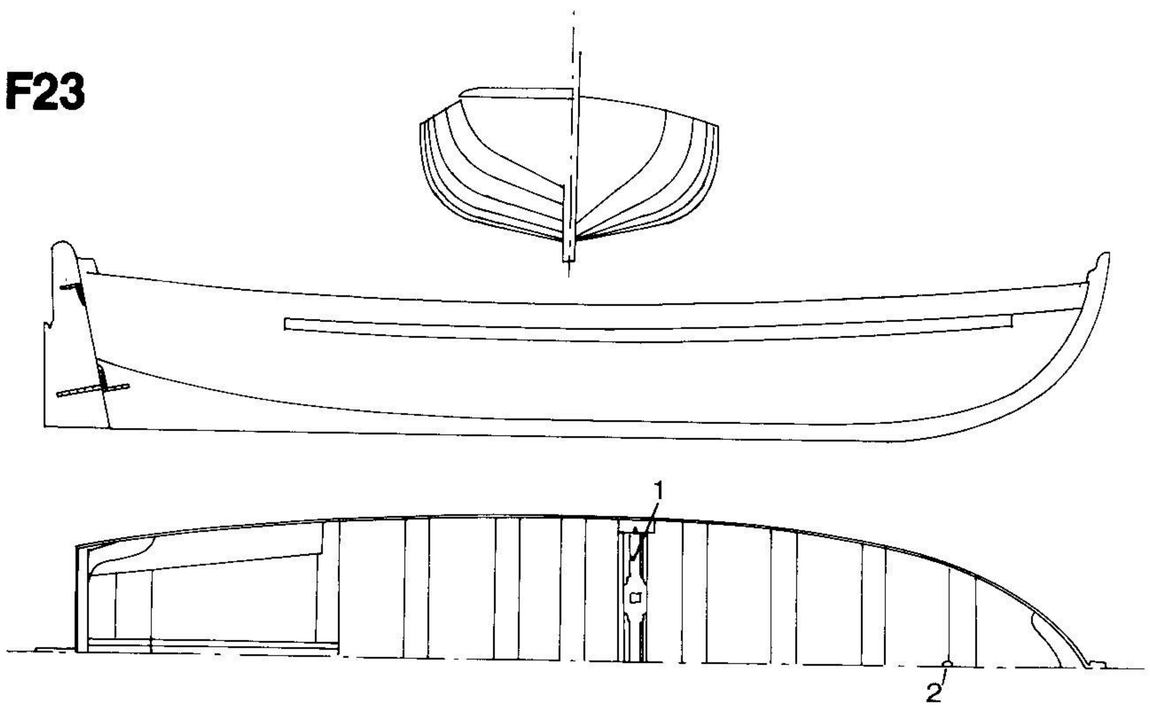

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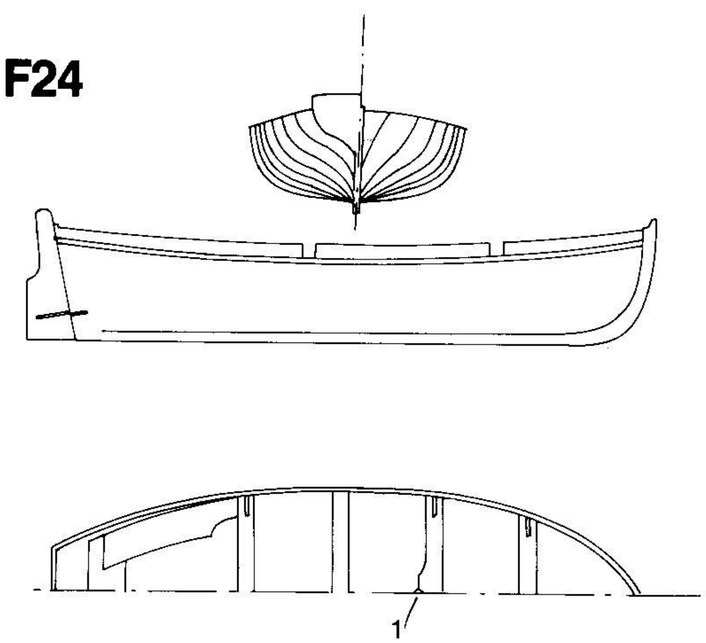

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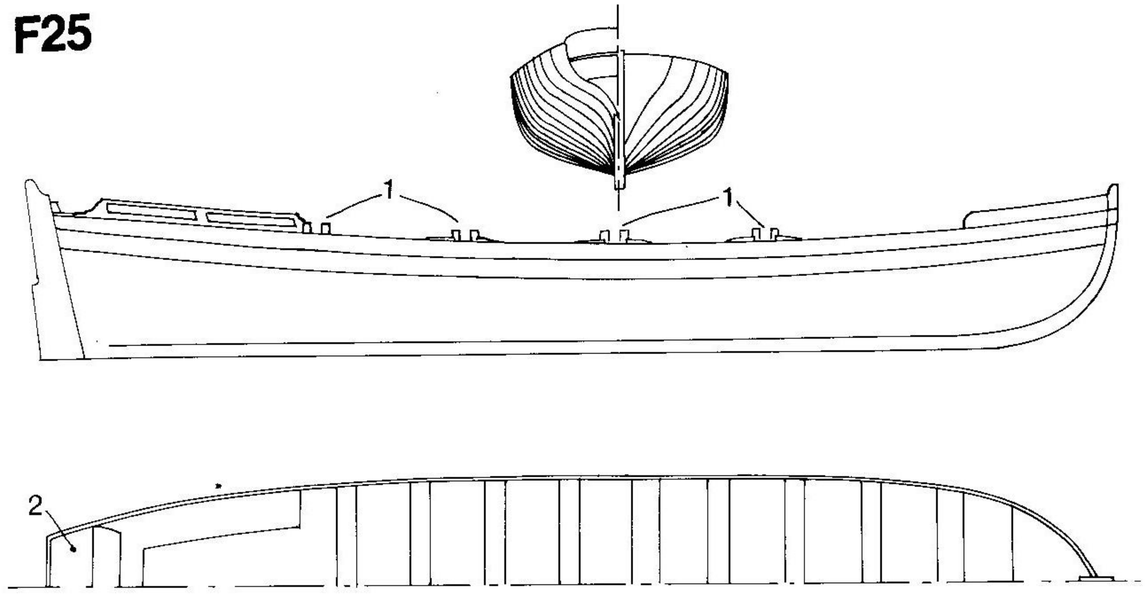


F25 CARVEL BUILT LARGE PINNACE
(1/96 scale)
Length 32ft
Breadth 6ft 7in
Depth 2ft 11in

1. Tholes
2. Seat for coxswain

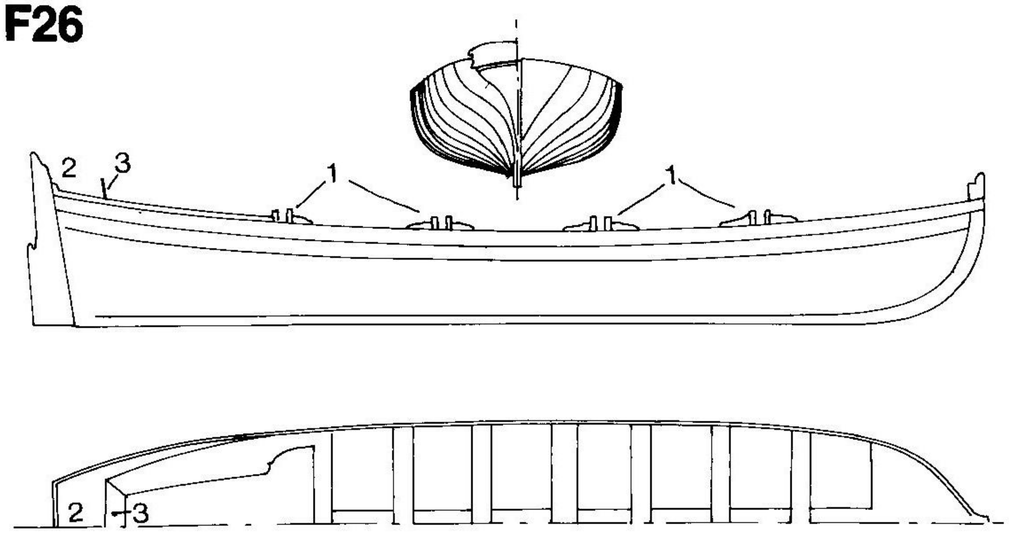
F26 CARVEL BUILT SMALL PINNACE
(1/96 scale)
Length 28ft
Breadth 6ft 7in
Depth 2ft 7½in

1. Tholes
2. Coxswain's seat
3. Bulkhead to separate coxswain from passengers

F27 CLINKER BUILT LARGE CUTTER
(1/96 scale)
Length 25ft
Breadth 6ft 11in
Depth 2ft 5¼in

1. Holes for oars
2. Brackets to support thwarts

F26



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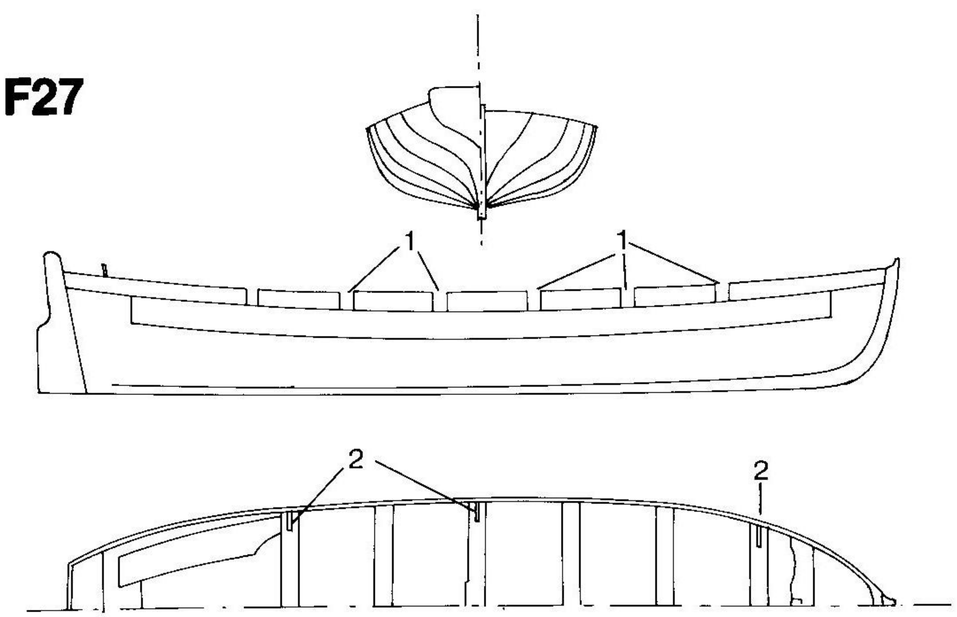


F28 LONGITUDINAL SECTION OF LARGE CUTTER (1/48 scale)

1. Thwarts
2. Ringbolts for raising boat from water
3. Knee

F29 STERN OF LARGE PINNACE (1/24 scale)

F30 STERN OF LONGBOAT, SHOWING STYLE OF PAINTING (no scale)

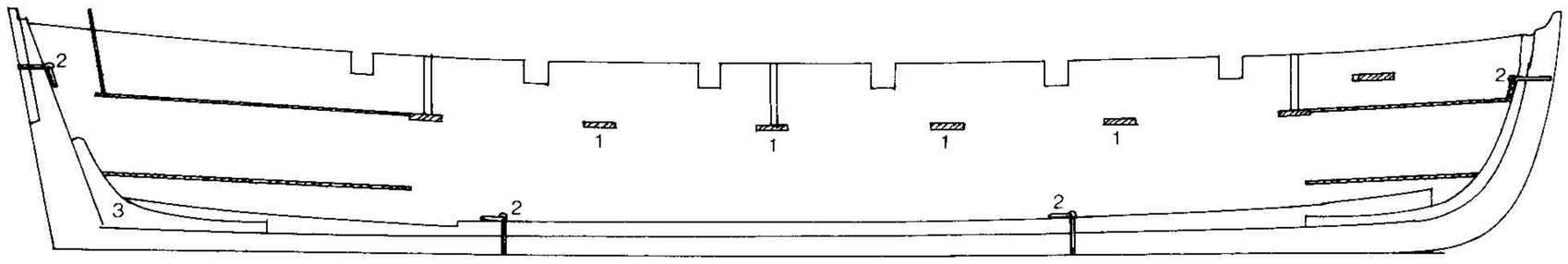
F31 DETAILS OF LONGBOAT (no scale)

1. Thwarts
2. Windlass
3. Windlass bar
4. Thole pins
5. Hole for mast
6. Knees

F32 PINNACE ON BOAT BOOMS (no scale)

1. Oars
2. Chocks
3. Ropes
4. Eyebolts in booms

F28



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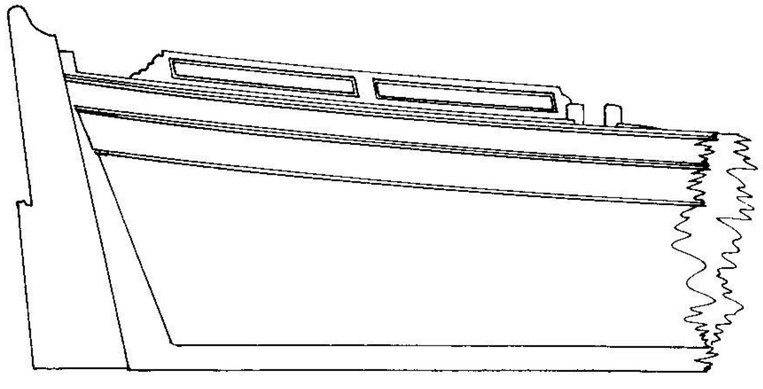

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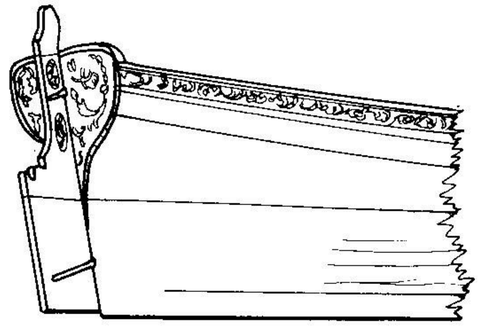

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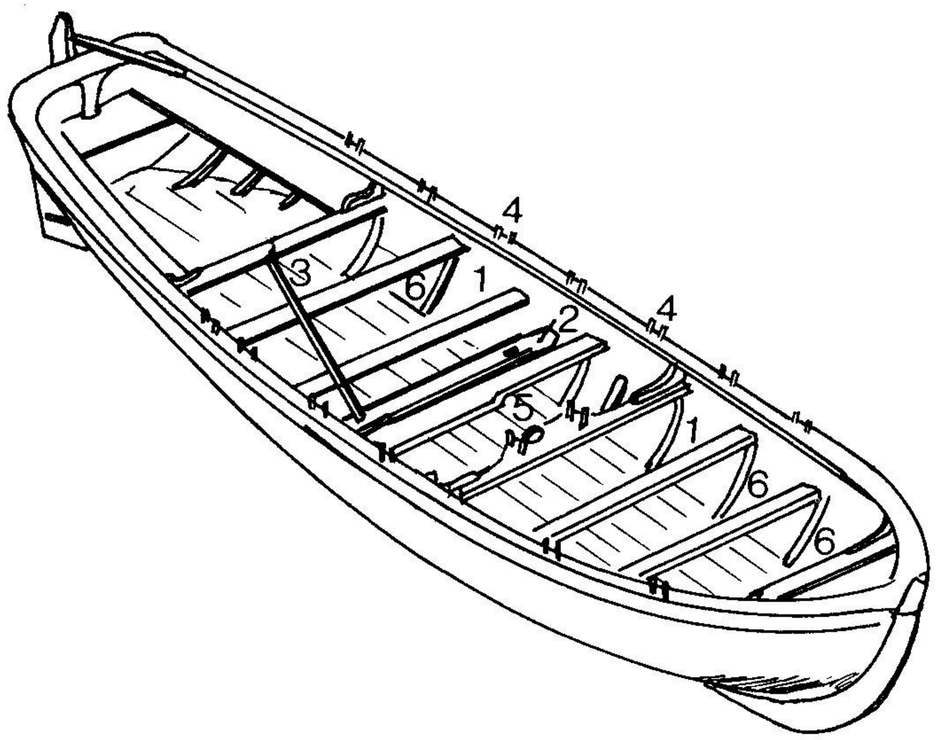

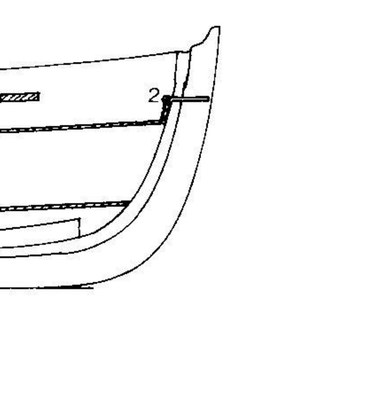

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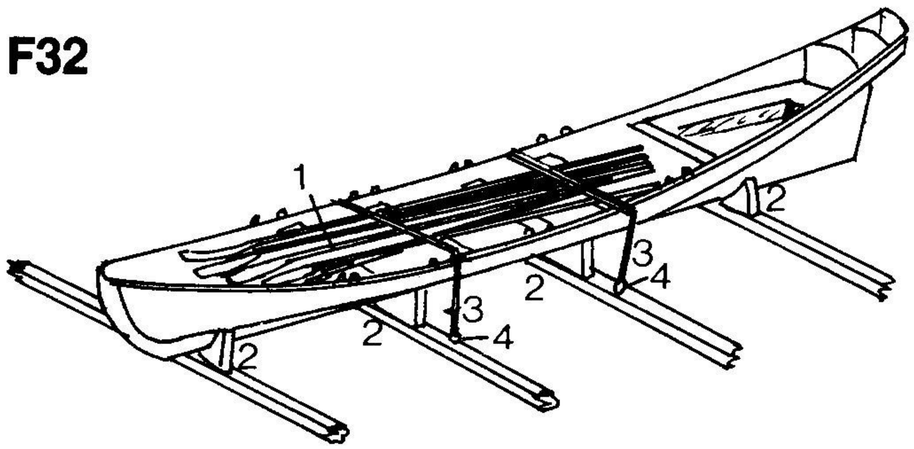


F33 PROBABLE METHOD OF STOWING BOATS ON BOOMS (1/96 scale)

1. Large pinnace
2. Longboat
3. Small pinnace
4. Small cutter
5. Large cutter
6. Lashings
7. Eyebolts
8. Boat booms

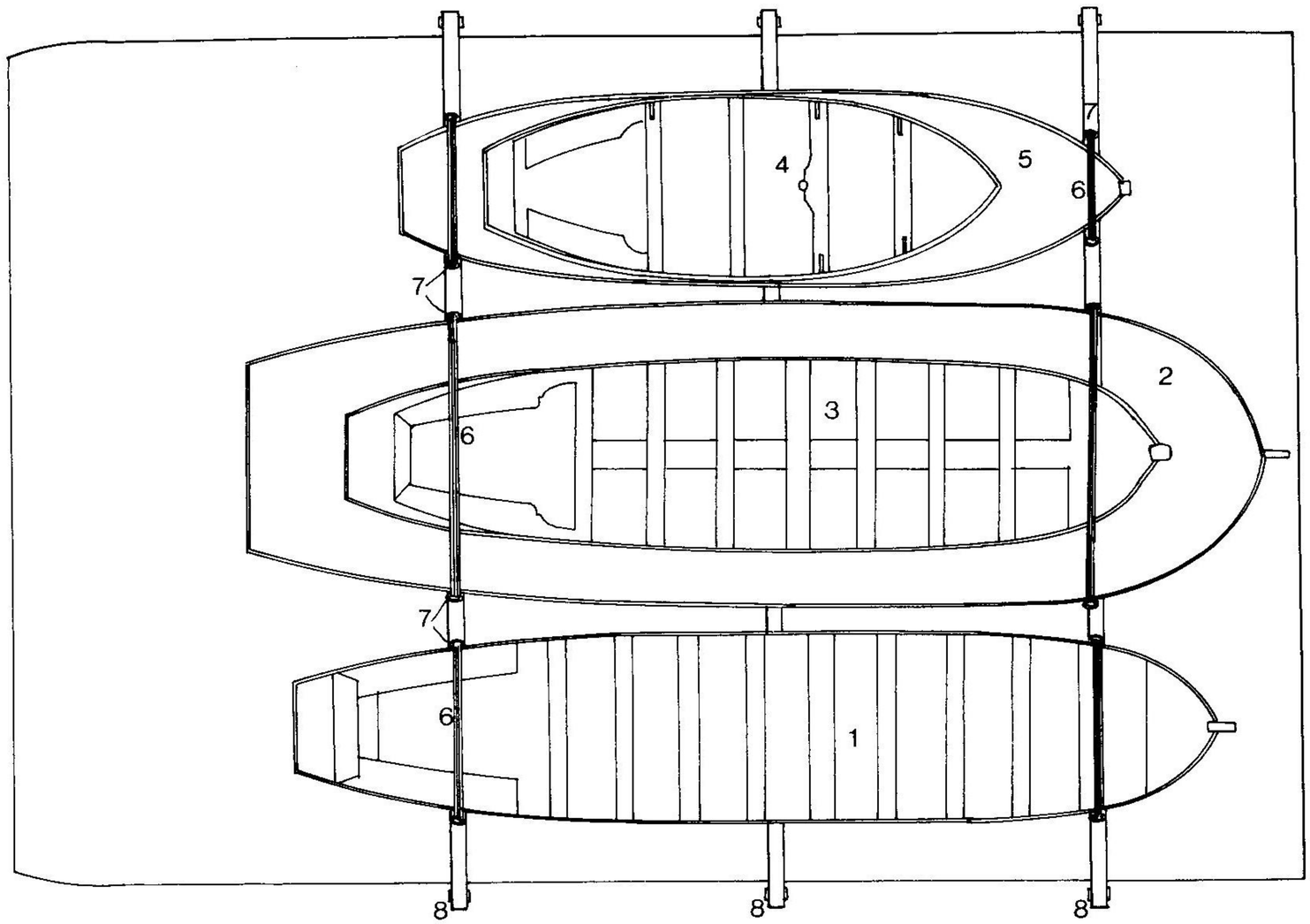
F34 GENERAL LAYOUT OF COPPER SHEATHING (based on planked model. 1/96 scale)

1. Load waterline
2. Stealers
3. Keel
4. Stem
5. Sternpost

F35 DETAILS OF COPPER SHEATHING (1/24 scale)

1. Plate 4ft × 1ft 2in
2. Overlap 1½in
3. Nails

F33



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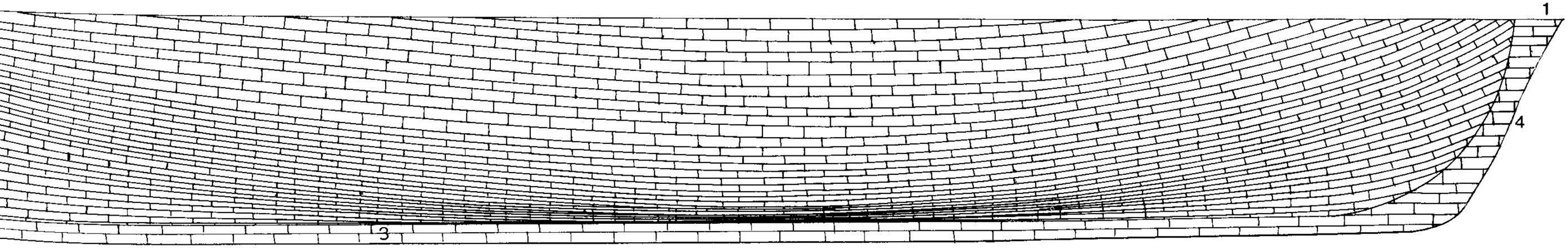

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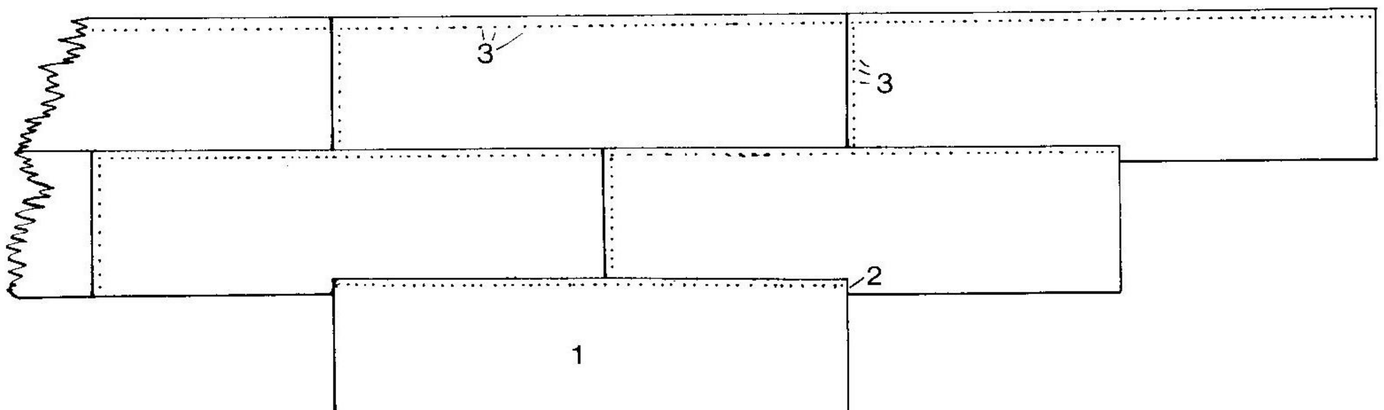


G1 HAMMOCK LAYOUT ON UNDERSIDE OF UPPER DECK (1/192 scale)

1. Line of upper deck
2. Line of gundeck
3. Hanging knees of upper deck, which restrict the space for hammocks.
4. Gun room
5. Officers' cabins
6. Mizzen mast
7. Hatches and ladderways
8. Capstans
9. Main mast
10. Fore mast
11. Manger
12. Rows of seamen's hammocks, with 14 inches per man
13. Petty officer's hammocks, with 28 inches per man
14. Master at arms's cot
15. Armourer's cot
16. Marines' hammocks
17. Marine sergeants' and corporals' hammocks

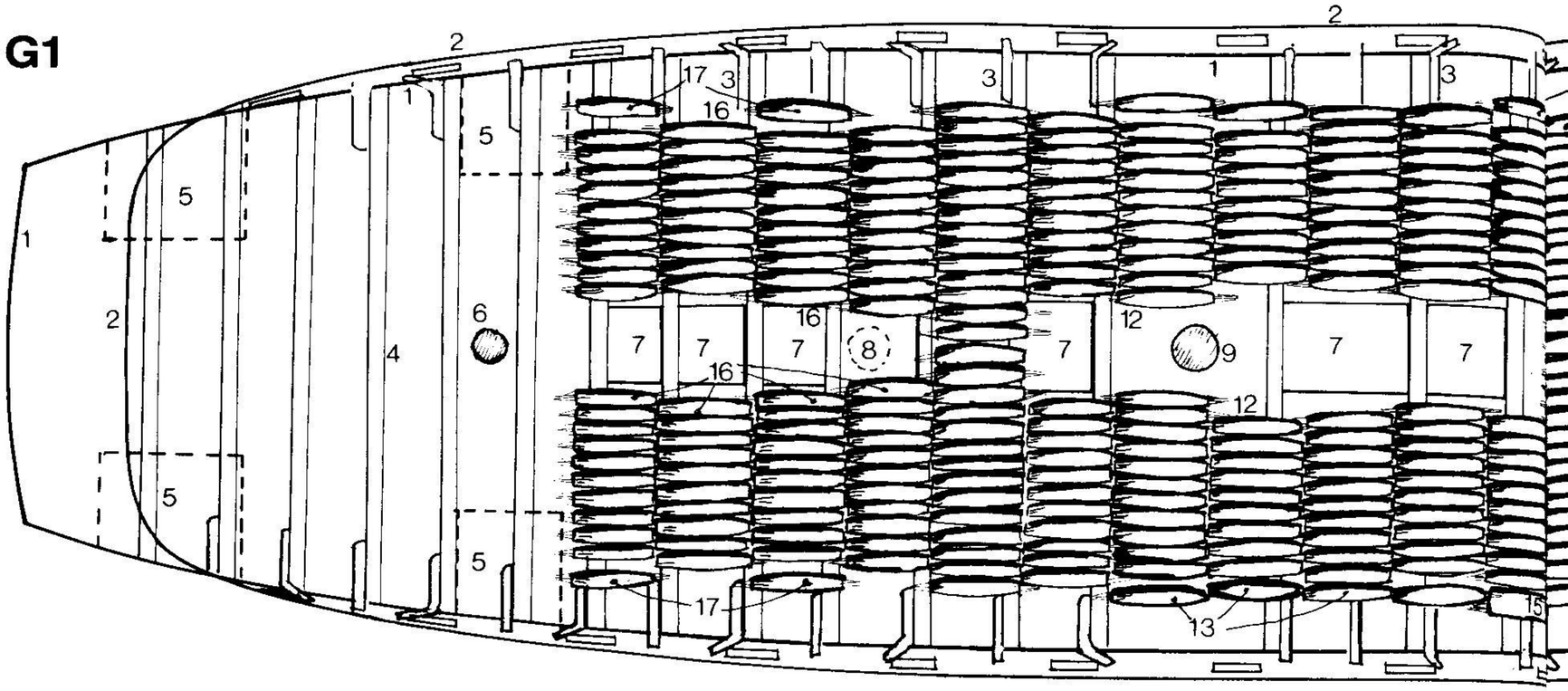
G2 TYPICAL MESS TABLE (no scale)

1. Table
2. Rope supporting table from hook in upper deck beam
3. Benches
4. Racks for plates, etc
5. Bowls to bring food from galley
6. 32-pounder gun
7. Gun tackle
8. Bags for seamen's belongings, suspended from deck beams
9. Upper deck beam
10. Barrel serving as stool
11. Water cask

G3 MESS TABLES ON LOWER DECK (1/96 scale)

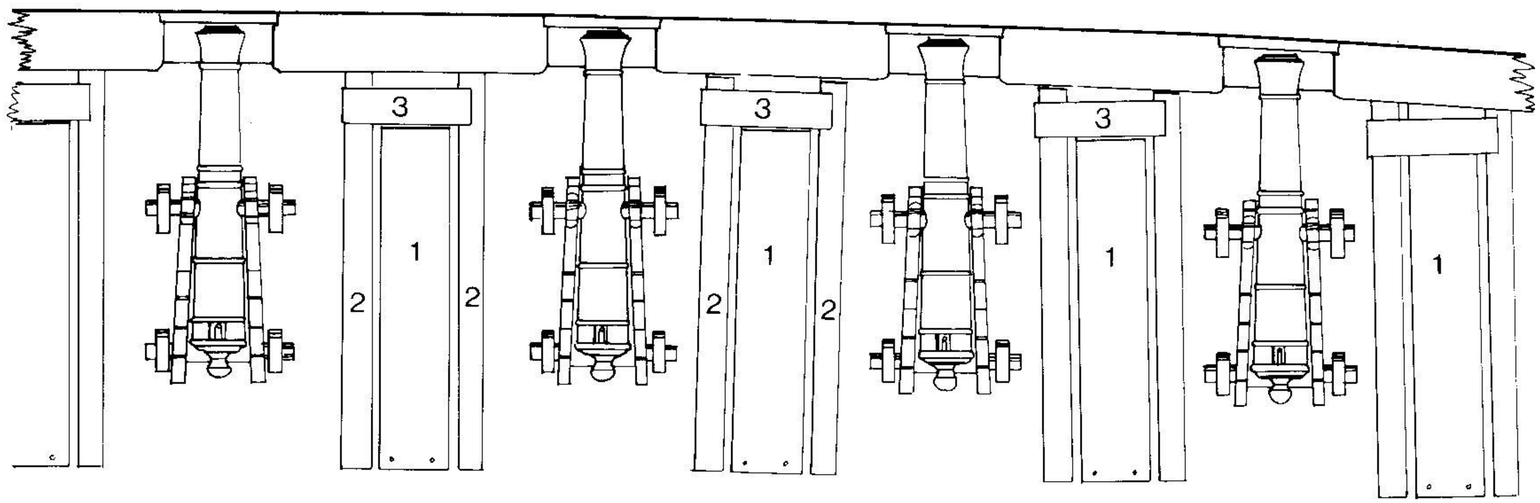
1. Tables
2. Benches
3. Racks for cutlery, etc

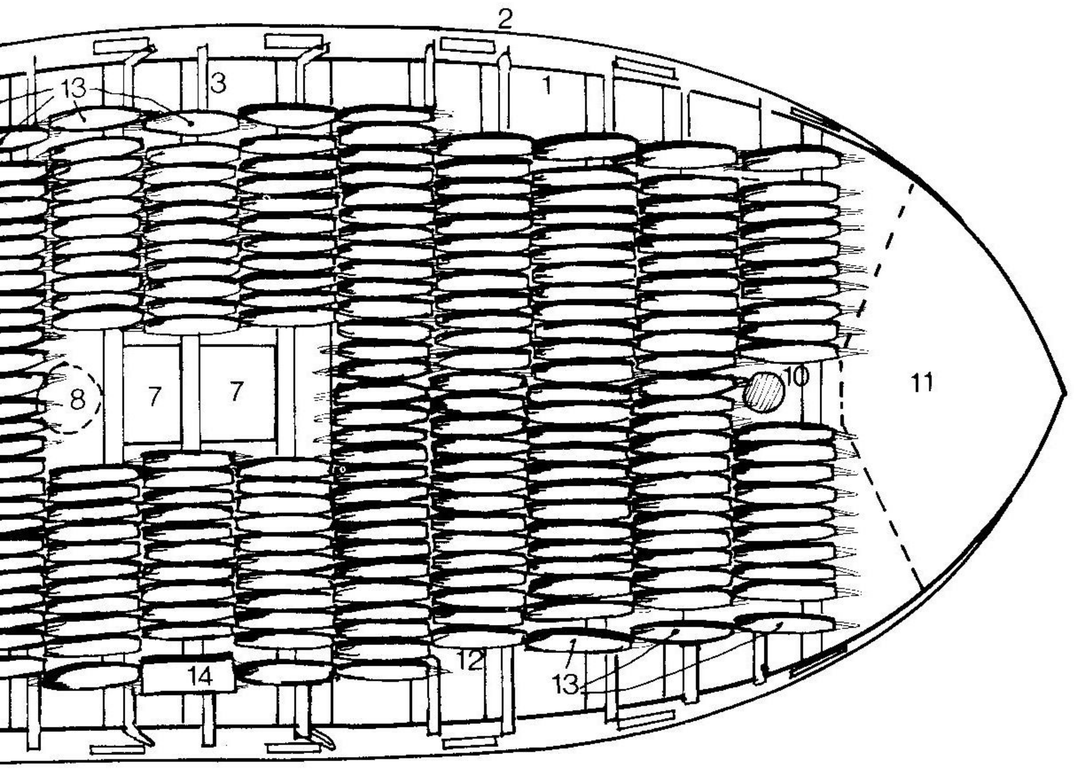
G1



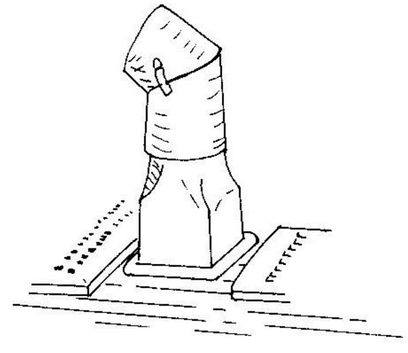
G2

G3





G5



G4 GALLEY STOVE (1/96 scale)

G4/1 Side view

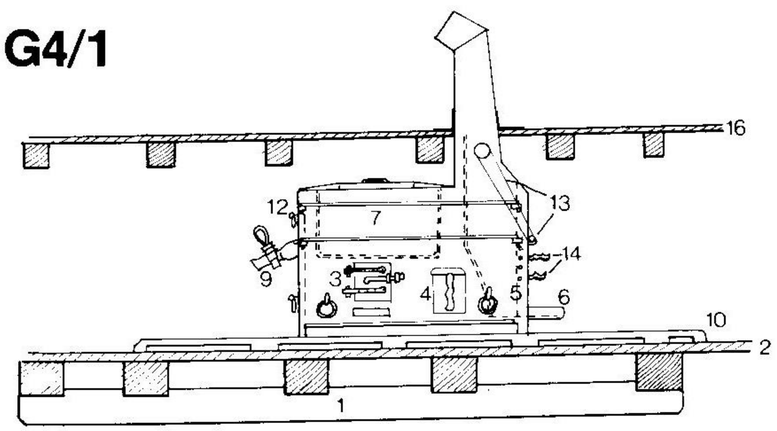
G4/2 View from forward

G4/3 Plan view

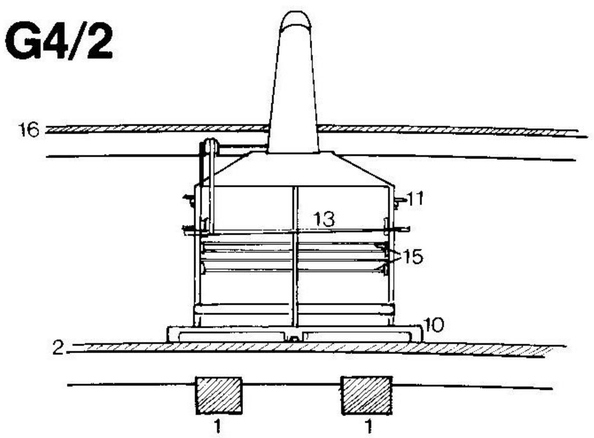
1. Carlines under stove, 12in square, recessed 2in into deck beam
2. Upper deck
3. Door to after fireplace
4. Door to oven
5. Forward fireplace
6. Tray
7. Boilers
8. Lids of boilers
9. Taps from boilers
10. Bottom flat
11. Rails
12. Eyebolts
13. Spit, operated by fan in chimney
14. Receptacles for spit
15. Bars across front of fire
16. Upper deck
17. Chimney

G5 DETAILS OF GALLEY CHIMNEY (no scale)

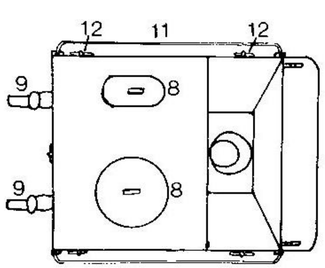
G4/1



G4/2



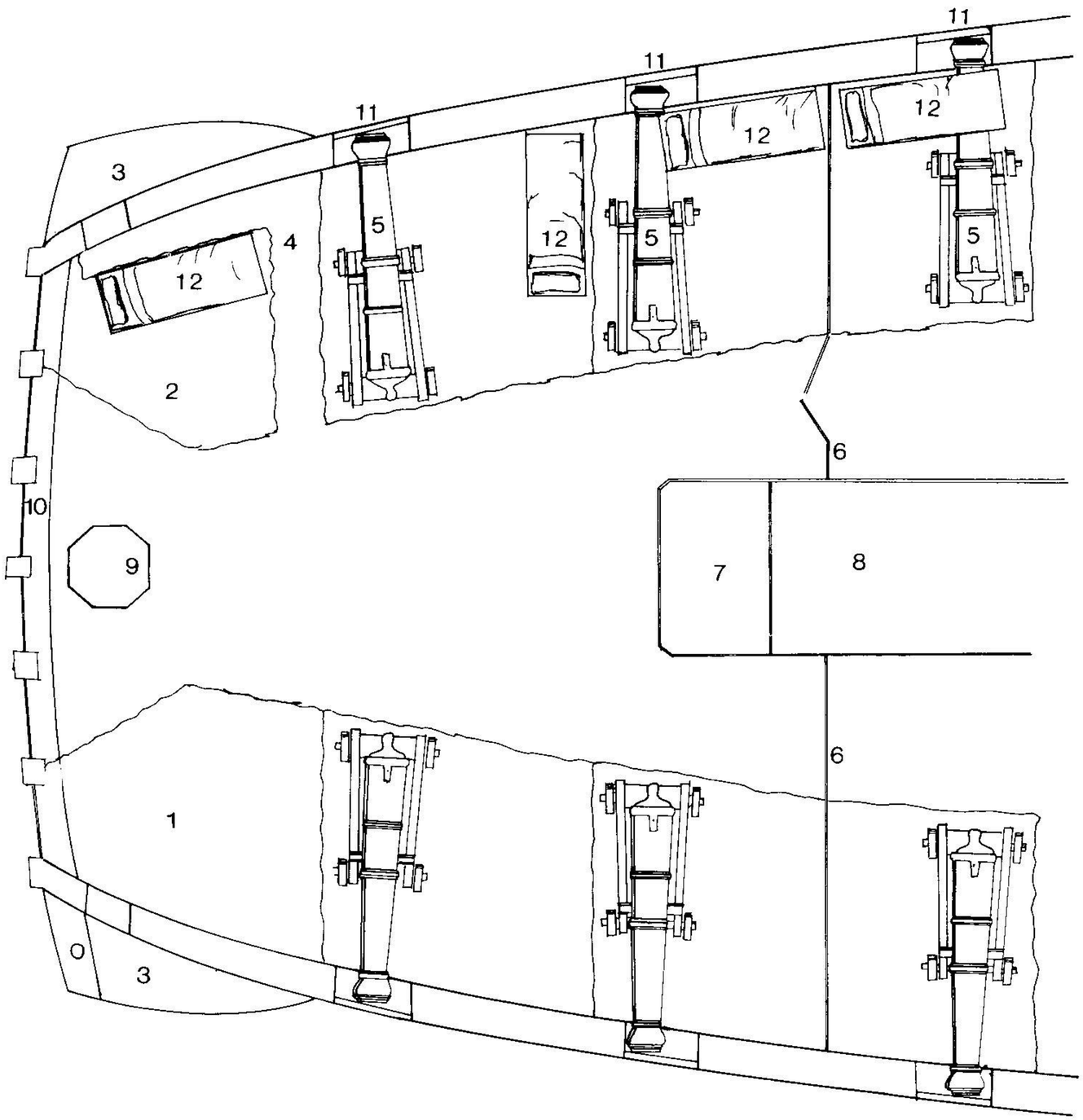
G4/3



G Accommodation

G6 WARDROOM AND OFFICERS' CABINS (1/96 scale)

1. First lieutenant's cabin, with direct access to the quarter gallery, and one stern window
2. Master's cabin, with access to stern window, but not to quarter gallery
3. Quarter galleries
4. Access to quarter galleries for other wardroom officers
5. 18-pounder guns
6. Bulkhead of wardroom
7. Lieutenant's pantry
8. Captain's pantry
9. Hexagonal cover for rudder head
10. Bench seat under windows
11. Gunports
12. Officers' bunks



G7 **WARDROOM CABINS AS FITTED BEFORE 1780 (1/96 scale)**

1. Cabin for first lieutenant
2. Cabins for junior lieutenants and marine officers, with curtains suspended from upper deck beams
3. Curtain doors to cabins, rolled up in the daytime
4. Wardroom bulkhead
5. Bench seat

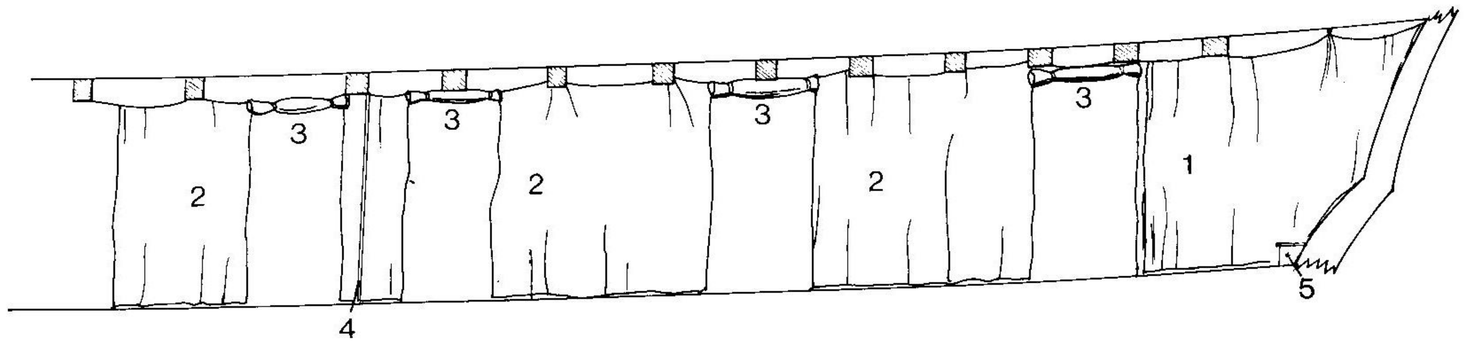
G8 **WARDROOM CABINS AS FITTED AFTER 1780 (1/96 scale)**

1. First lieutenant's cabin. Sometimes a permanent wooden structure (master's cabin similar)
2. Junior officers' cabins, made of canvas stretched on wooden frames
3. Doors constructed in the same way
4. Door to first lieutenant's cabin, with louvres

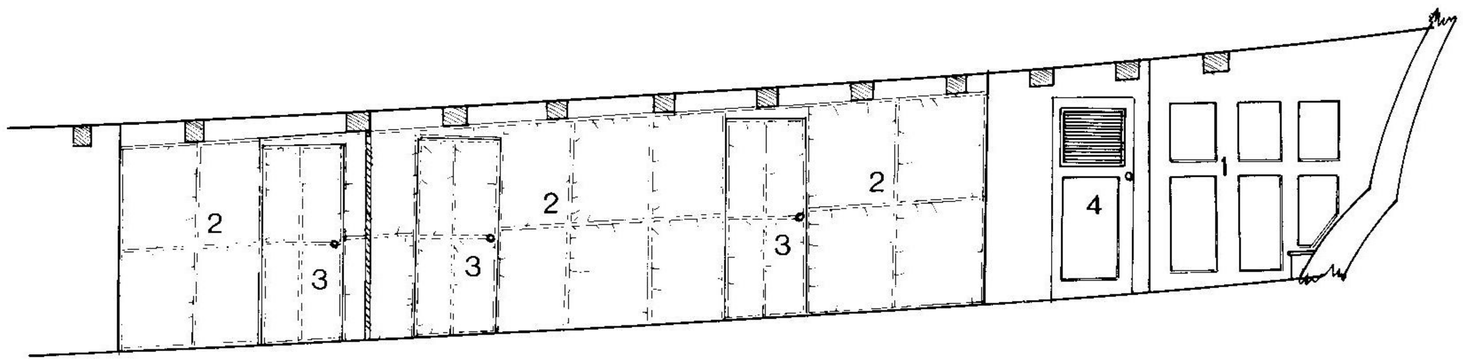
G9 **SIDE VIEW OF CAPTAIN'S AND WARDROOM PANTRY ON THE UPPER DECK (1/96 scale)**

1. Door to captain's pantry
2. Door to wardroom pantry
3. Bulkhead separating wardroom pantry from captain's pantry
4. Bulkhead of the wardroom
5. Mizzen mast

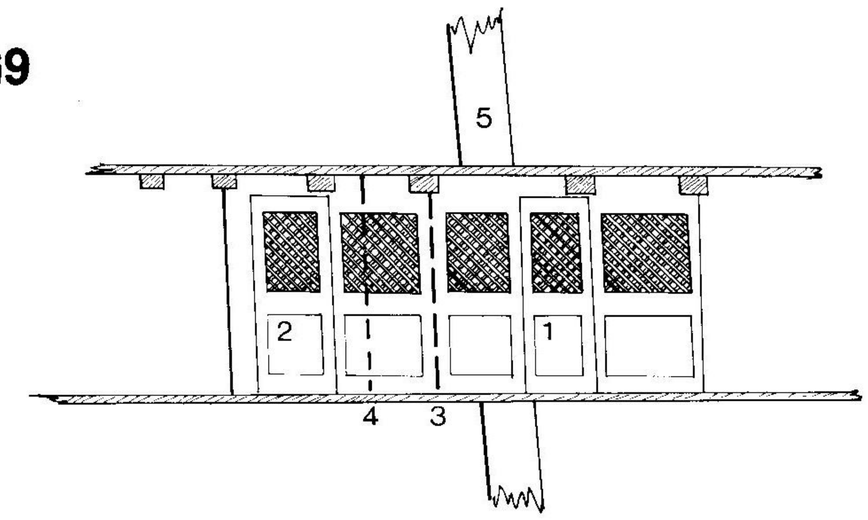
G7



G8



G9



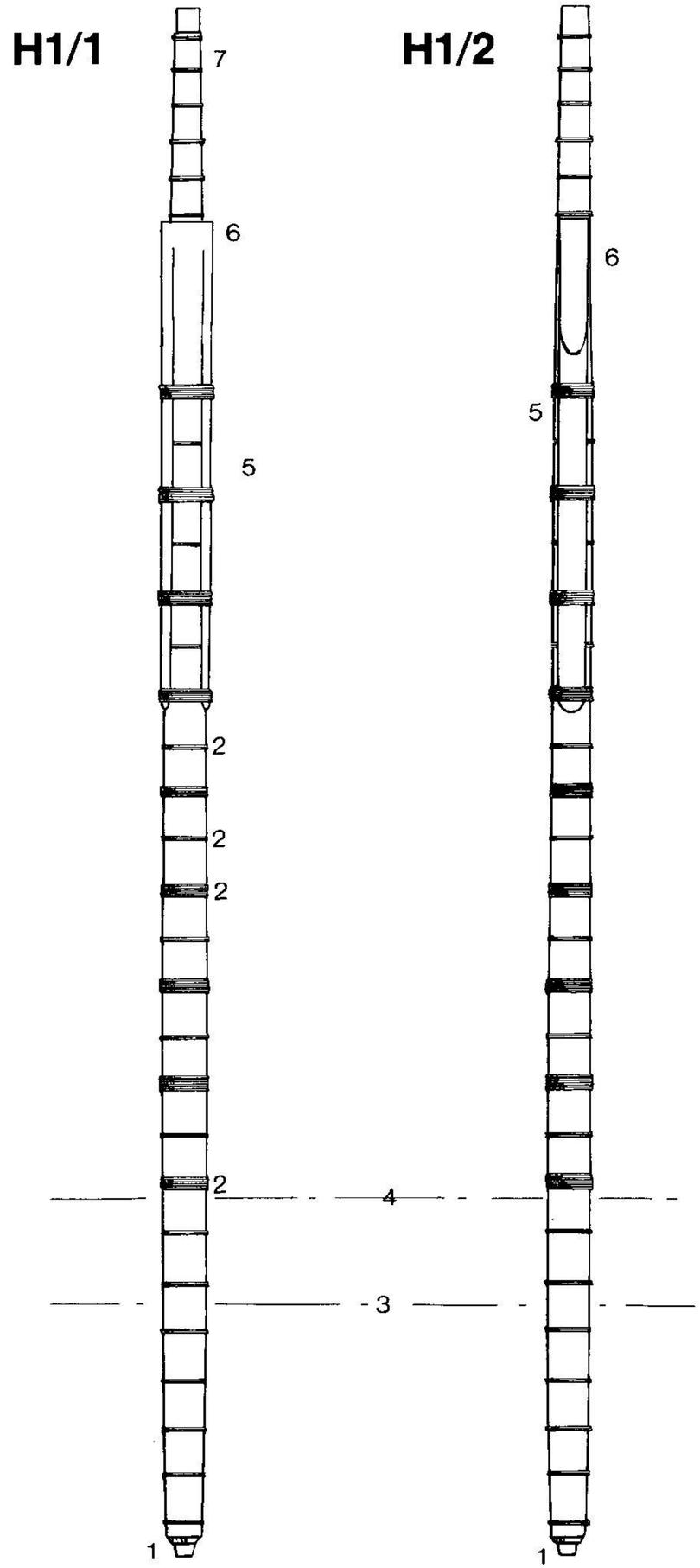
H Masts and Yards

H1 MAIN MAST (1/192 scale)

H1/1 View from forward

H1/2 Side view

1. Tenon at heel
2. Rope woldings, 3½in rope, replaced by iron hoops about 1800
3. Level of gundeck
4. Level of upper deck, and 'partners', where the mast has its greatest circumference
5. Cheeks
6. Hounds
7. Head



H2 **FORE MAST (1/192 scale)**

H2/1 **View from forward**

H2/2 **Side view**

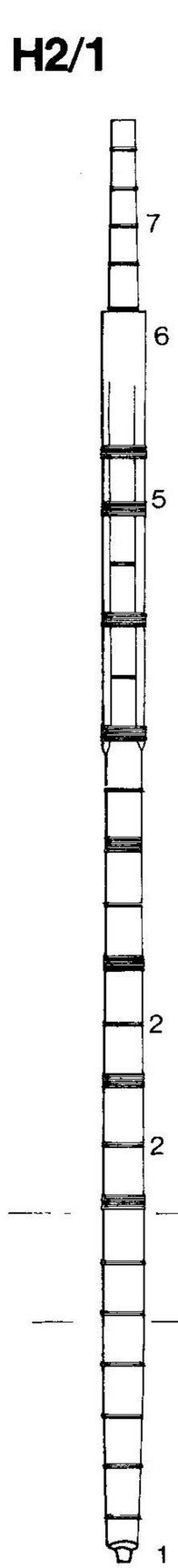
1. Tenon at heel
2. Rope woldings, 3½in rope, replaced by iron hoops about 1800
3. Level of gundeck
4. Level of upper deck, and 'partners', where the mast has its greatest circumference
5. Cheeks
6. Hounds
7. Head

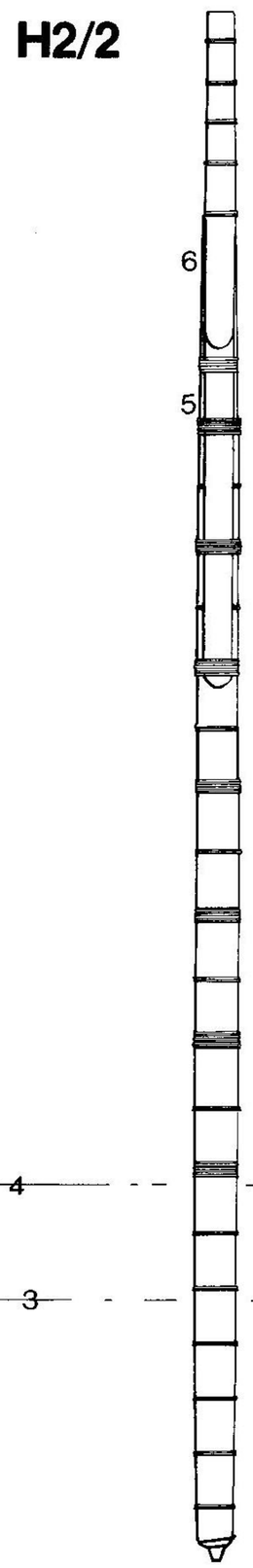
H3 **MIZZEN MAST (1/192 scale)**

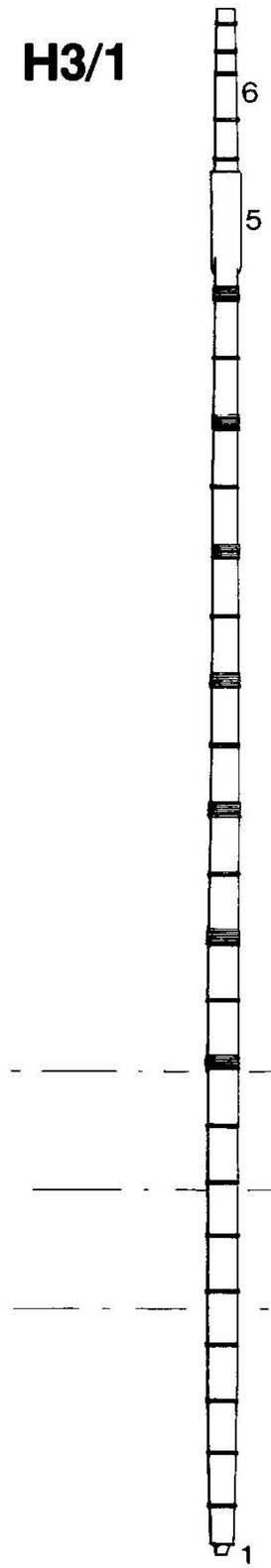
H3/1 **View from forward**

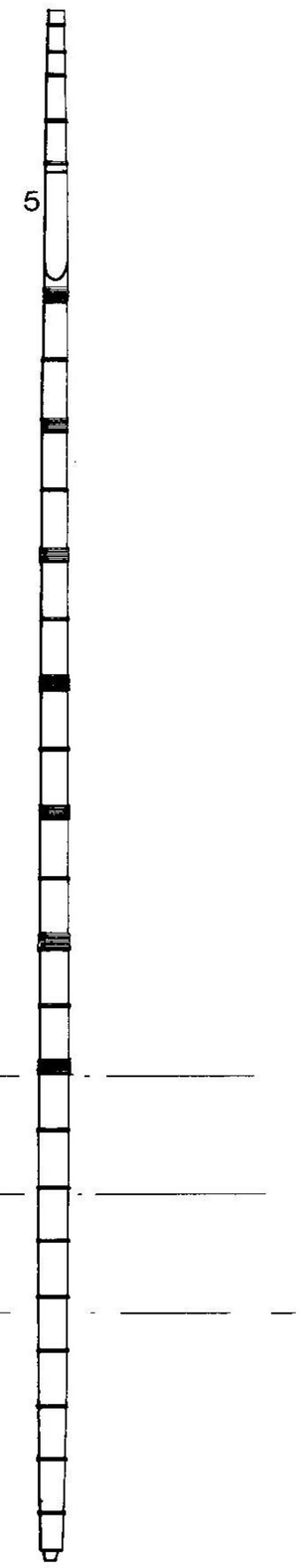
H3/2 **Side view**

1. Heel
2. Level of gundeck
3. Level of upper deck, and 'partners' at which the mast has the greatest diameter
4. Level of quarterdeck
5. Hounds (no cheeks fitted on mizzens at this time)
6. Head







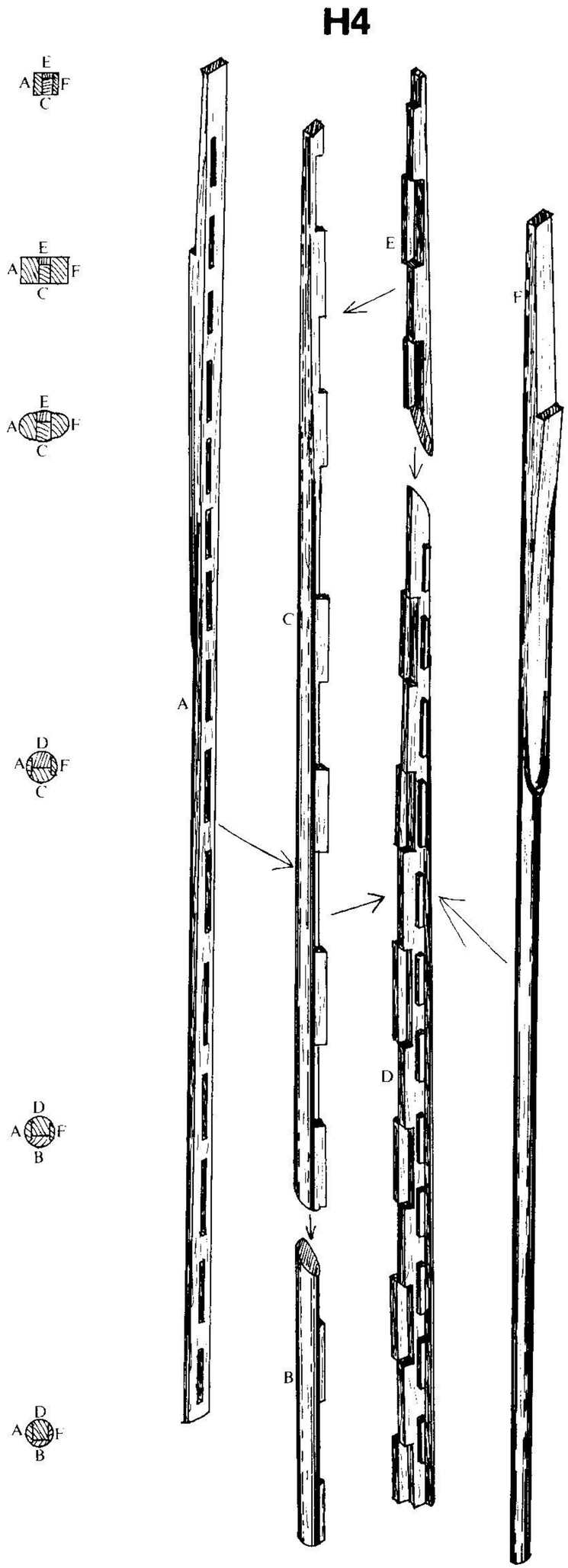


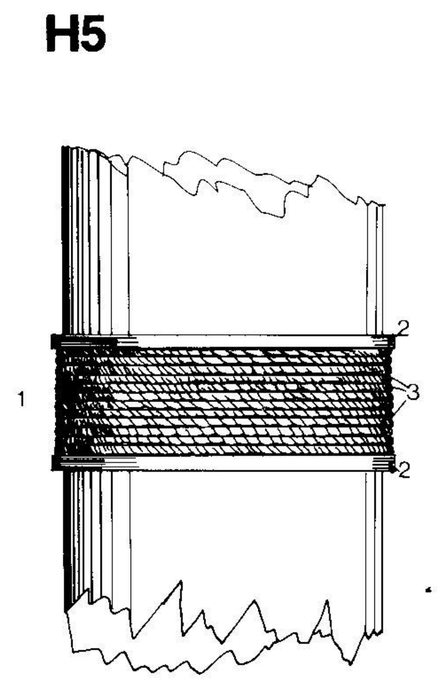
H Masts and yards

H4 **TYPICAL CONSTRUCTION OF A MADE MAST, ABOUT 1780 (note: there were many other methods of constructing masts at this time. No scale)**

H5 **DETAILS OF ROPE WOLDINGS ON LOWER MASTS AND BOWSPRIT (1/30 scale)**

1. Wolding, 12in deep
2. Wooden bands, 1½in square, to hold wolding in place
3. Rope, 3½in circumference on main, fore and bowsprit, 2½in on mizzen





H6 FITTING OF MAIN MAST (1/120 scale)

H6/1 Longitudinal section

H6/2 Athwartship section

H6/3 Sectional plans at deck and hold levels

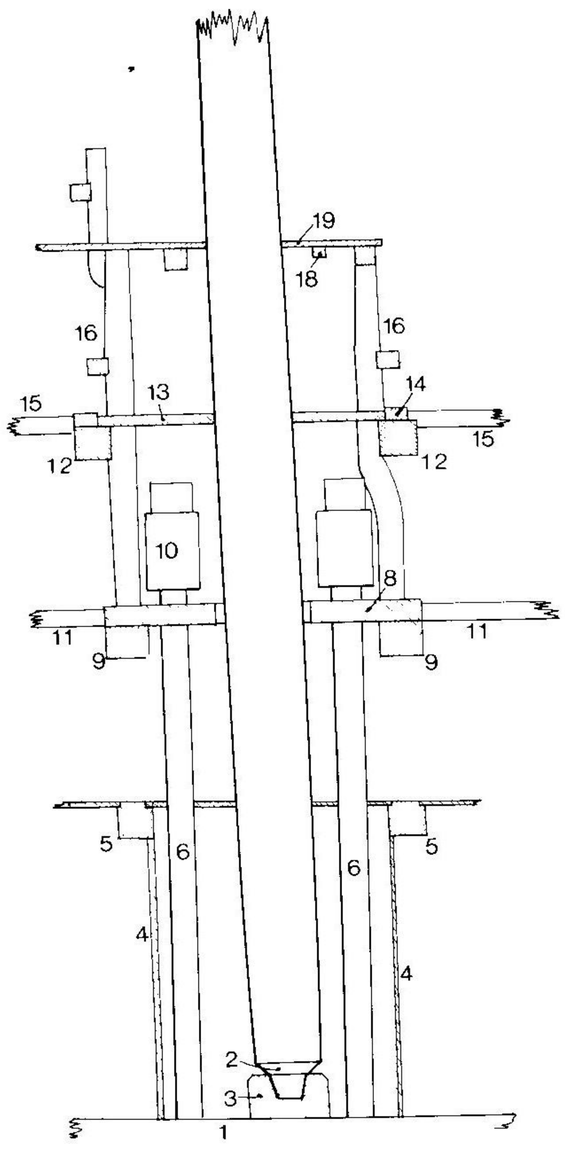
IN HOLD
1. Kelson
2. Heel of mast
3. Step
4. Pump well
5. Orlop deck beams
6. Pump tubes

GUNDECK
7. Carlines
8. Cross chock, 9in deep
9. Gundeck beams
10. Pump cisterns
11. Hatchways

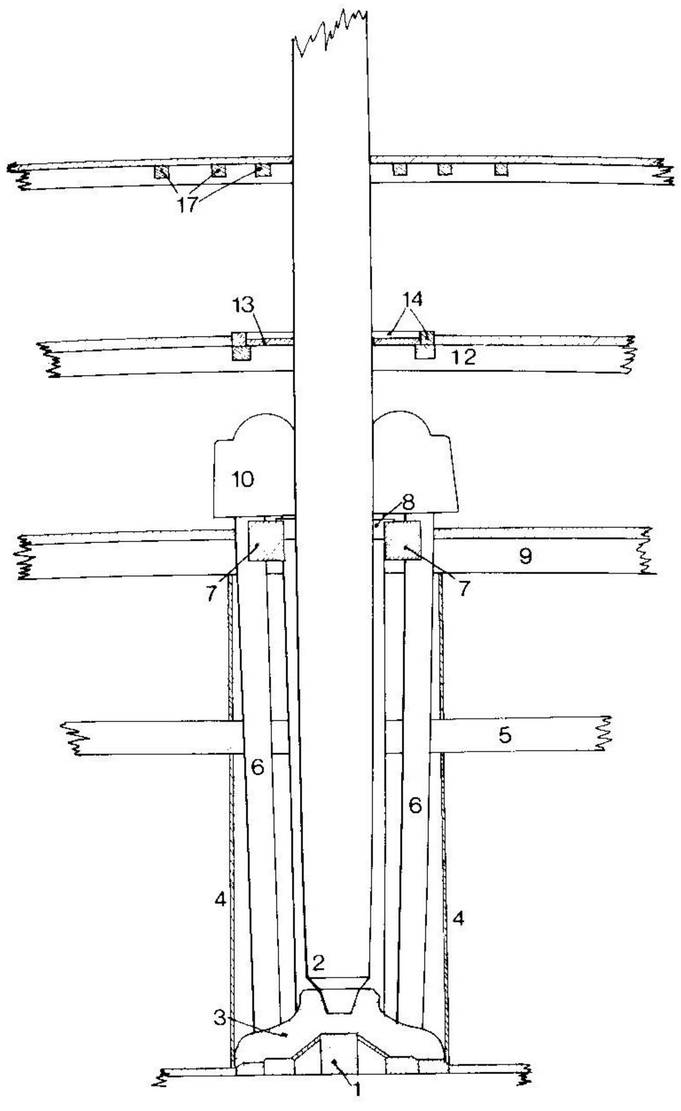
UPPER DECK
12. Upper deck beams
13. Partners, 3in thick
14. Coamings
15. Hatchways
16., Bitts

QUARTERDECK
17. Quarterdeck carlines
18. Ledges
19. Deck plank

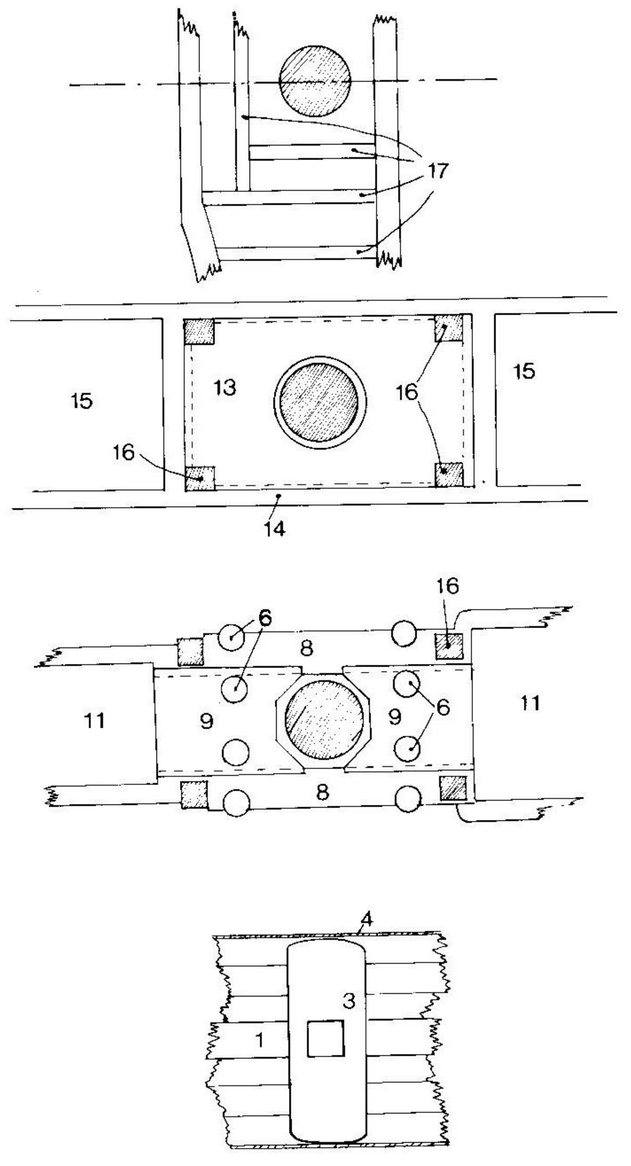
H6/1



H6/2



H6/3



H Masts and yards

H7 **MAIN TOP AND CAP (section through the centre-line. 1/120 scale)**

1. Head of lower mast
2. Heel of main topmast
3. Trestletrees, 15ft 5¼in × 1ft 5⅜in × 11⅝in
4. Crosstrees
5. Planking of top, 3in thick
6. Gunwale of the top
7. Rim
8. Filling pieces, between the battens
9. Battens, 4in thick at the rim, tapering to 2in at the hole
10. Hole for fid
11. Cap, 6ft 5in × 3ft 2½in × 1ft 5⅛in
12. Bolster
13. Chock
14. Bib

H8 **CROSSTREES AND TRESTLETREES (from above. 1/120 scale)**

1. Main mast
2. Main topmast heel
3. Fid, to hold topmast in place
4. Crosstrees
5. Trestletrees
6. Bolster
7. Chocks
8. Fid plate (iron) to protect wood from the fid

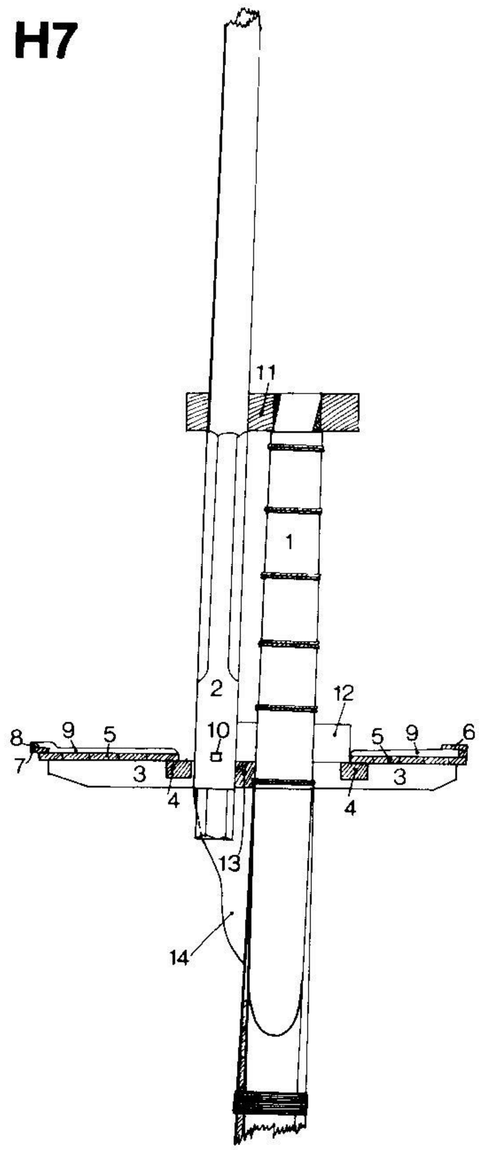
H9 **TOP AND CAP ASSEMBLY (front view. 1/120 scale)**

1. Cap
2. Heel of main topmast
3. Filling pieces and ends of battens
4. Rim
5. Planking of top
6. Trestletrees
7. Crosstrees, 15ft 15½in × 1ft 5⅜in × 11⅝in
8. Bib
9. Bolster

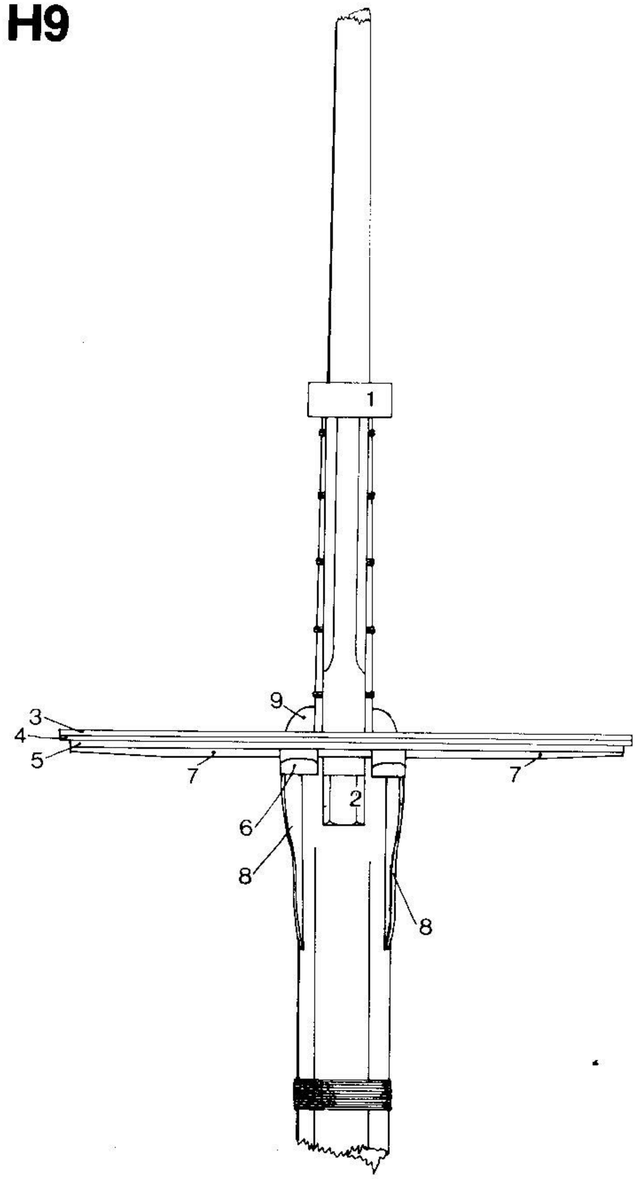
H10 **MAIN TOP (Athwartship section at forward edge of crosstrees 1/120 scale)**

1. Crosstrees
2. Trestletrees
3. Bibs
4. Planking of top
5. Battens
6. Rim
7. Plank with recesses to fit swivel guns
8. Fid
9. Bolsters

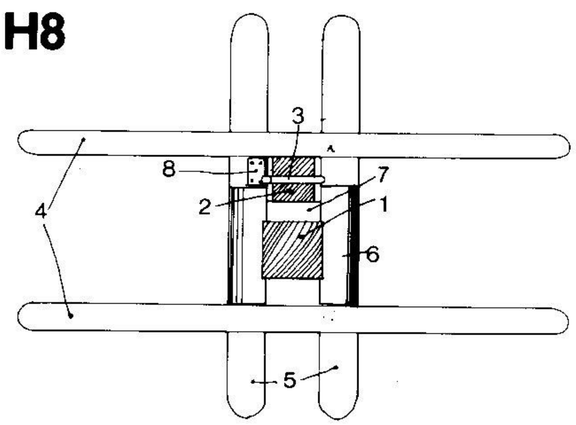
H7



H9



H8



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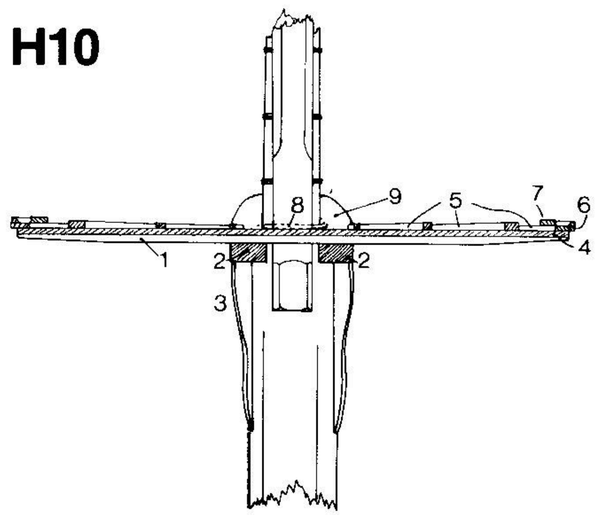


H11 **METHOD OF PLANKING TOPS (no scale)**

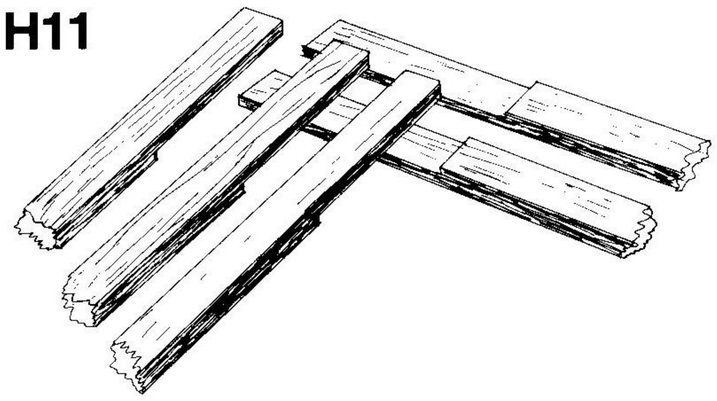
H12 **MAIN TOP (plan view. 1/120 scale)**

1. Main mast
2. Main topmast
3. Trestletrees
4. Crosstrees
5. Battens
6. Rim
7. Gunwale
8. Filling pieces
9. Bolsters
10. Planking
11. Futtock plate
12. Holes for futtock shrouds
13. Fittings for swivel guns
14. Tenons for top rail

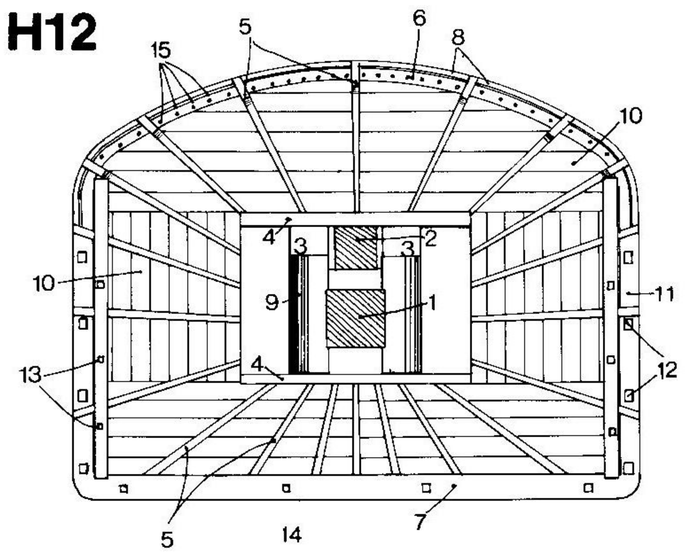
H13 **RAIL OF THE MAIN TOP (1/120 scale)**

1. Stanchions
2. Rail
3. Cross section (twice scale)

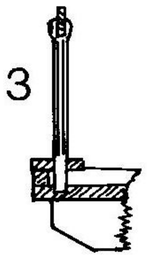
H11

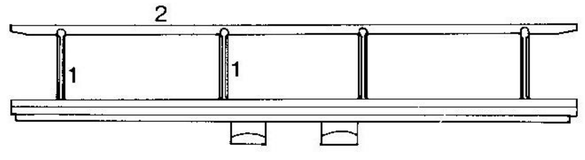


H12



H13





H Masts and yards

H14 FORE TOP (elevation and plan. 1/192 scale)

1. Fore mast
2. Fore topmast
3. Bibs
4. Trestletrees
5. Crosstrees
6. Planking of top
7. Battens
8. Cap
9. Rails
10. Bolster

H15 MIZZEN TOP (elevation and plan. 1/192 scale)

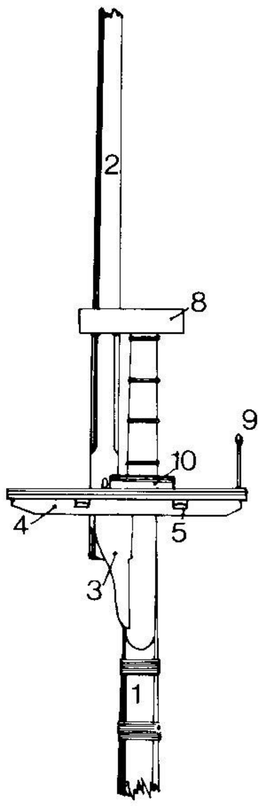
1. Mizzen mast
2. Mizzen topmast
3. Bibs
4. Trestletrees
5. Crosstrees
6. Planking of top
7. Battens
8. Cap
9. Rails
10. Bolster

H16 TOPMASTS (1/192 scale)

1. Main topmast
2. Fore topmast
3. Mizzen topmast
4. Block, hexagonal in section
5. Heeling, square
6. Position of cap
7. Hounds, hexagonal
8. Head, square

H17 TOPMAST TRESTLETREES AND CROSSTRESS (1/96 scale)

1. Main topmast
2. Main topgallant mast
3. Trestletrees
4. Crosstrees
5. Bolster
6. Fid
7. Holes for topgallant shrouds



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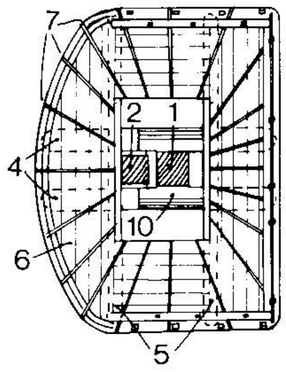

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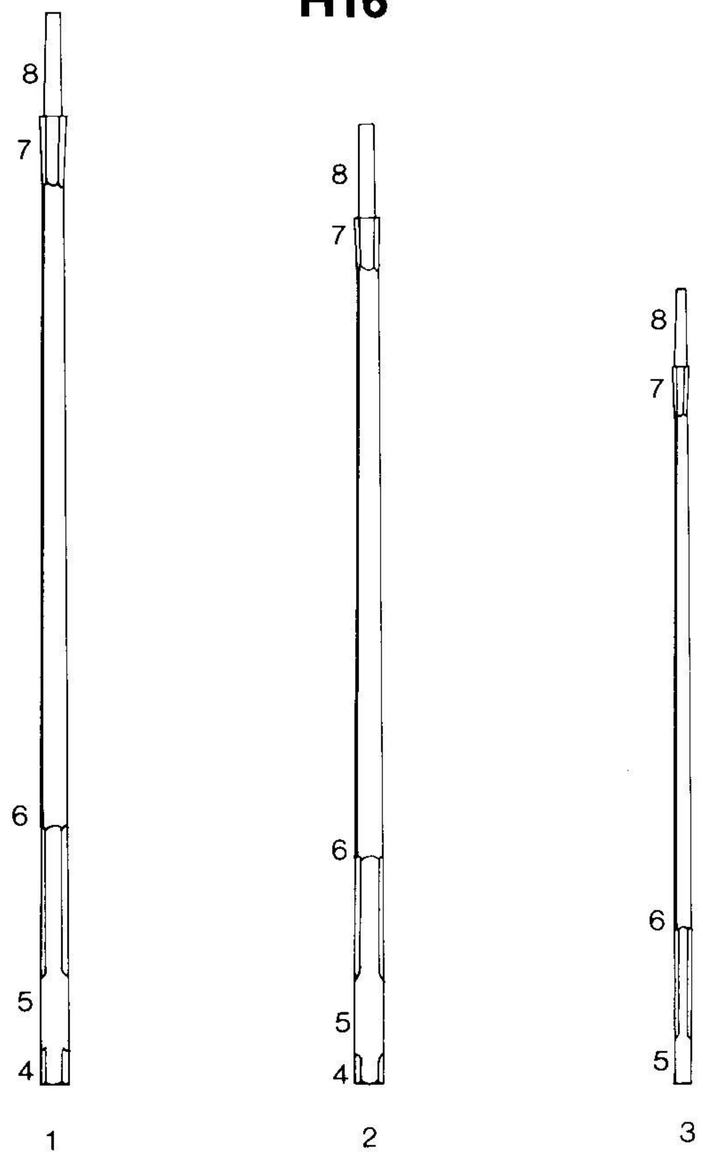

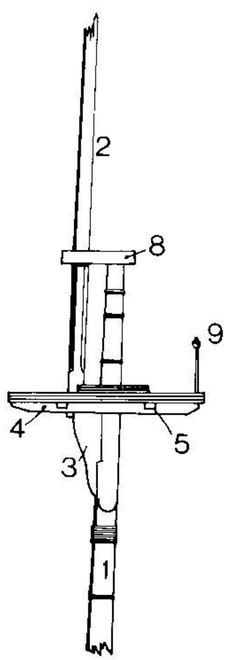

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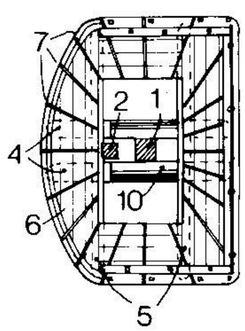

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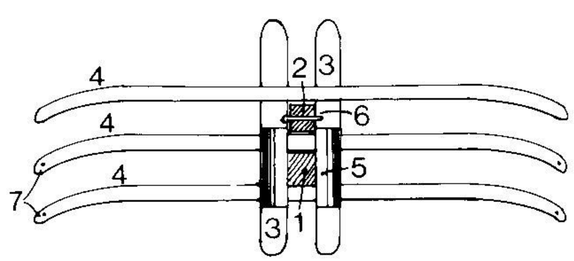


H18 MAIN TOPGALLANT TRESTLETREES AND CROSSTREES (elevation and plan. 1/96 scale)

1. Topmast
2. Topgallant
3. Trestletrees
4. Crosstrees
5. Bolster
6. Fid
7. Cap

H19 FORE AND MIZZEN TRESTLETREES AND CROSSTREES (1/192 scale)

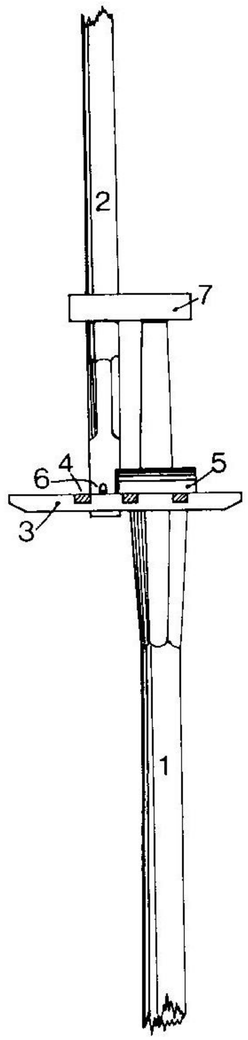
H19/1 Fore (plan and elevation)

H19/2 Mizzen (plan and elevation)

1. Fore topmast
2. Mizzen topmast
3. Trestletrees
4. Crosstrees
5. Bolster
6. Cap

H20 TOPGALLANT MASTS (1/192 scale)

1. Main topgallant
2. Fore topgallant
3. Mizzen topgallant
4. Heels
5. Positions of caps
6. Hounds
7. Trucks



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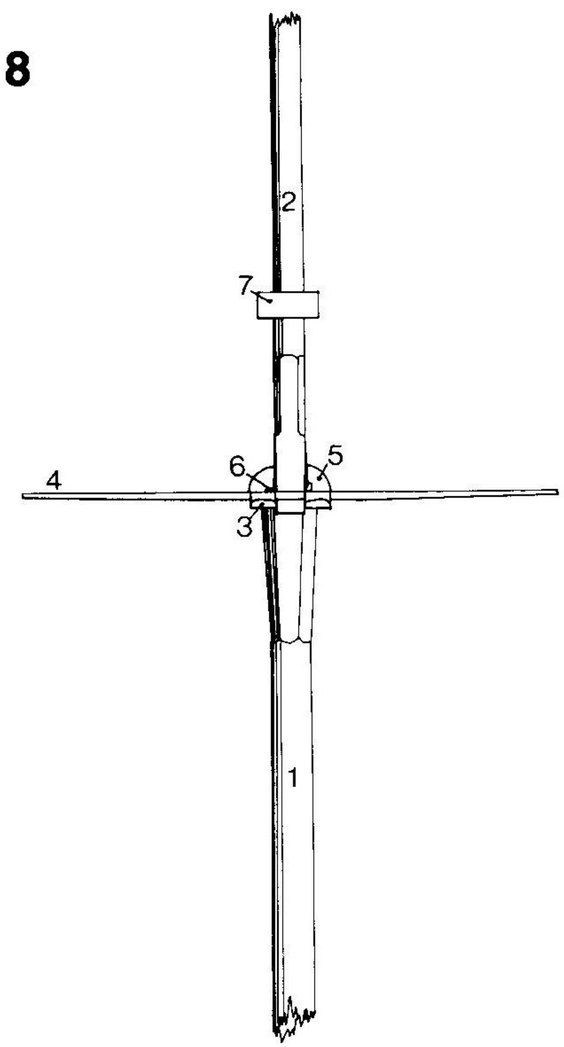

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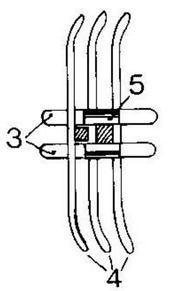

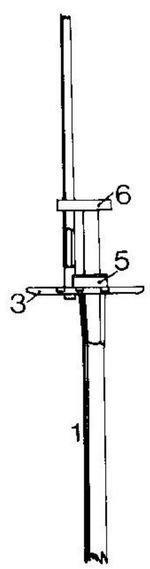

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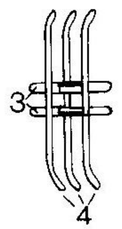

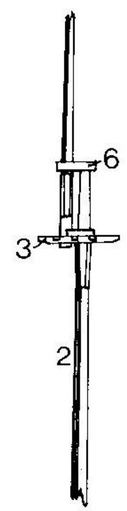

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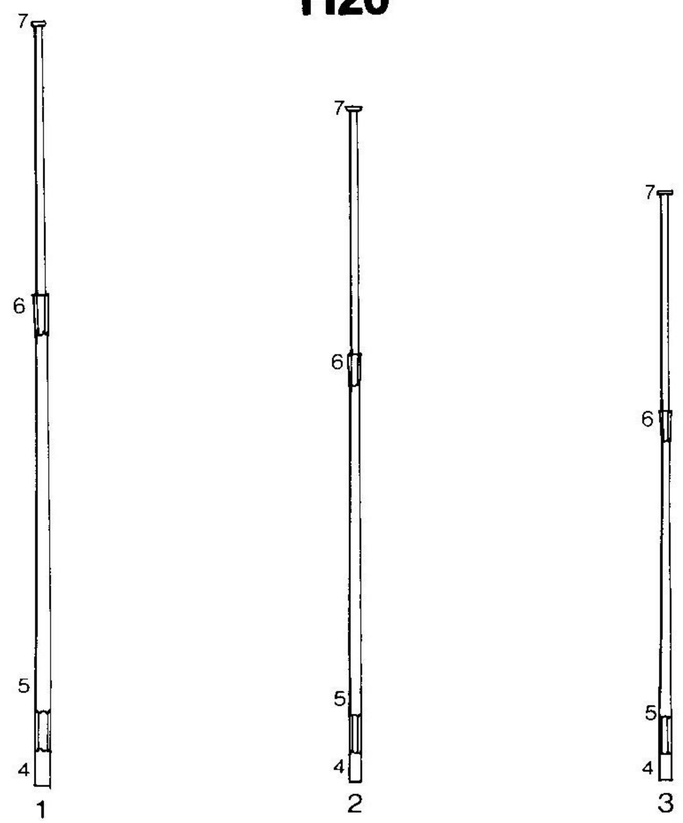


H Masts and yards

H21 STEPPING AND GAMMONING OF BOWSPRIT (1/96 scale)

H21/1 Longitudinal section

H21/2 Front view

H21/3 Athwartship elevation of step

1. Bowsprit
2. Step, made in two halves scarphed together
3. Deck beams
4. Stem
5. Knee of the head
6. Knightheads
7. Gammoning
8. Gammoning cleats
9. Gammoning hole
10. Part of the rail of the head

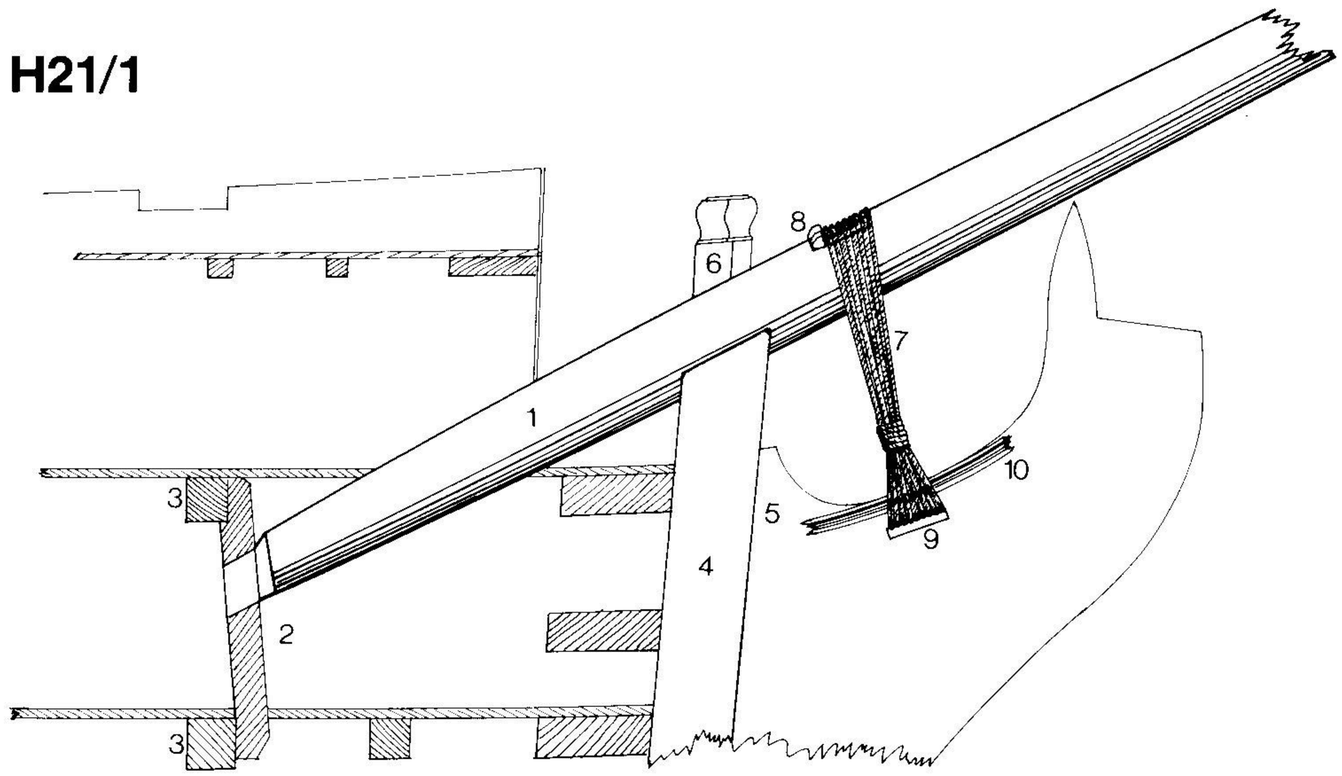
H22 BOWSPRIT (1/192 scale)

H22/1 Side view

H22/2 Plan view

1. Heel or butt
2. Bed, where the bowsprit has its greatest diameter
3. Tenon for cap
4. Gammoning cleat, to prevent gammoning from sliding down bowsprit
5. Fairlead cleat, for various ropes leading along bowsprit
6. Jibboom saddle
7. Bees
8. Bee block
9. Holes for fore topmast stay and preventer

H21/1



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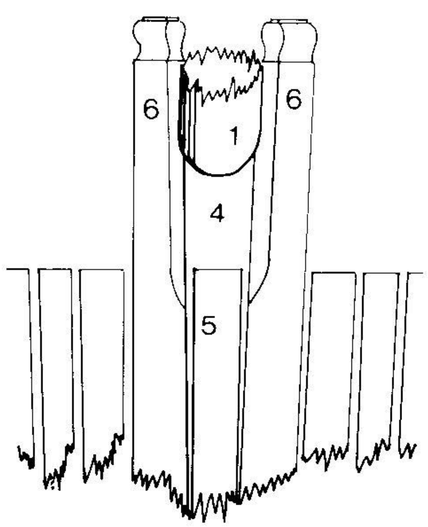

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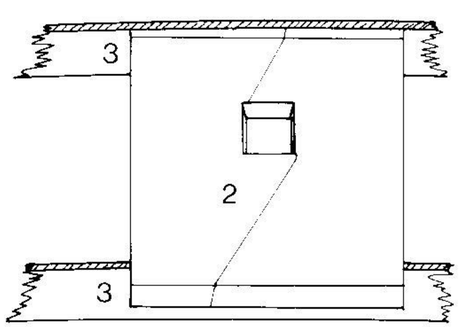
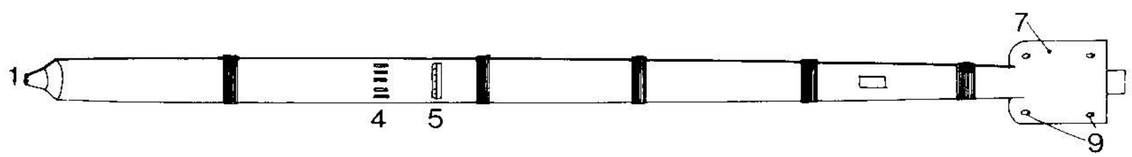


H22/1

H22/2



H23 BOWSPRIT CAP AND HEELING OF JIBBOOM (1/96 scale)

1. Bowsprit
2. Jibboom
3. Bees
4. Heel ropes
5. Saddle
6. Cap

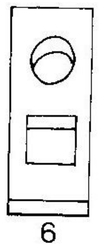
H24 JIBBOOM (1/192 scale)

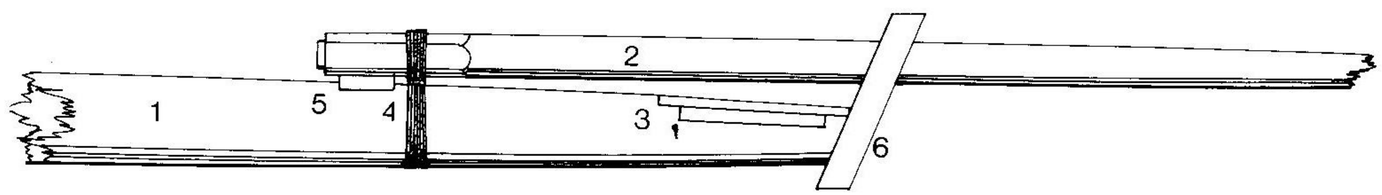
1. Heel
2. Hexagonal section, 4ft long
3. Shoulder for rigging at end of boom
4. Sheave block for outhauler
5. Sheave block for heel rope

H25 DETAILS OF BOOMKINS (no scale)

1. Boomkins
2. Spectacle frame
3. Iron to fix boomkin to knee of head
4. Knightheads
5. Bulkhead bulkhead

H23





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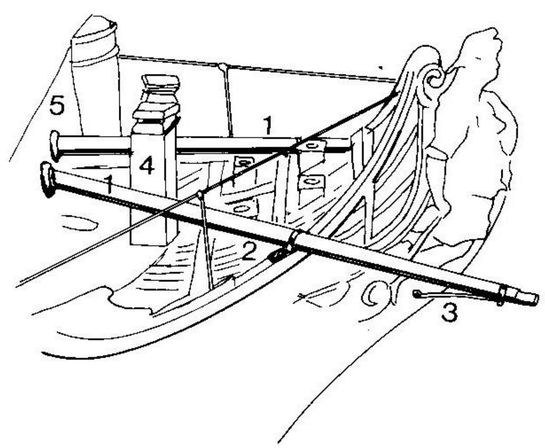


H25

H Masts and yards

H26 LOWER YARDS (front view and plan view. 1/192 scale)

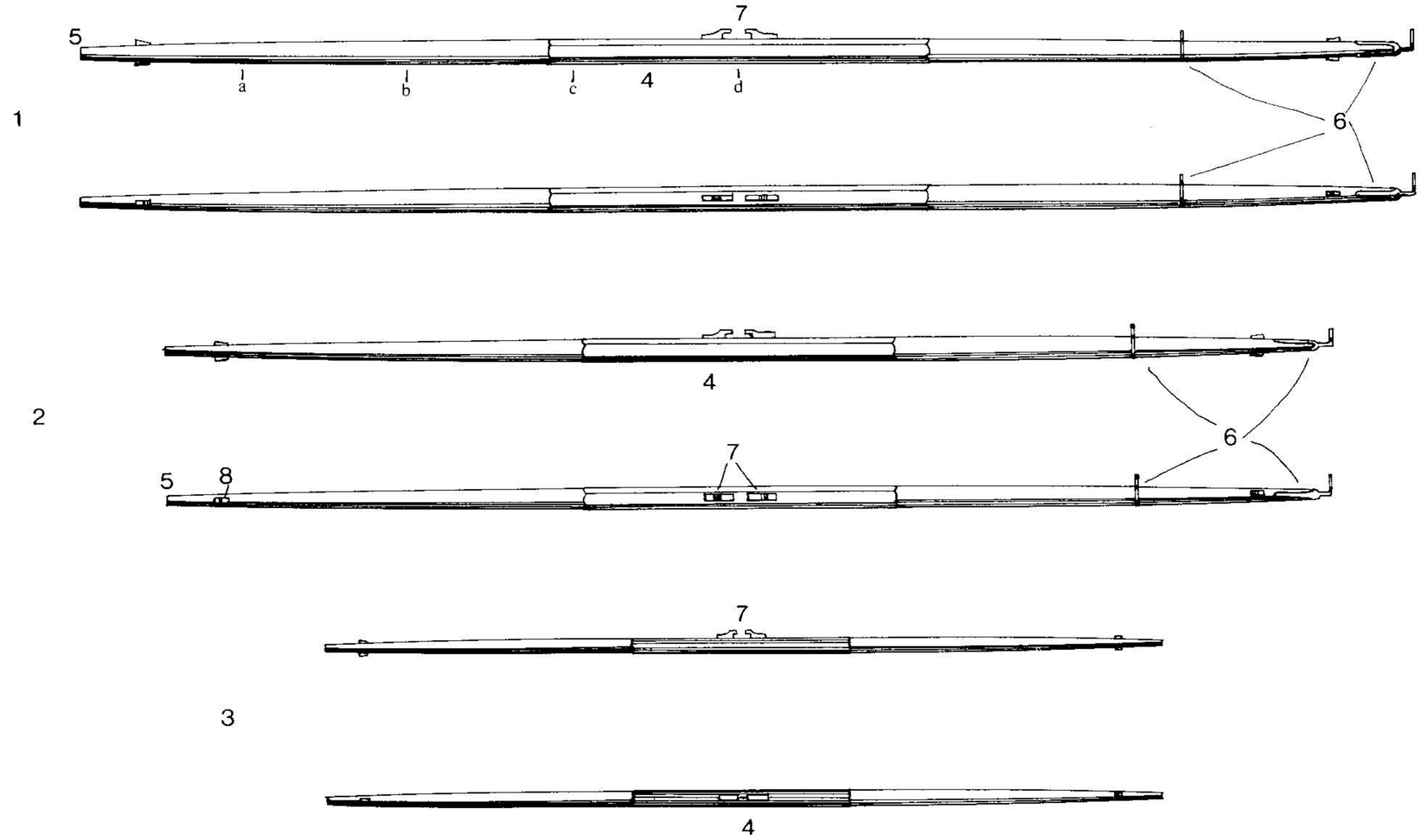
1. Main yard
2. Fore yard
3. Crossjack yard
4. Centre section, one-quarter of the length of the yard – octagonal in section on fore and main, sixteen-squared on the mizzen
5. Yardarm as finished before fitting of the stunsail boom irons
6. Stunsail boom irons (not on crossjack)
7. Sling cleats
8. Yardarm cleats

H27 SECTIONS OF THE MAIN YARD (1/96 scale)

H28 SCARPHING YARDS WITH TABLE AND COAK (often used for lower yards after about 1780. No scale)

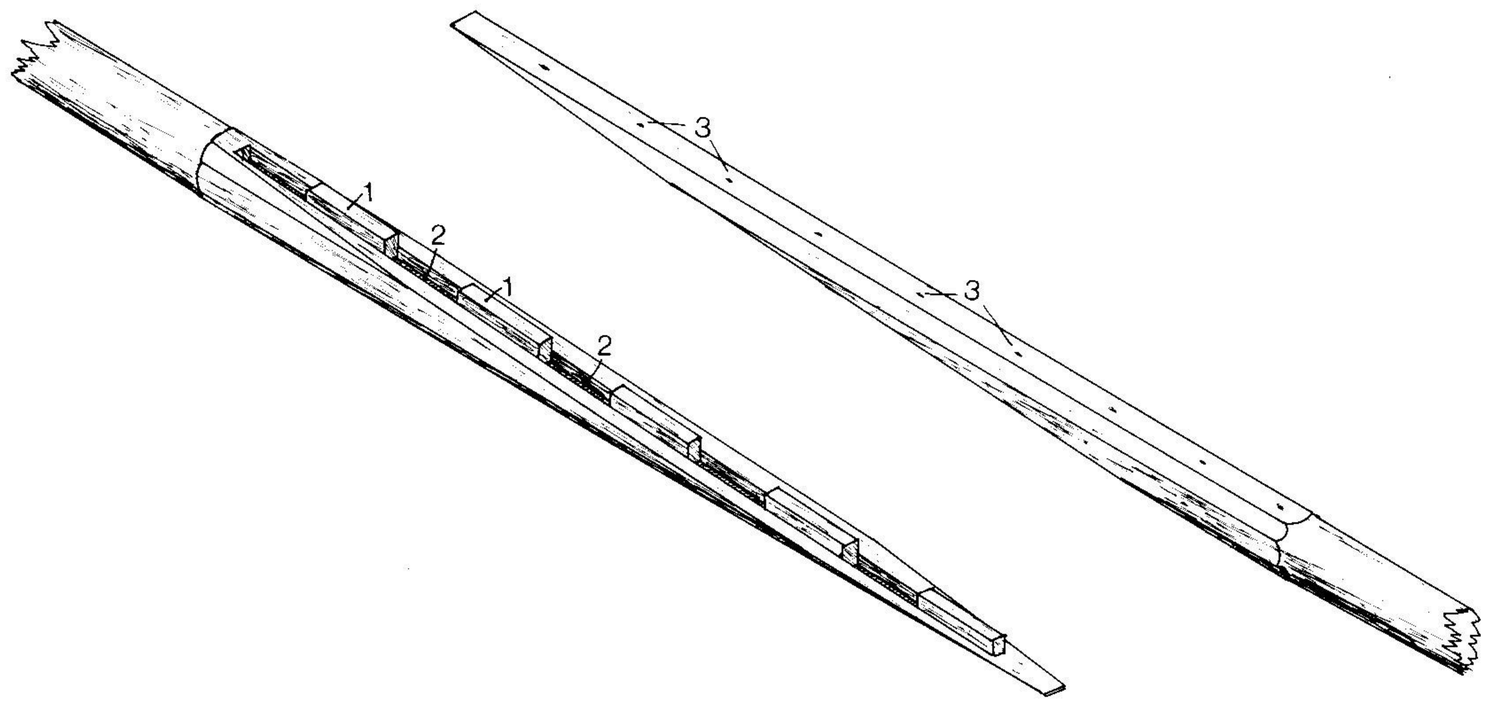
1. Table
2. Coak
3. Holes for bolts

H26



H27

H28



H29 **METHOD OF MAKING LOWER YARDS BY 'TONGUING' (no scale)**

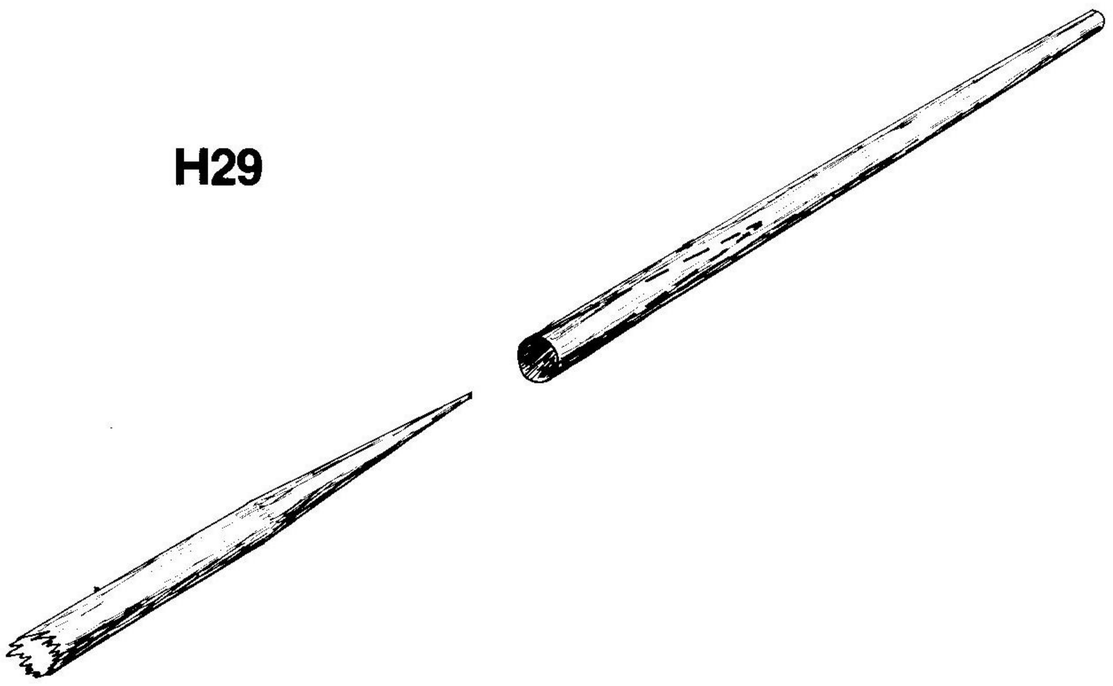
H30 **YARDARM FITTINGS (no scale)**

1. Yard viewed from end on
2. Inner stunsail boom iron
3. Outer stunsail boom iron
4. Iron fitting for outer iron
5. Bolts
6. Yardarm cleats
7. Yardarm, one-twentieth of the length of yard

H31 **MIZZEN YARD (1/192 scale)**

1. Forward end
2. Sling cleats, just forward of centre of yard
3. Yardarm cleats

H29



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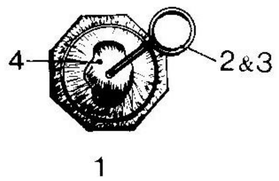

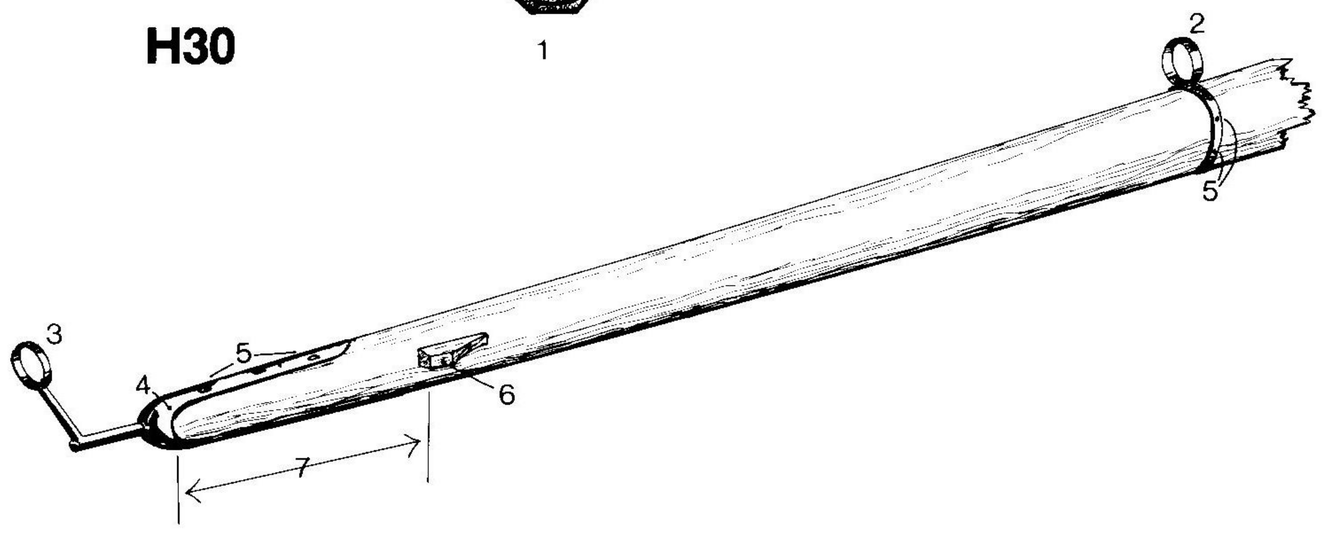

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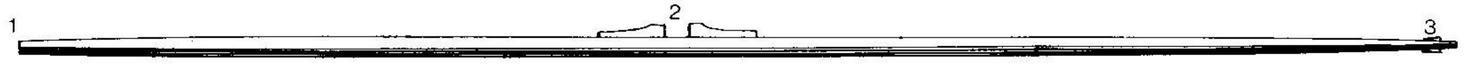


H Masts and yards

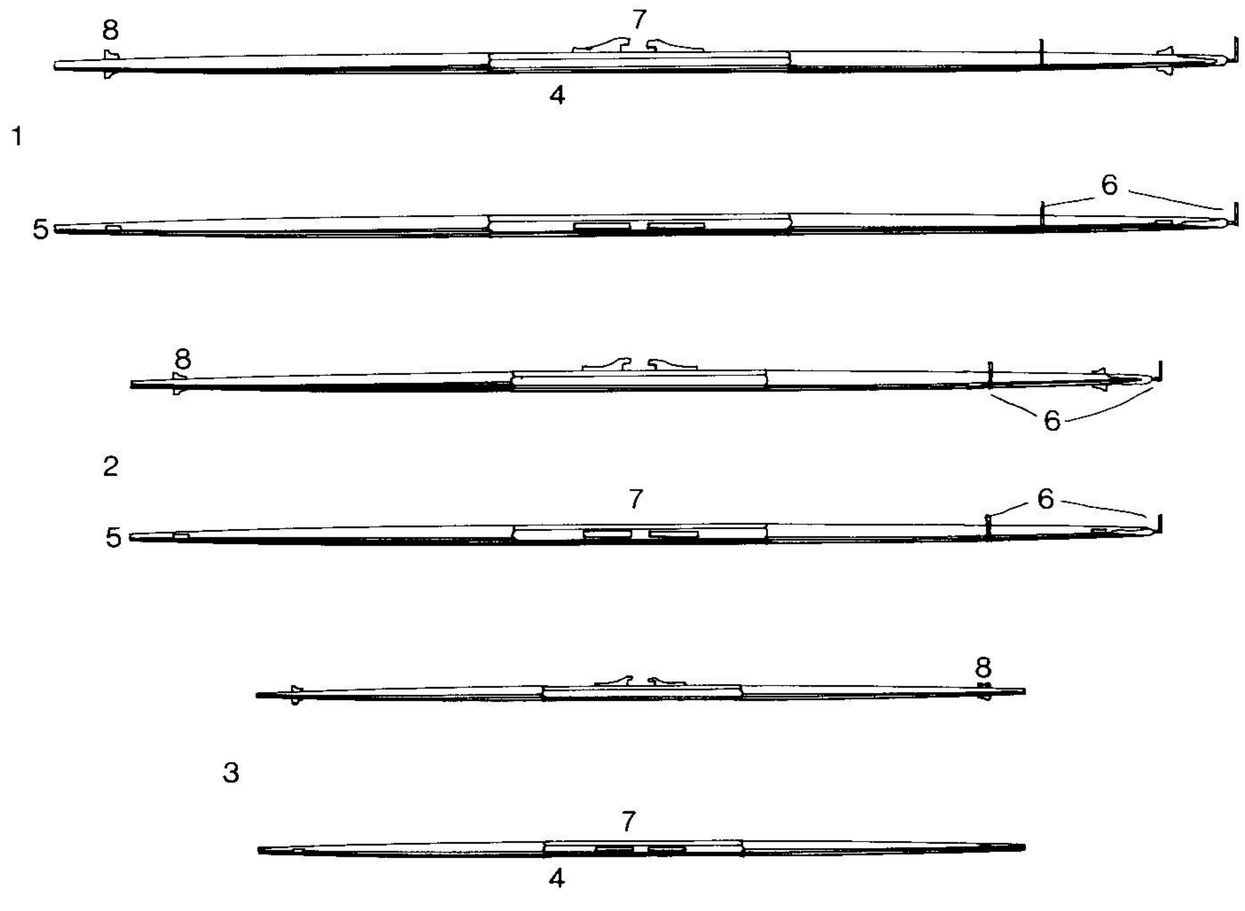
H32 TOPSAIL YARDS (front view and plan view. 1/192 scale)

1. Main topsail yard
2. Fore topsail yard
3. Mizzen topsail yard
4. Centre section, one-quarter of the length of the yard, octagonal in section
5. Yardarm as finished before fitting of the stunsail boom irons
6. Stunsail boom irons (not on mizzen)
7. Sling cleats
8. Yardarm cleats

H33 TOPGALLANT YARDS (front view and plan view. 1/192 scale)

1. Main topgallant yard
2. Fore topgallant yard
3. Centre section, one-quarter of the length of the yard, octagonal in section
4. Sling cleats
5. Yardarm cleats

H32



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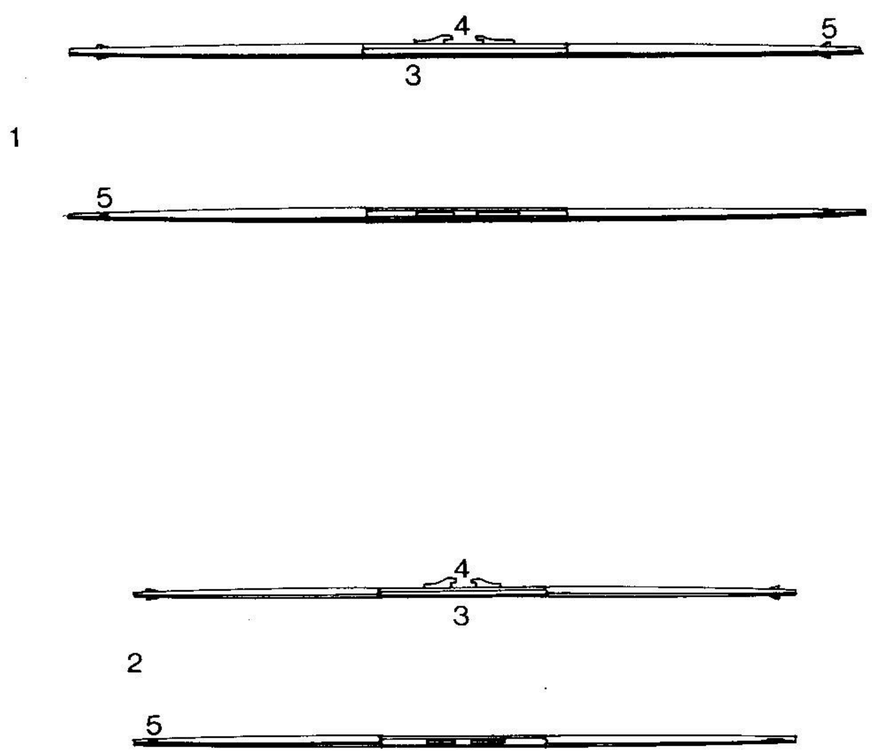

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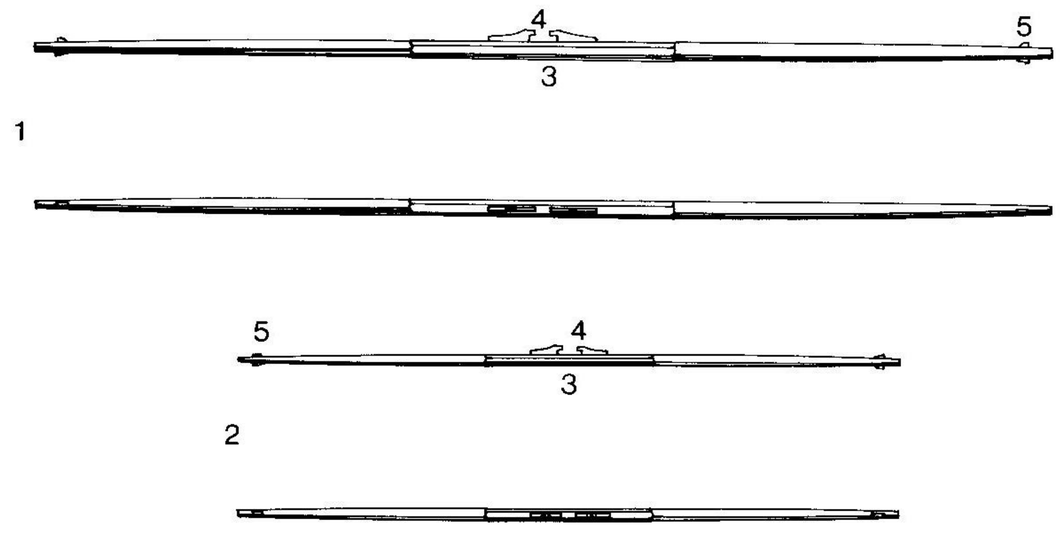


H34 SPRITSAIL AND SPRIT TOPSAIL YARD (front view and plan view. 1/192 scale)

1. Spritsail yard
2. Sprit topsail yard
3. Centre section, one-quarter of the length of the yard, octagonal in section
4. Sling cleats
5. Yardarm cleats

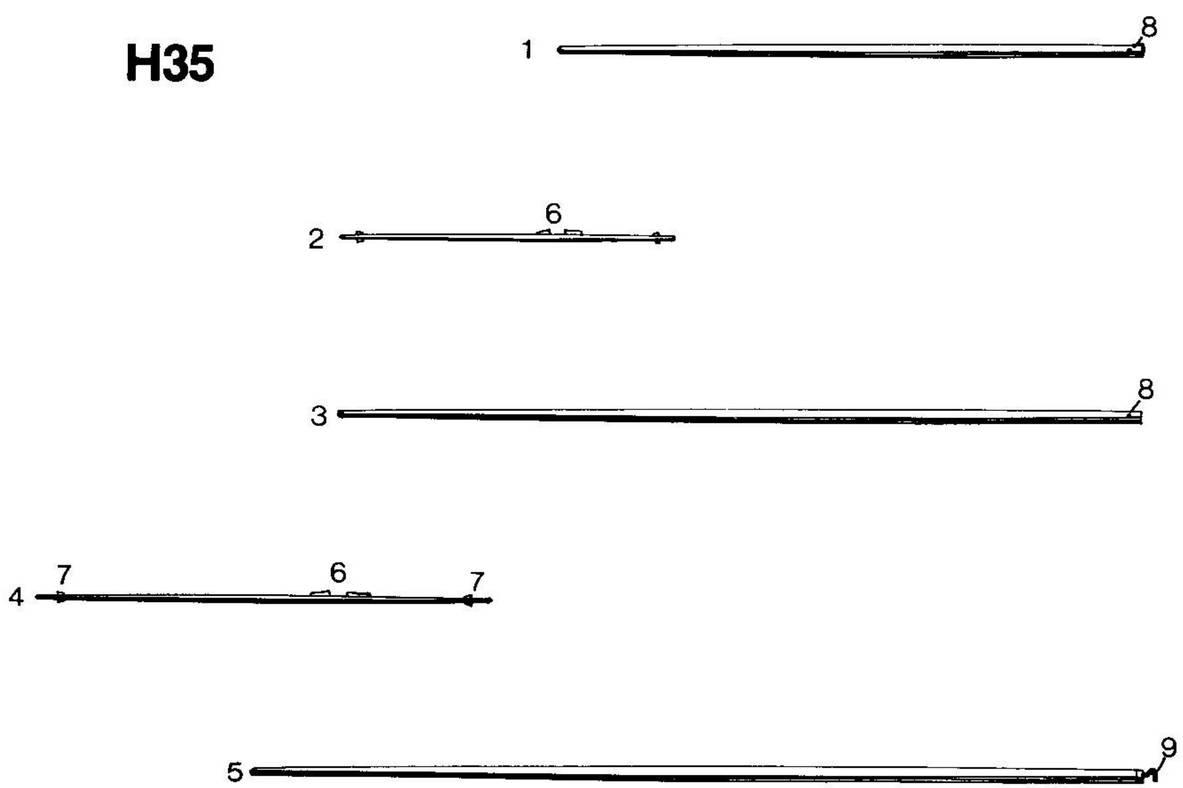
H35 MAIN STUNSAIL YARDS AND BOOMS (1/192 scale)

1. Topsail stunsail boom
2. Topsail stunsail yard
3. Main stunsail boom
4. Main stunsail yard
5. Lower stunsail boom
6. Sling cleats
7. Yardarm cleats
8. Holes for lashing of tack block
9. Ferrules for fitting of booms

H36 FORE STUNSAIL YARDS AND BOOMS (1/192 scale)

1. Topsail stunsail boom
2. Topsail stunsail yard
3. Main stunsail boom
4. Main stunsail yard
5. Lower stunsail boom
6. Sling cleats
7. Yardarm cleats
8. Holes for lashing of tack block
9. Ferrules for fitting of booms

H35



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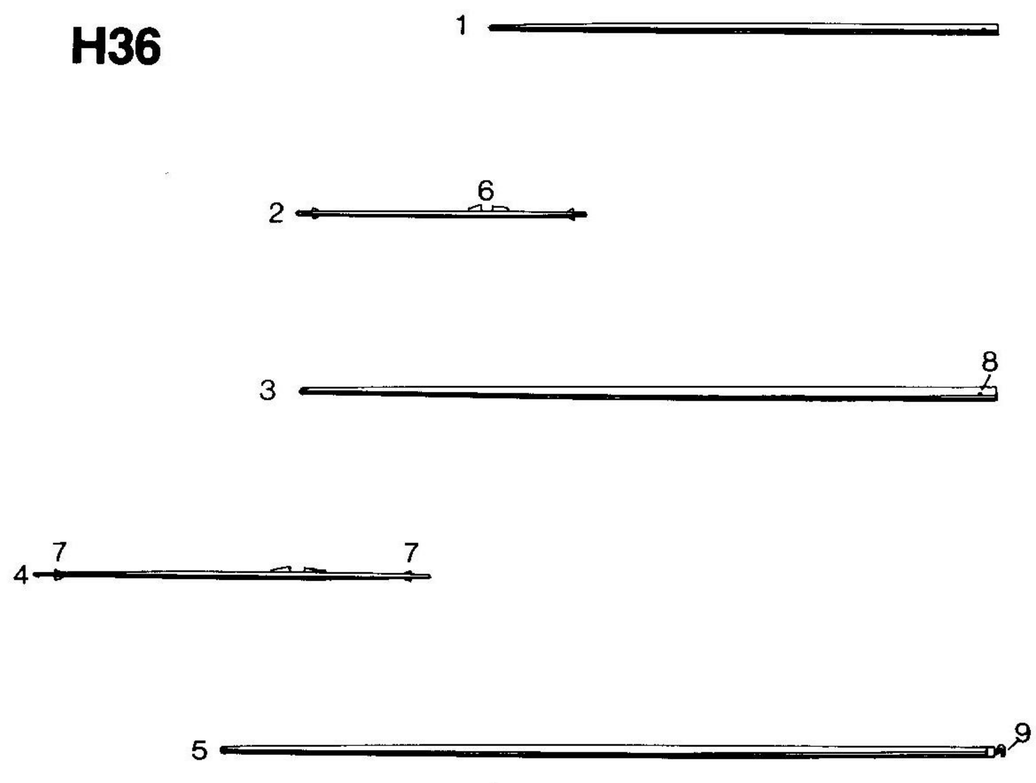
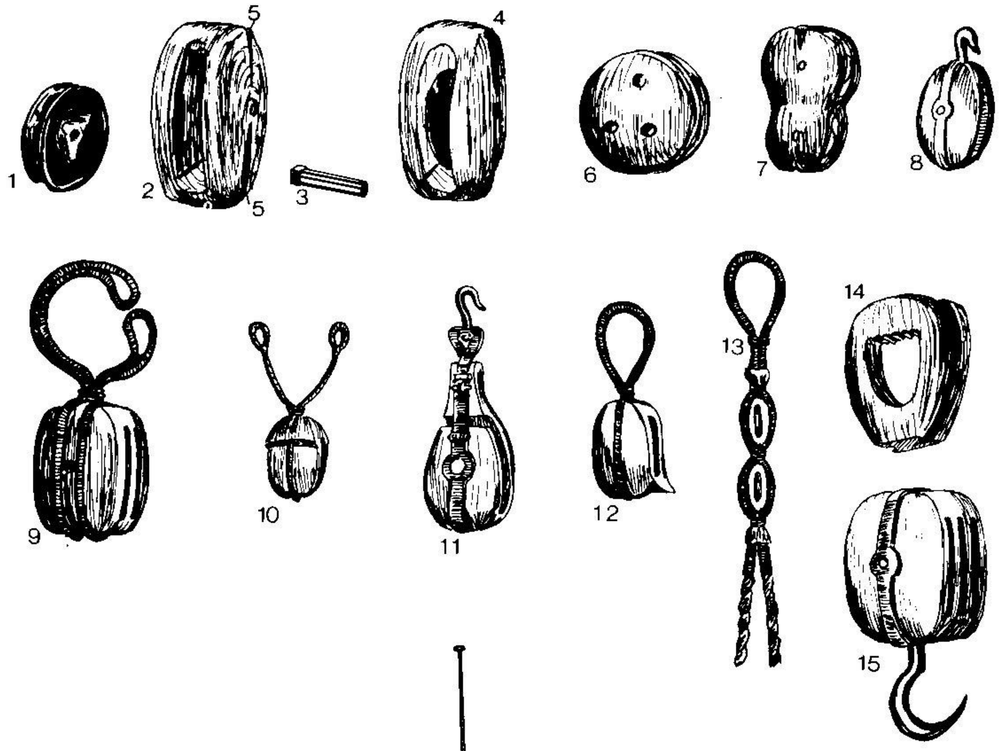


I1 EXAMPLES OF BLOCKS (no scale)

1. Sheave
2. Shell
3. Pin
4. Completed single block
5. Grooves for strop
6. Deadeye
7. Long-tackle block
8. Ironbound single block
9. Double block (jeer block)
10. Clew garnet block
11. Snatch block
12. Shoulder block
13. Sister block
14. Heart block
15. Cat block

I2 SHROUDS (1/384 scale)

1. Fore deadeyes, 16½in diameter
2. Fore shrouds, 9 pairs, 11in circumference
3. Fore futtock shrouds, 6½in circumference
4. Fore topmast deadeyes, 9¾in diameter
5. Fore topmast shrouds, 6 pairs, 6½in circumference
6. Fore topgallant futtock shrouds, 4in circumference
7. Fore topgallant deadeyes, 6in diameter
8. Fore topgallant shrouds, 3 pairs, 4in circumference
9. Main deadeyes, 16½in diameter
10. Main shrouds, 9 pairs, 11in circumference
11. Main topmast futtock shrouds, 6½in circumference
12. Main topmast deadeyes, 9¾in diameter
13. Main topmast shrouds, 6 pairs, 6½in circumference
14. Main topgallant futtock shrouds, 4in circumference
15. Main topgallant deadeyes, 6in diameter
16. Main topgallant shrouds, 4in circumference
17. Mizzen deadeyes, 9¾in diameter
18. Mizzen shrouds, 6 pairs, 6in circumference
19. Mizzen topmast futtock shrouds, 4½in circumference
20. Mizzen topmast deadeyes, 6¾in diameter
21. Main topmast shrouds, 4 pairs, 4½in circumference
22. Mizzen topgallant futtock shrouds, 2½in circumference
23. Mizzen topgallant deadeyes, 3¾in diameter
24. Mizzen topgallant shrouds, 2 pairs, 2½in circumference



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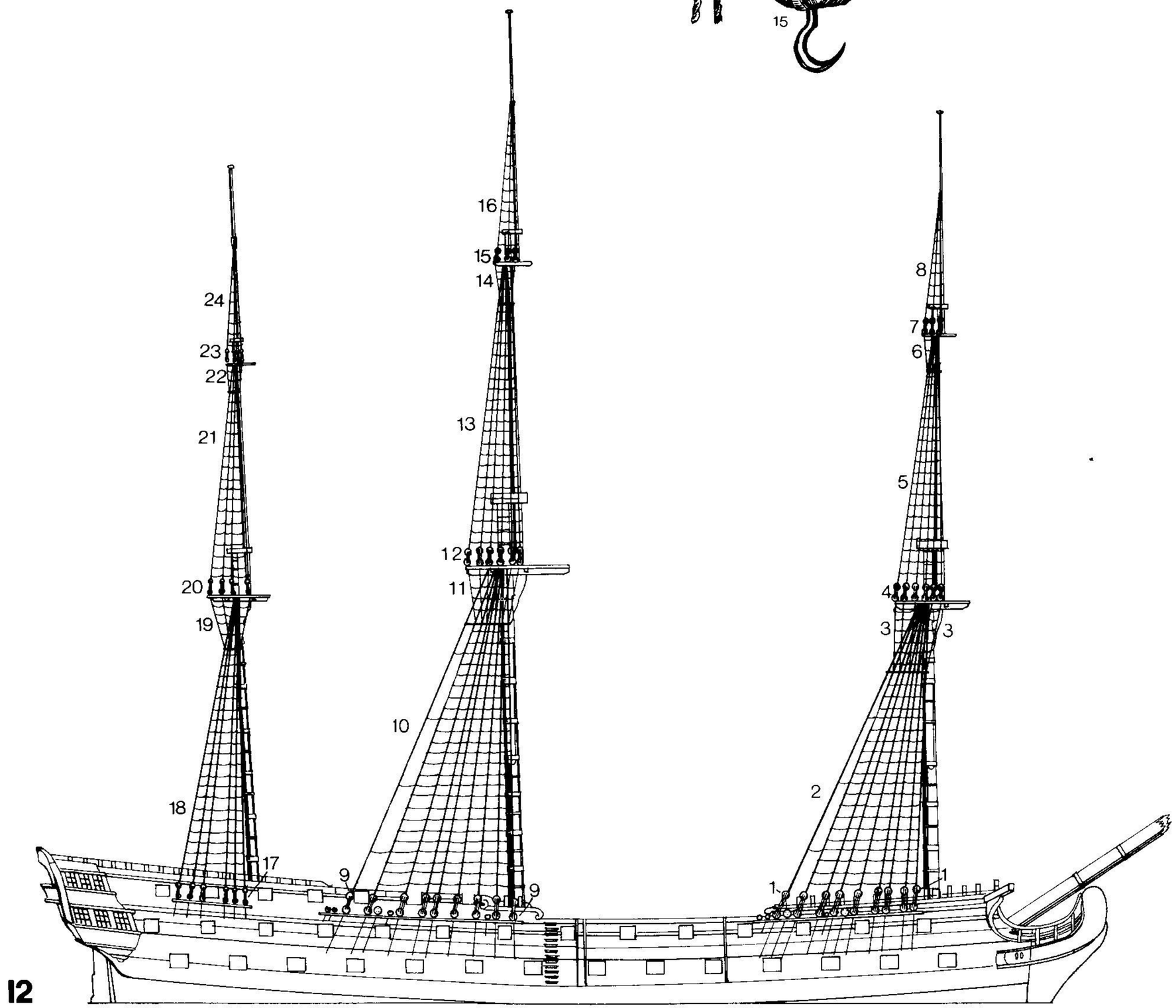


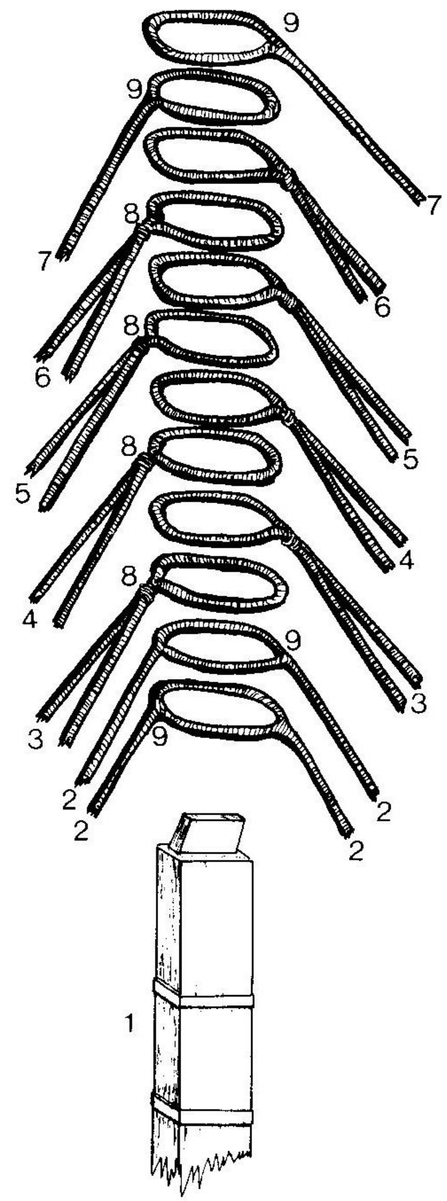
I2

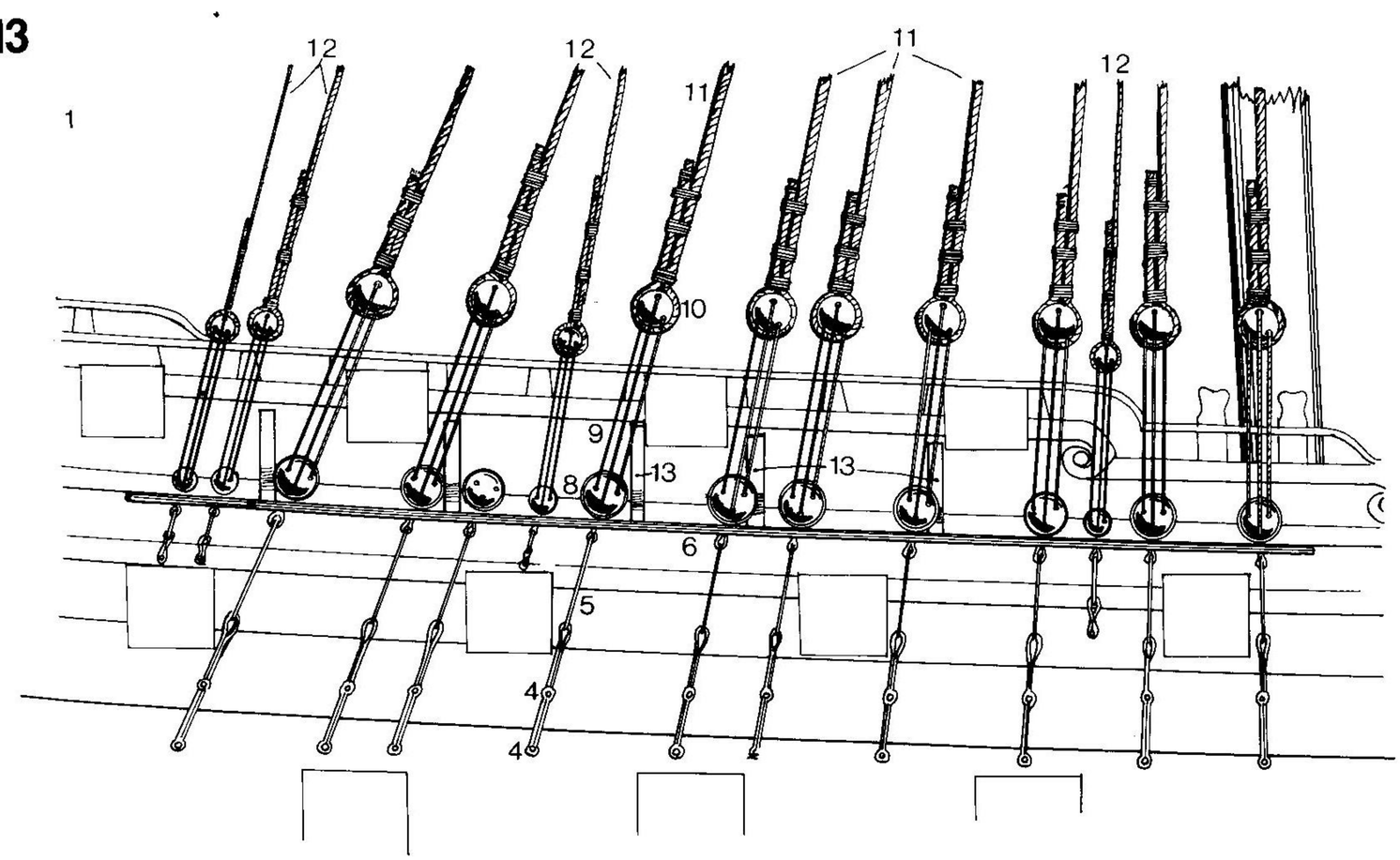
I3 **MAIN CHANNELS AND DEADEYES (1/96 scale)**

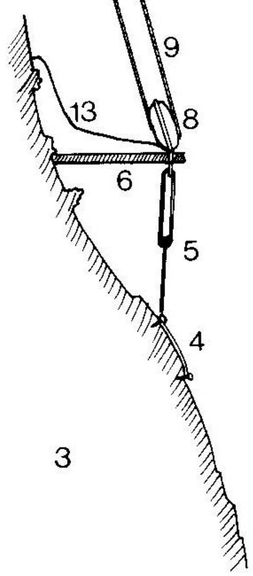
1. Side view
2. Plan view
3. Cross section
4. Bolts
5. Chains
6. Channels, 5¼in thick at inner edge, 4½in at outer edge
7. Holes for chains to pass through channels
8. Lower deadeyes
9. Lanyards
10. Upper deadeyes
11. Shrouds
12. Backstays
13. Brackets

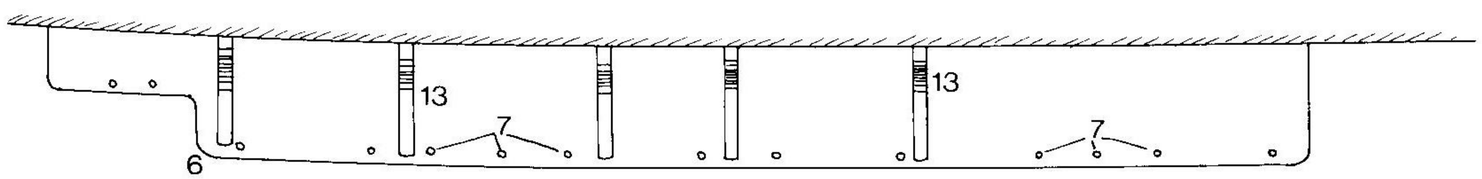
I4 **FITTING OF SHROUDS (no scale)**

1. Head of mast
2. Pendants of tackles
3. 1st and 2nd shrouds (starting from forward)
4. 3rd and 4th shrouds
5. 5th and 6th shrouds
6. 7th and 8th shrouds
7. 9th shroud
8. Seizings
9. Eye splices









I Sails and rigging

I5 FUTTOCK SHROUDS

I5/1 Athwartship section (1/96 scale)

I5/2 Detail of futtock plate (no scale)

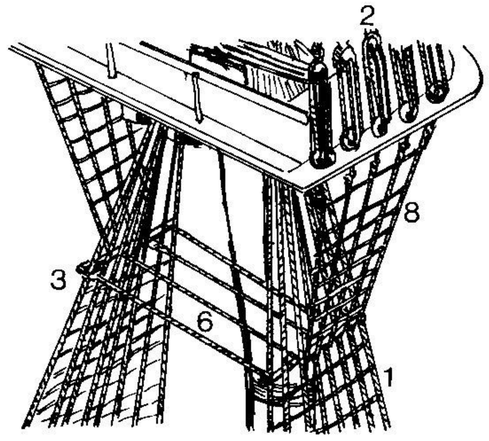
I5/3 General view (no scale)
1. Lower shrouds
2. Topmast shrouds
3. Futtock staves
4. Deadeyes
5. Futtock plates
6. Catharpins
7. Hook
8. Futtock shrouds

I6 DETAILS OF RATLINES (no scale)
1. Shrouds
2. Ratlines, 1½in circumference
3. Eye splice
4. Seizing
5. Clove hitch

I7 CROWSFEET OF MAIN TOP (also fitted to fore and mizzen tops. 1/96 scale)
1. Top
2. Crowsfeet
3. Euphroe block
4. Euphroe tackle
5. Stay

I5/2

I5/3



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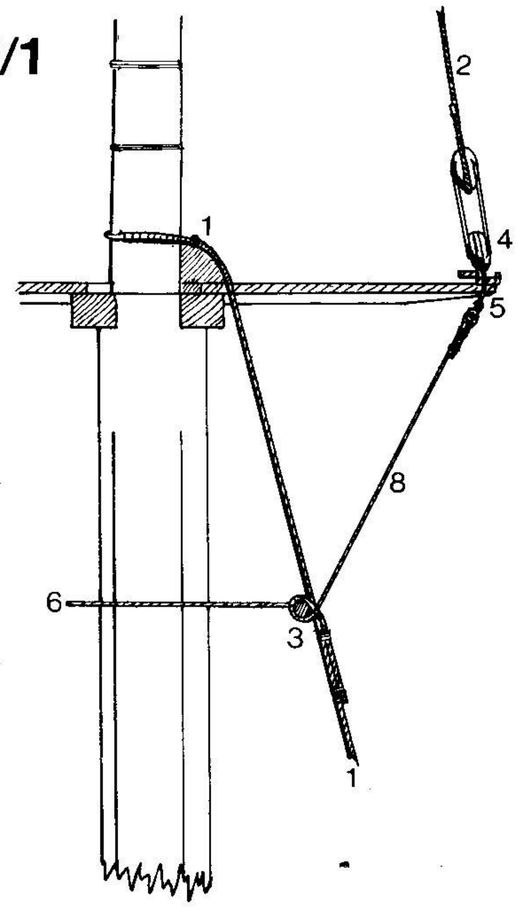

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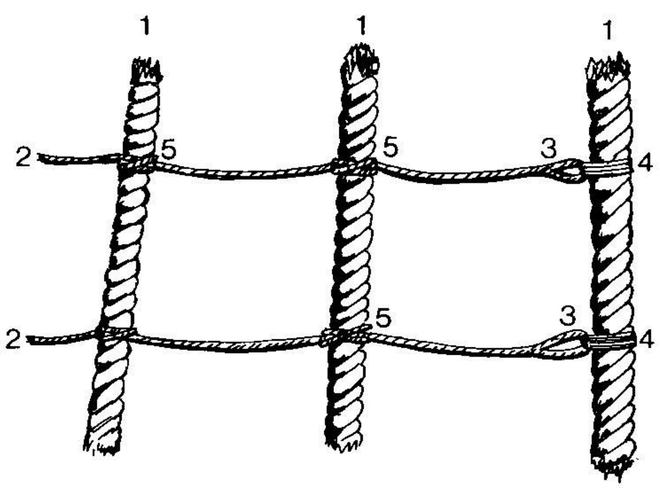

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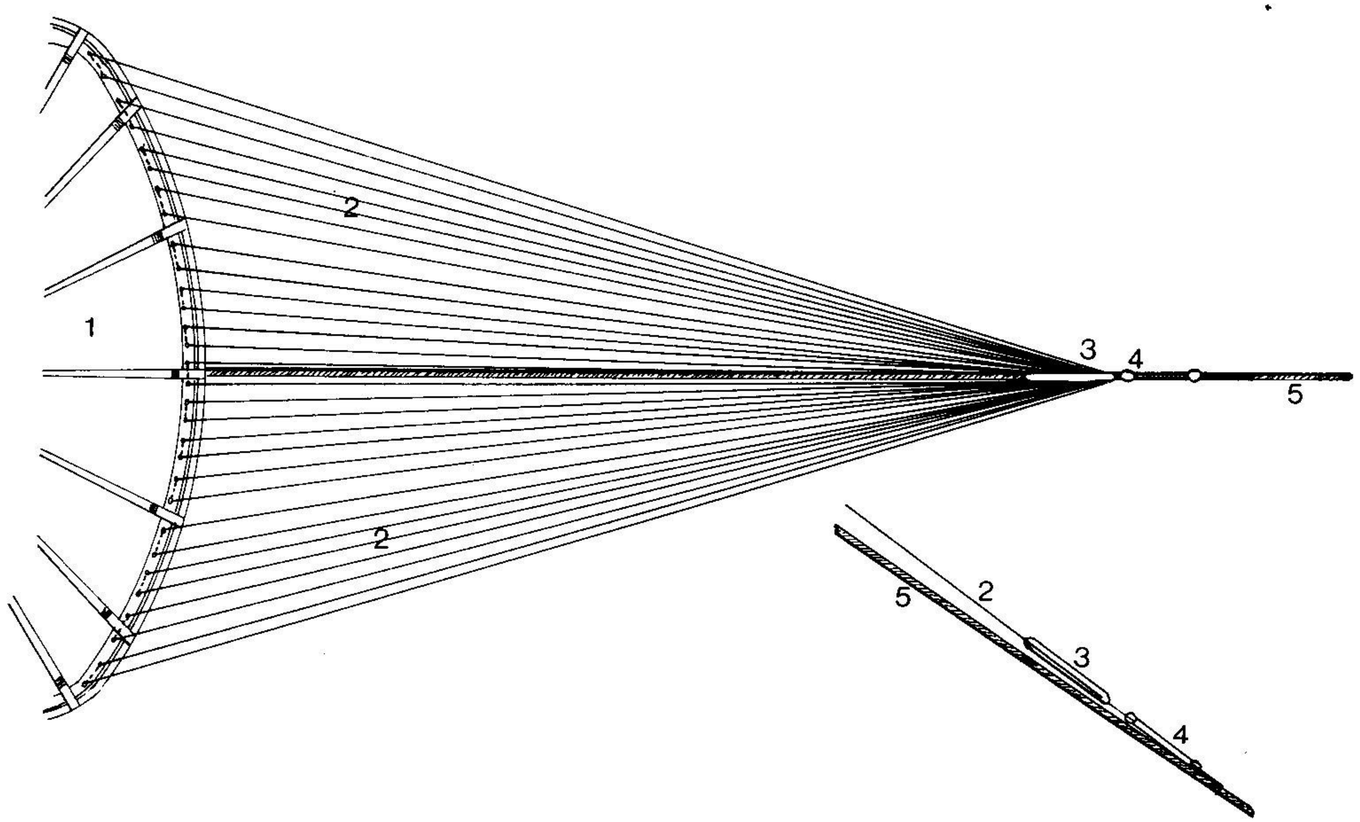
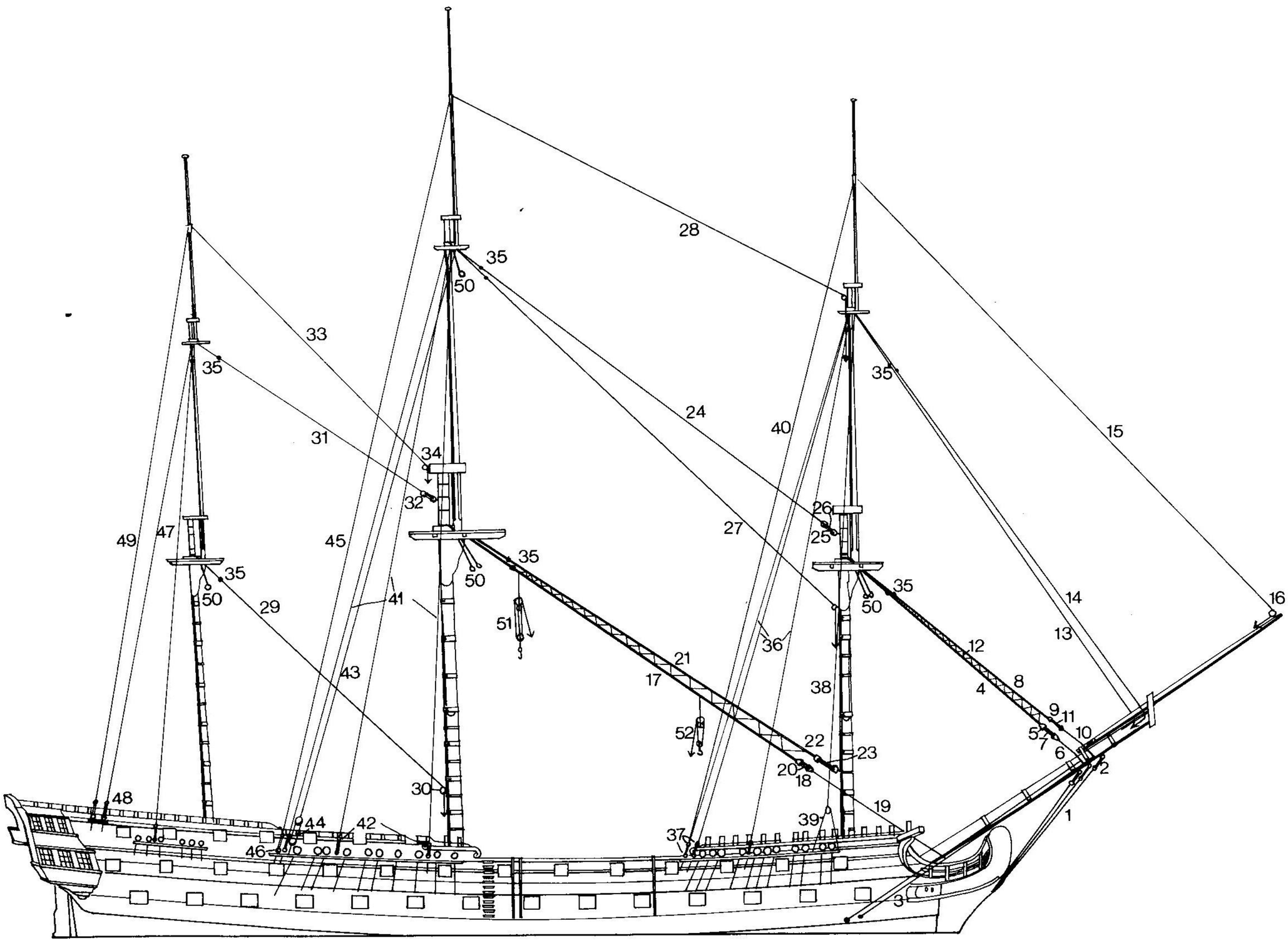


STAYS AND BACKSTAYS (1/384 scale)

Note: Rope sizes are for circumference; blocks, etc for diameter

1. Bobstays (3), 8½in
2. Blocks, 13in
3. Bowsprit shrouds, 2 pairs, 7½in
4. Fore stay, 17in
5. Heart blocks, 25in
6. Collar, 8½in
7. Stay lanyards, 5½in
8. Fore preventer stay, 11in
9. Heart blocks, 16in
10. Collar, 5½in
11. Lanyards, 3½in
12. Snaking, 1½in
13. Fore topmast stay, 8½in (leading through hole on port side of bowsprit bees)
14. Fore topmast preventer stay, leading through hole in starboard side of bees
15. Fore topgallant stay, 4½in
16. Block, 18in
17. Main stay, 18in
18. Heart blocks, 26in
19. Collar, 13in
20. Lanyard, 6in
21. Fore preventer stay, 12½in
22. Blocks, 16in
23. Lanyard, 4in
24. Main topmast stay, 8½in
25. Blocks, 11in
26. Lanyard, 3in
27. Main topmast preventer stay, leading to belaying point on deck through 26in block
28. Main topgallant stay, 4½in, leading through 18in block
29. Mizzen stay, 8½in
30. Block, 34in
31. Mizzen topmast stay, 5in
32. Blocks, 6½in
33. Mizzen topgallant stay, 3in
34. Block, 12in
35. Mouse and collar
36. Fore standing backstays, 3 pairs, 6½in
37. Deadeyes, 10½in
38. Fore breast backstay, 6½in
39. Backstay falls, 3in
40. Fore topgallant backstay, one pair, 4in
41. Main standing backstays, 3 pairs, 6½in
42. Deadeyes
43. Shifting backstays, 6½in
44. Backstay falls, 3in
45. Main topgallant backstay, 4in
46. Deadeyes, 6½in
47. Mizzen backstays, 2 pairs, 4½in
48. Deadeyes, 7in
49. Mizzen topgallant backstays, one pair, 2½in
50. Tackle pendants
51. Main stay tackle
52. Fore hatch tackle



I9 MAIN TOP FITTINGS (no scale)

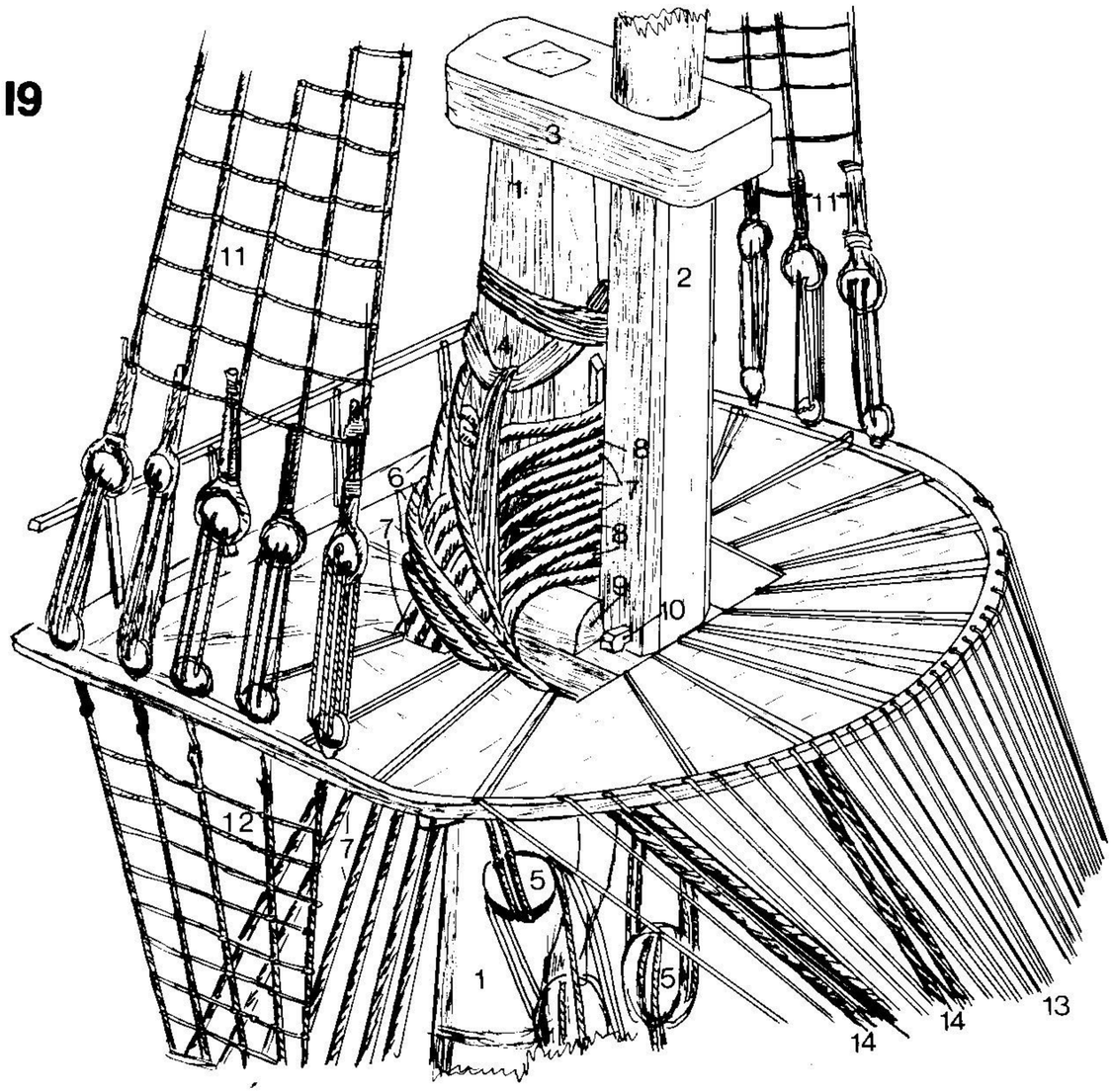
1. Main mast
2. Main topmast
3. Cap
4. Jeer block lashing
5. Jeer blocks
6. Collars of stays and pendants
7. Starboard shrouds
8. Port shrouds
9. Bolster
10. Fid
11. Topmast shrouds
12. Futtock shrouds
13. Crowsfeet
14. Main stay and main preventer stay

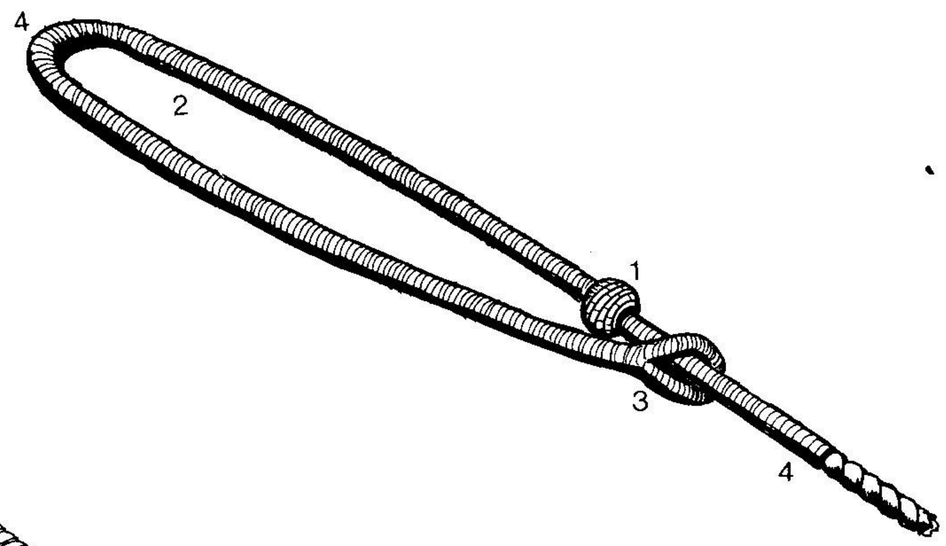
I10 DETAILS OF MAIN AND FORE STAYS (no scale)

1. Mouse
2. Collar
3. Eye splice
4. Ends of rope served with spun yarn
5. Lower collar
6. Heart blocks
7. Lashing
8. Seizing

I11 SNAKING OF FORE AND MAIN STAYS (no scale)

1. Stay
2. Preventer stay
3. Worming of stays
4. Snaking, 1½in rope





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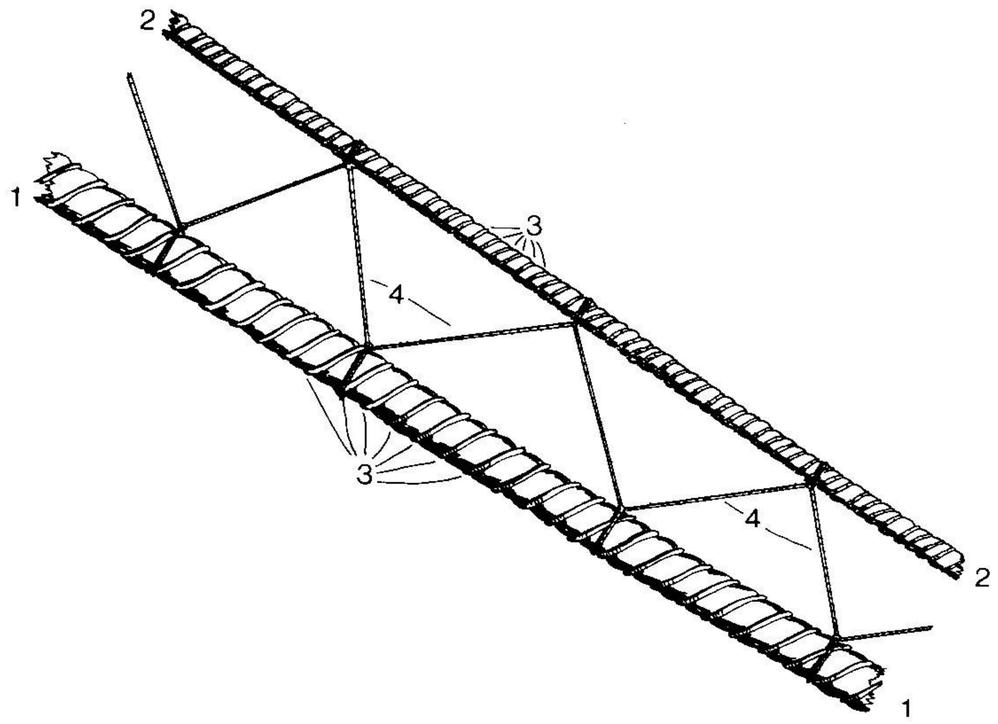

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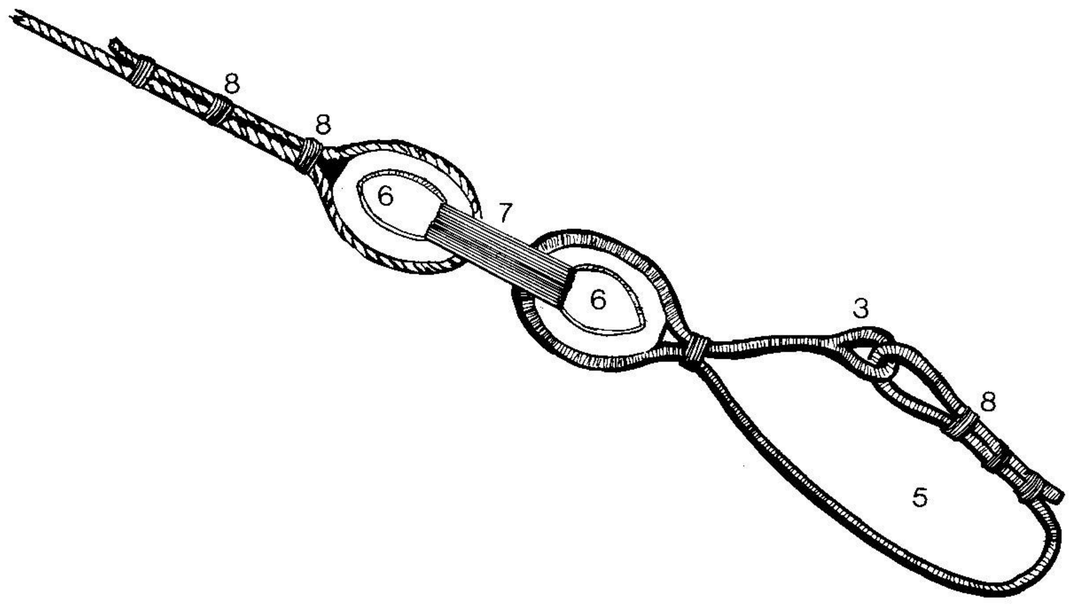


I12 JEERS AND TRUSSES OF MAIN YARD (fore yard similar. 1/96 scale)

I12/1 Side view

12/2 View from forward

1. Head of main mast
2. Hounds of mast
3. Yard
4. Cleat
5. Strop of jeers
6. Double blocks
7. Jeer falls
8. Lower strop
9. Sling cleats
10. Truss

I13 DETAILS OF TRUSSES (no scale)

1. Yard
2. Mast
3. Seizing
4. Iron thimble in eye splice
5. Port truss
6. Starboard truss

I14 TIE AND PARREL OF MAIN TOPMAST (1/96 scale)

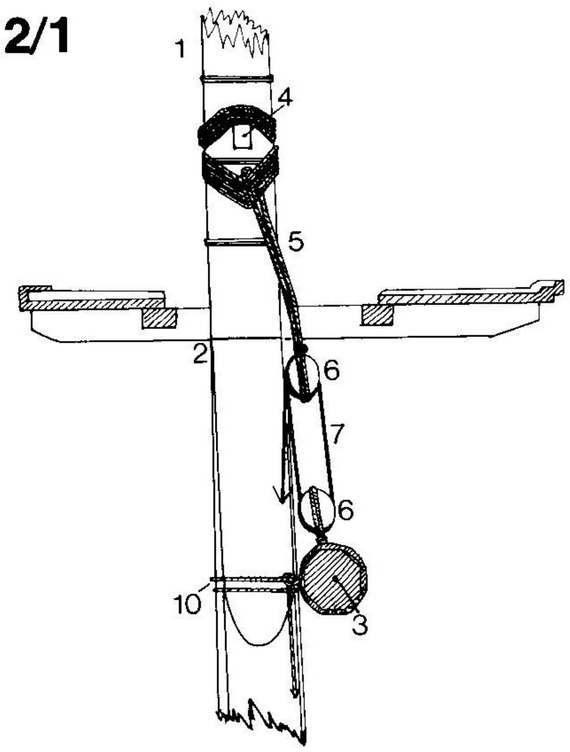
I14/1 View from forward

14/2 Side view

Note: Other top and topgallant yards were fitted in a similar way

1. Head of topmast
2. Yard
3. Sling cleats
4. Crosstrees
5. Bolster
6. Strop
7. Single blocks
8. Runner of the tie
9. Double block
10. Parrel

I12/1



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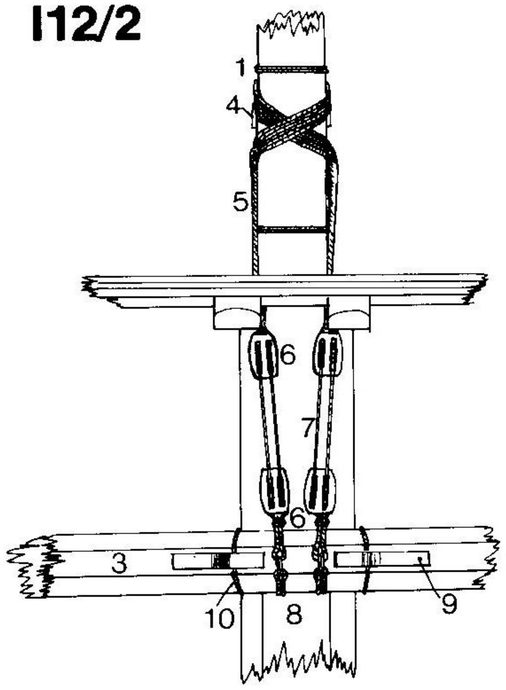

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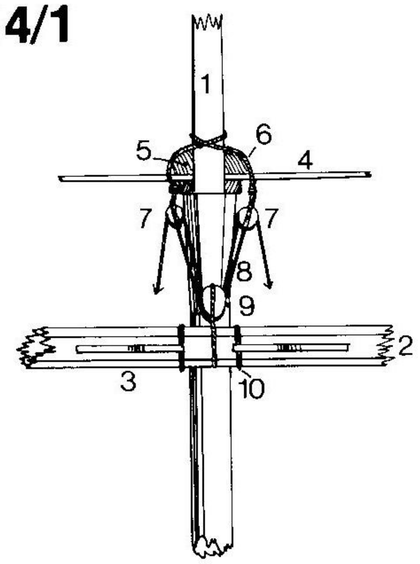

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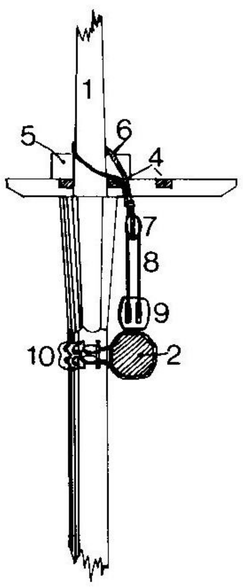

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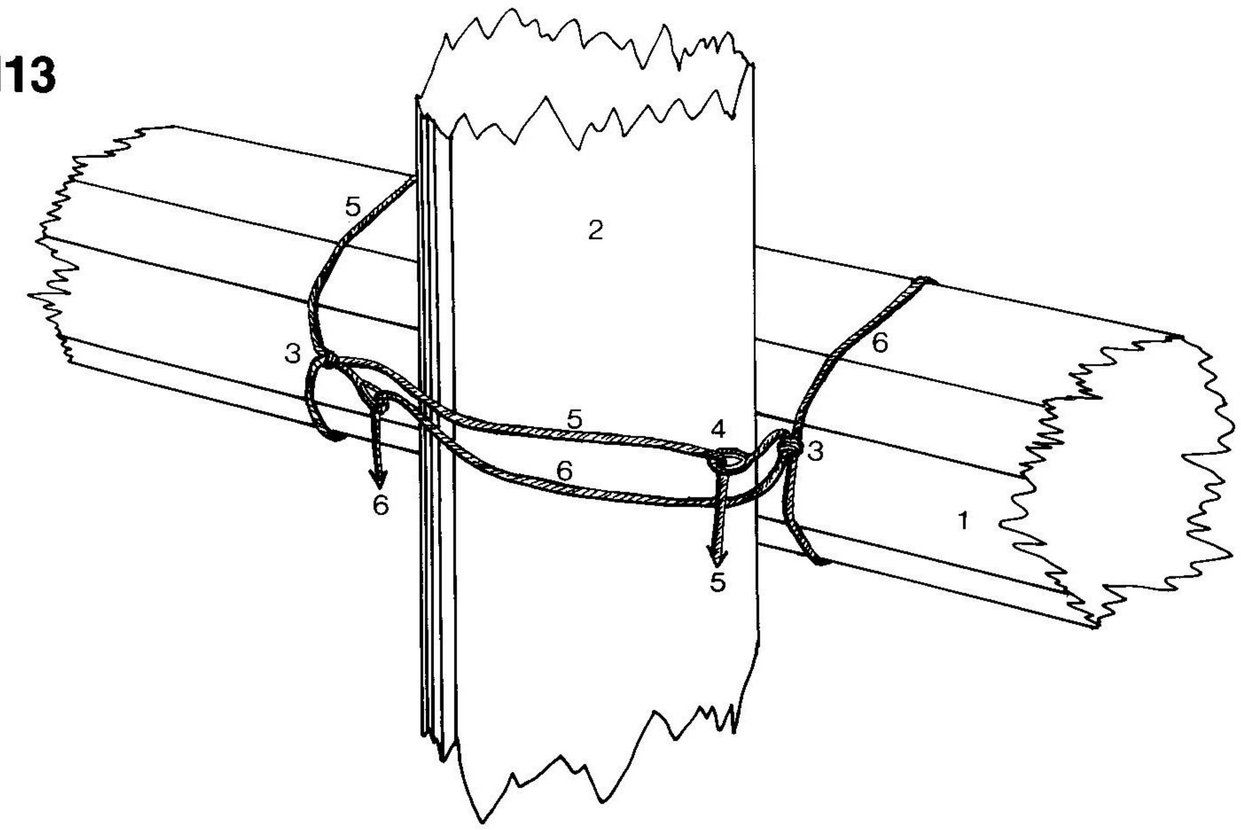


I15 DETAILS OF PARREL (no scale)

I15/1 Longitudinal section

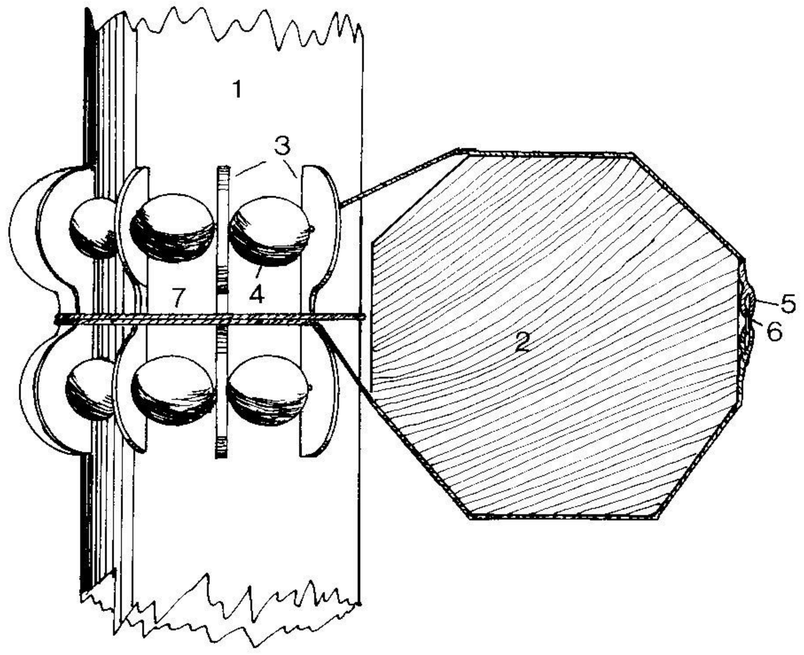
I15/2 Sectional plan

1. Mast
2. Yard
3. Bibs
4. Trucks
5. Eye splices
6. Seizing
7. Parrel rope, passed through ribs and trucks, round yard, and then through grooves in ribs

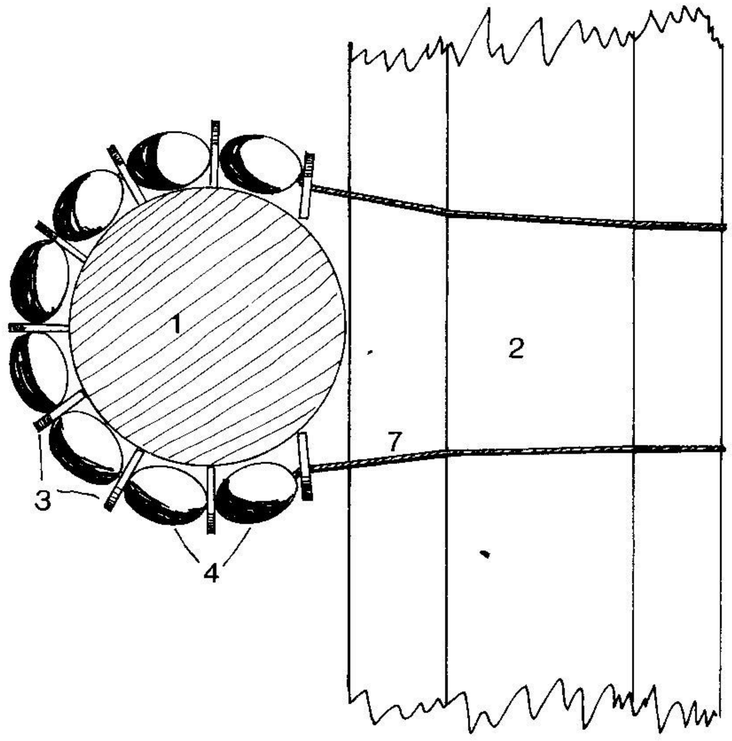
I16 SLING AND HALYARD OF SPRITSAIL YARD (1/96 scale)

1. Bowsprit
2. Cap
3. Spritsail yard
4. Slings
5. Halyard
6. Single blocks

I15/1



I15/2



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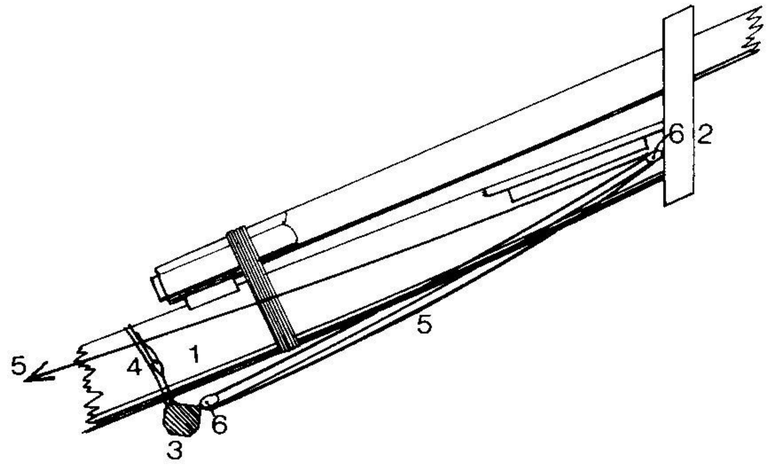
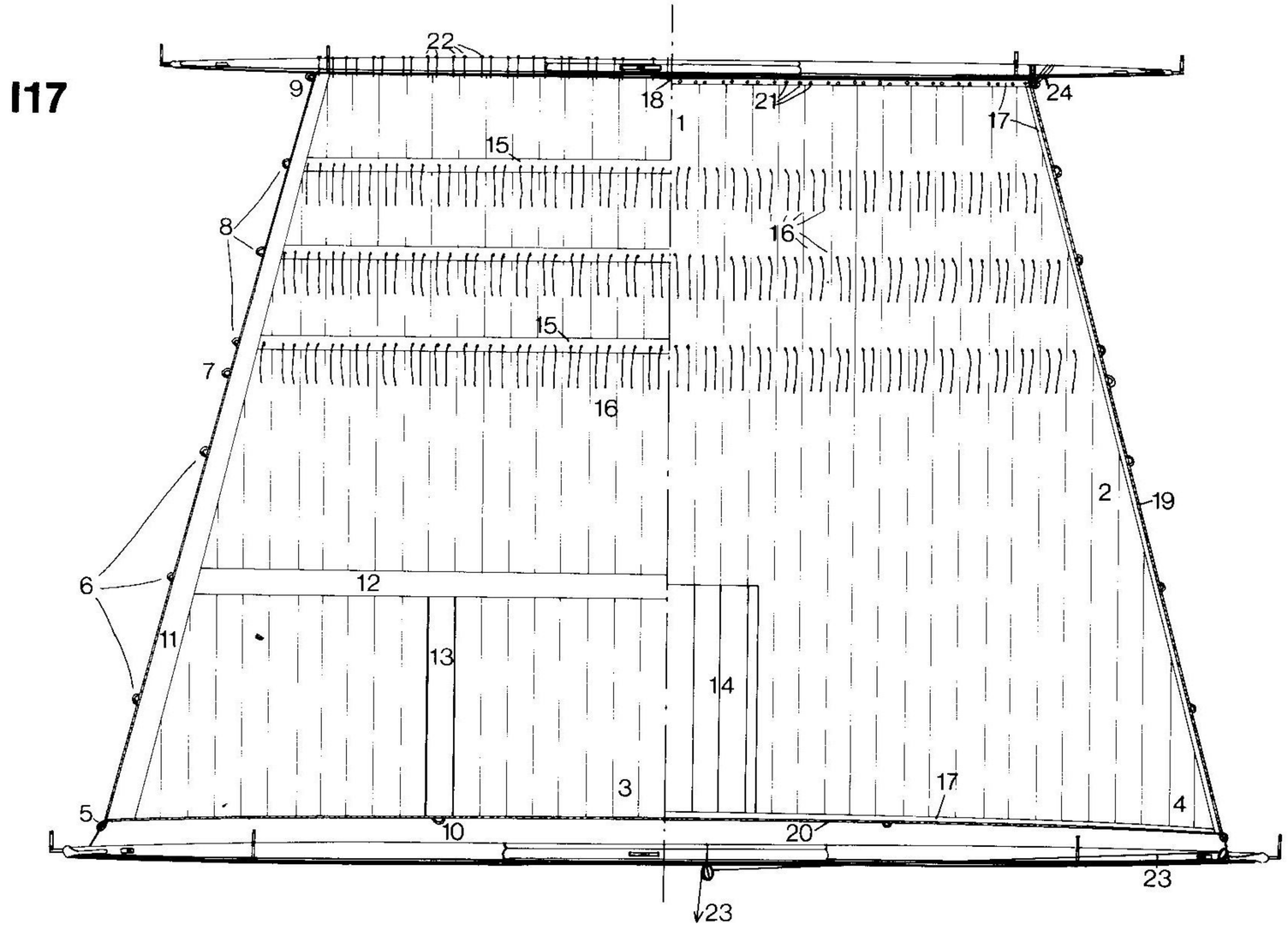


I17 **DETAILS OF FORE TOPSAIL (fore side on left, aft side on right. 1/192 scale)**

1. Head
2. Leech
3. Foot
4. Clew
5. Clew cringles
6. Bowline cringles
7. Reef tackle cringle
8. Reef cringles
9. Head earring cringle
10. Buntline cringles
11. Leech linings
12. Middle lining
13. Buntline cloth
14. Top lining
15. Reef bands
16. Reef points
17. Tabling
18. Head rope
19. Leech rope
20. Foot rope
21. Robband holes
22. Robbands
23. Topsail sheet
24. Earring

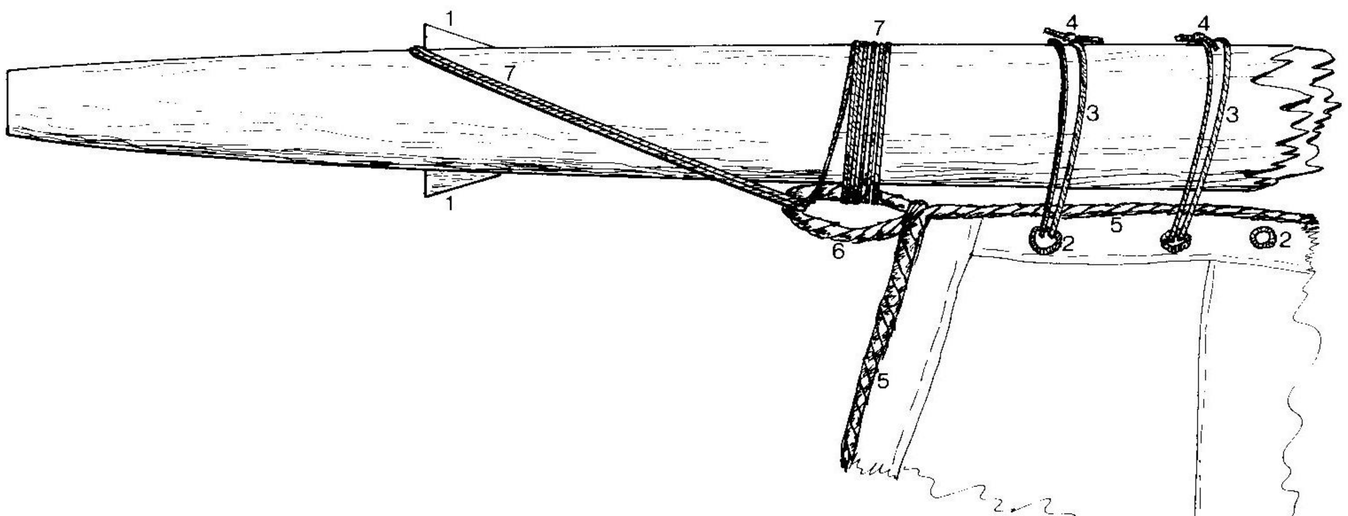


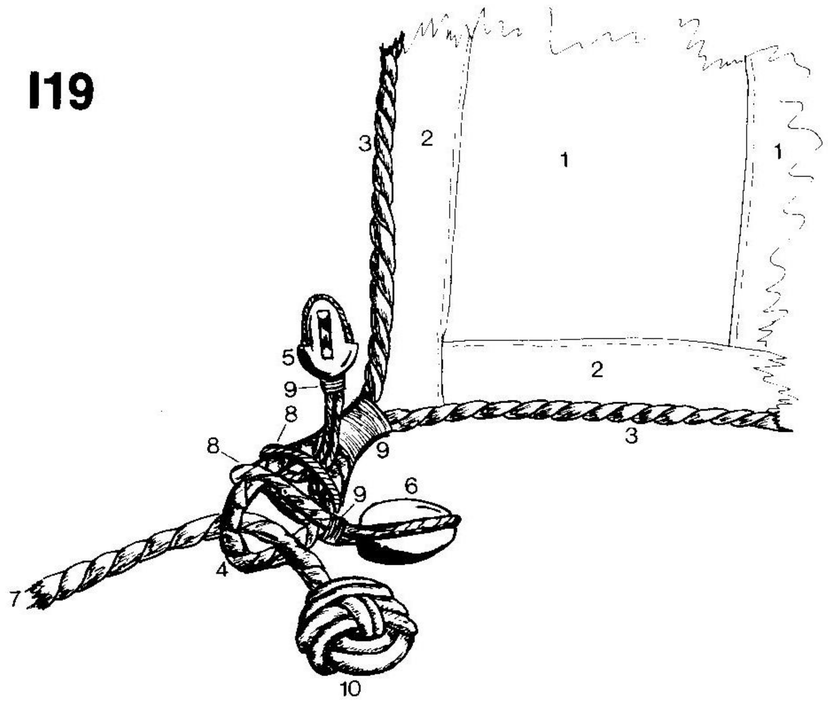
I18 **DETAILS OF HEAD OF SQUARE SAIL (no scale)**

1. Yardarm cleats
2. Robband holes
3. Robbands (two per cloth of sail)
4. Reef knot
5. Bolt rope
6. Head earring cringle
7. Earring (two turns taken round the yard outside the yardarm cleats, and the rest of the rope turned round the yard inside the cleats)

I19 **BLOCKS AT CLEW OF MAIN AND FORE COURSES (no scale)**

1. Cloths of sail
2. Tabling
3. Bolt ropes
4. Clew cringle
5. Clewline block
6. Sheet block
7. Tack
8. Strops
9. Seizings
10. Double crowned wall knot in end of tack





7 Sails and rigging

I20 SAILS ON MAINMAST (from forward. 1/384 scale)

1. Main course
2. Main topsail
3. Main topgallant
4. Reef points
5. Reef cringles
6. Bowline cringles
7. Clew cringles
8. Buntline cringles
9. Buntlines, leading through block on the yard, then through two blocks on the underside of the top
10. Reef tackle cringles
11. Reef tackle pendants

I21 RIGGING ON AFTER SIDE OF MAINMAST (1/384 scale)

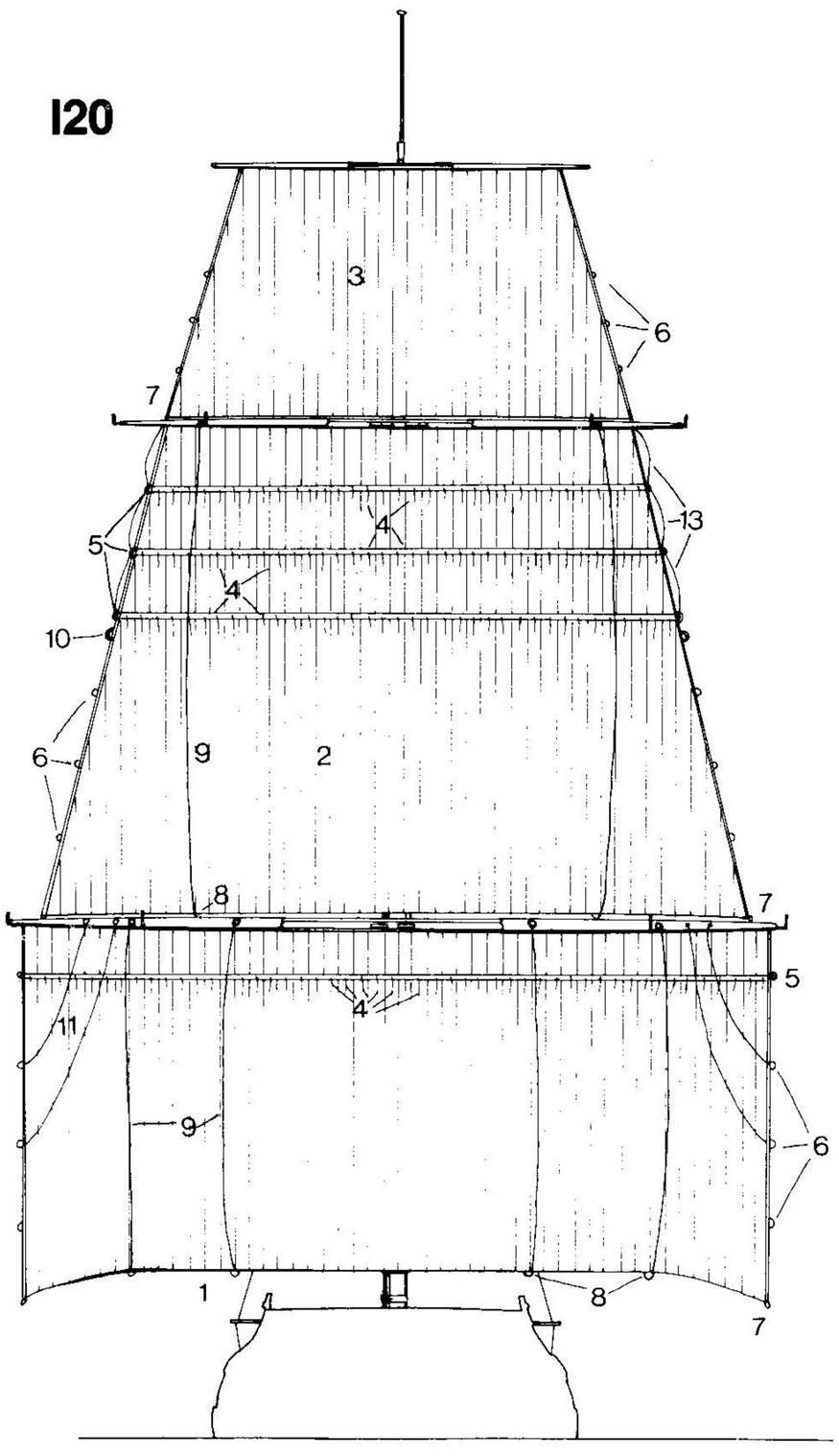
Note: Foremast is similar. Most lines are shown only on one side for clarity, but were in fact fitted on both sides

1. Shrouds
2. Futtock shrouds
3. Catharpins
4. Topsail sheet
5. Lifts
6. Clew garnet
7. Clewlines
8. Foot ropes
9. Stirrups
10. Leechlines (leading from forward edge of main course)
11. Reef tackle falls

I22 SAILS ON FORE MAST (1/384 scale)

1. Fore course
2. Fore topsail
3. Fore topgallant sail
4. Reef points
5. Reef cringles
6. Bowline cringles
7. Buntline cringles
8. Reef tackle cringles
9. Clew cringles

I20



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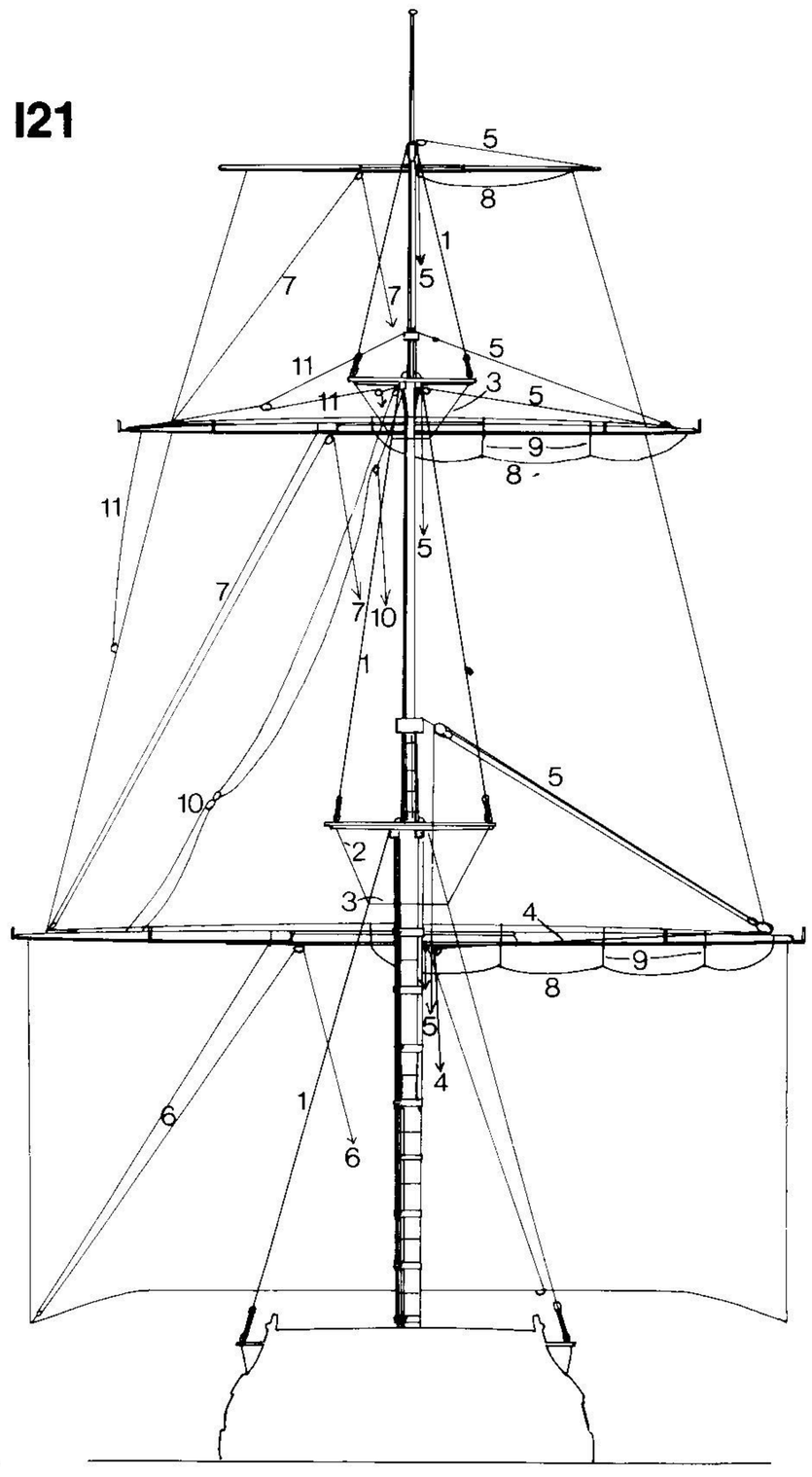

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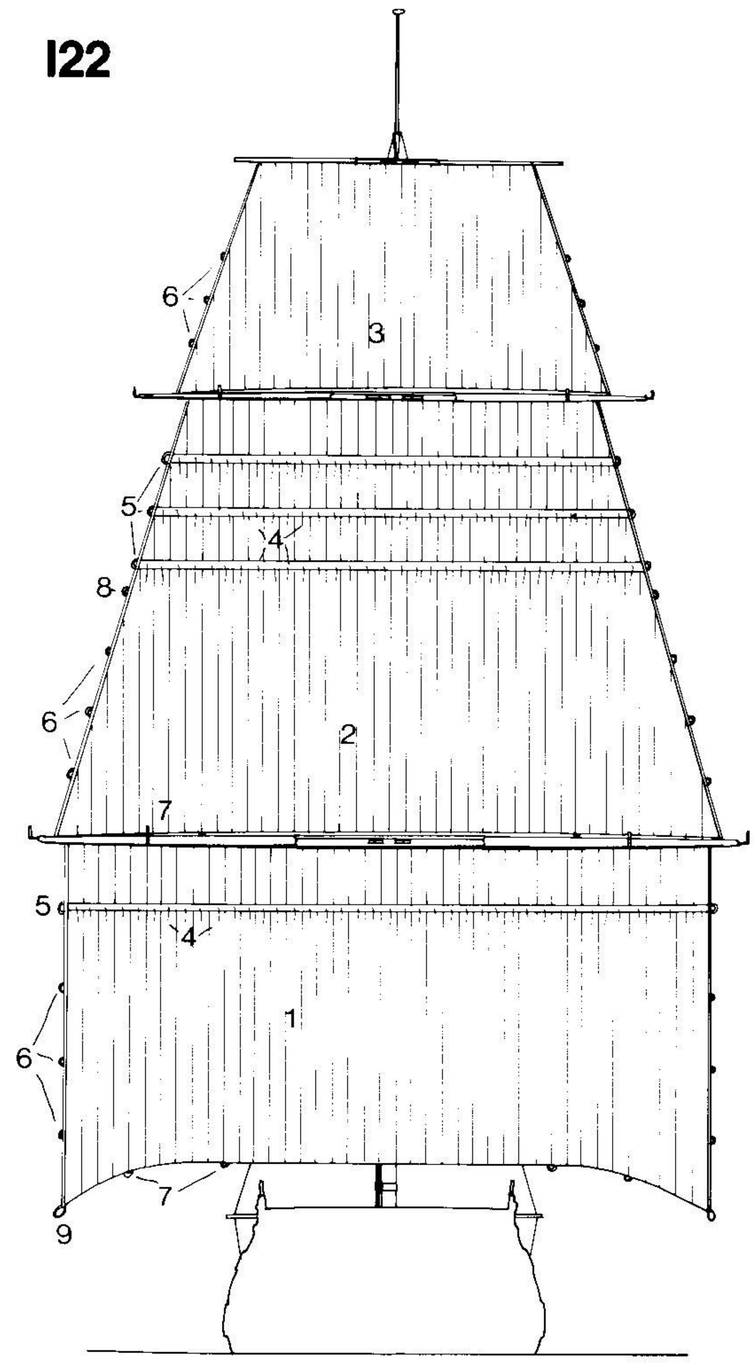
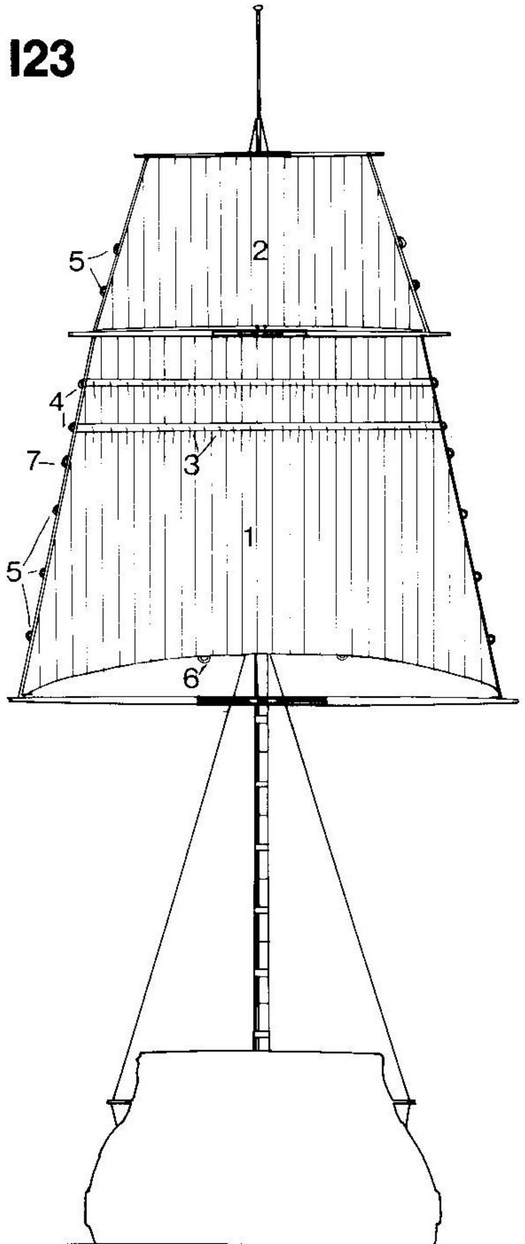


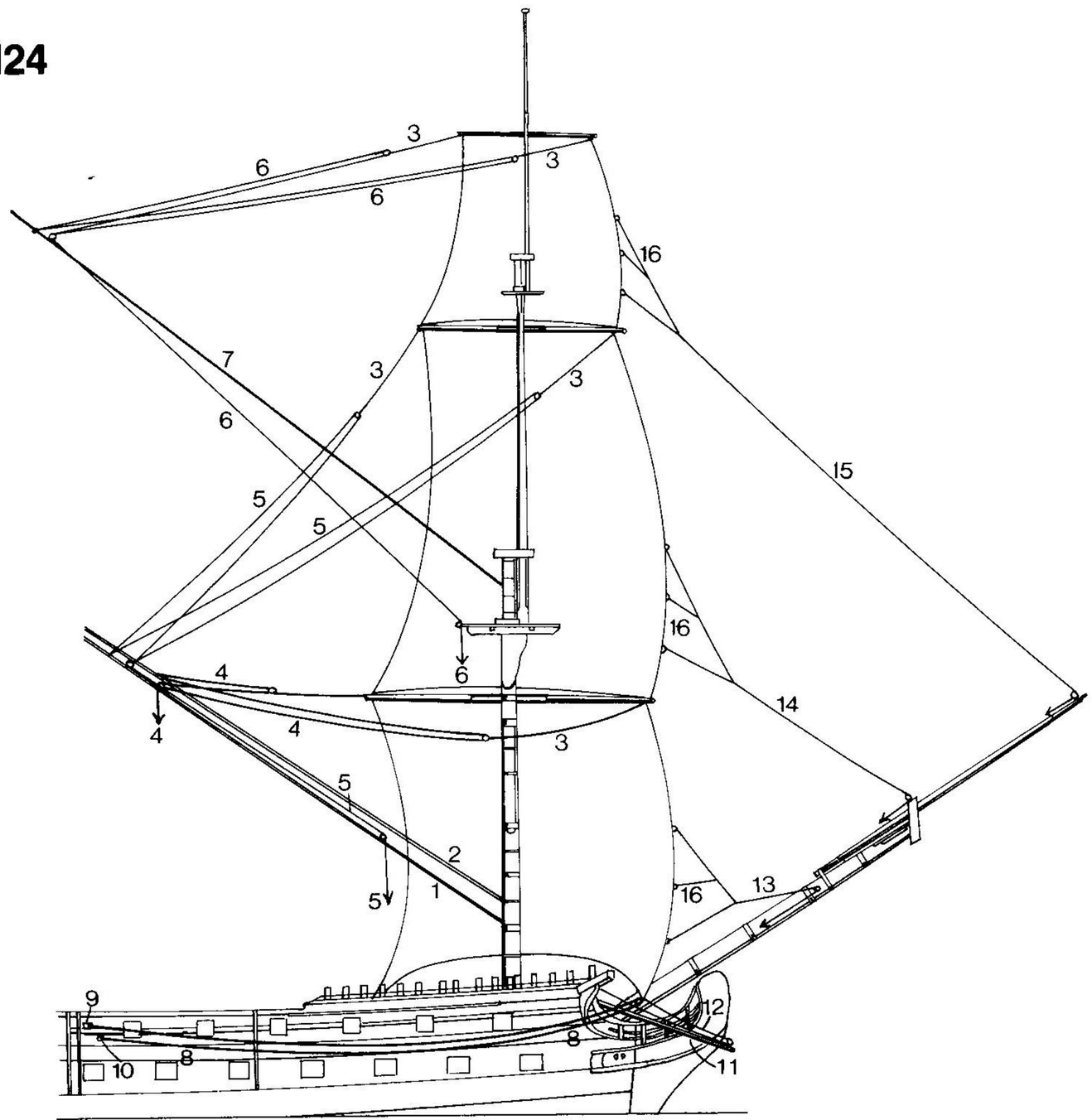
I23 SQUARE SAILS ON MIZZEN MAST (1/384 scale)

1. Mizzen topsail
2. Mizzen topgallant (not introduced until 1770)
3. Reef points
4. Reef cringles
5. Bowline cringles
6. Buntline cringles
7. Reef tackle cringles

I24 FORE BRACES, BOWLINES AND SHEETS (1/384 scale)

1. Main stay
2. Main preventer stay
3. Brace pendants
4. Fore brace
5. Fore topmast brace
6. Fore topgallant brace
7. Main topmast stay
8. Fore sheet
9. Sheave block in side
10. Eyebolt
11. Boomkin
12. Fore tack
13. Fore bowline
14. Fore topsail bowline
15. Fore topgallant bowline
16. Bridles





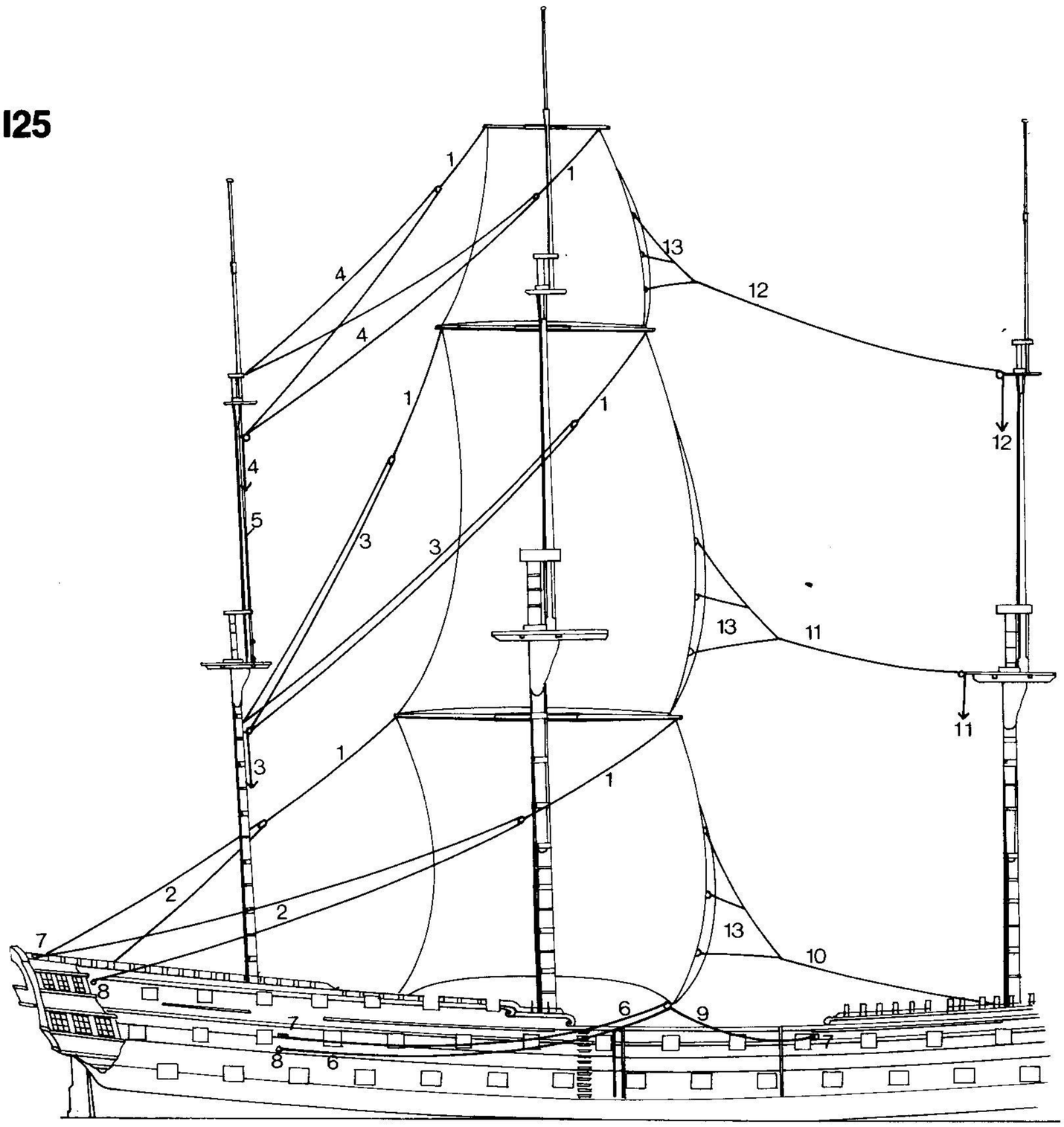
I25 MAIN BRACES, BOWLINES AND SHEETS (1/384 scale)

1. Brace pendants
2. Main brace
3. Main topmast brace
4. Main topgallant brace
5. Foremost mizzen topgallant shroud
6. Main sheet
7. Sheave block in side
8. Eyebolt
9. Main tack
10. Main bowline
11. Main topsail bowline
12. Main topgallant bowline
13. Bridles

I26 MIZZEN BOWLINES AND BRACES (1/384 scale)

1. Crossjack brace
2. Mizzen topsail brace
3. Mizzen topgallant brace
4. Mizzen topsail bowline (note that the bowlines are crossed over, and the port bowline passes through a block on the starboard shroud)
5. Aftermost main shroud
6. Mizzen topgallant bowline
7. Bridles

I25



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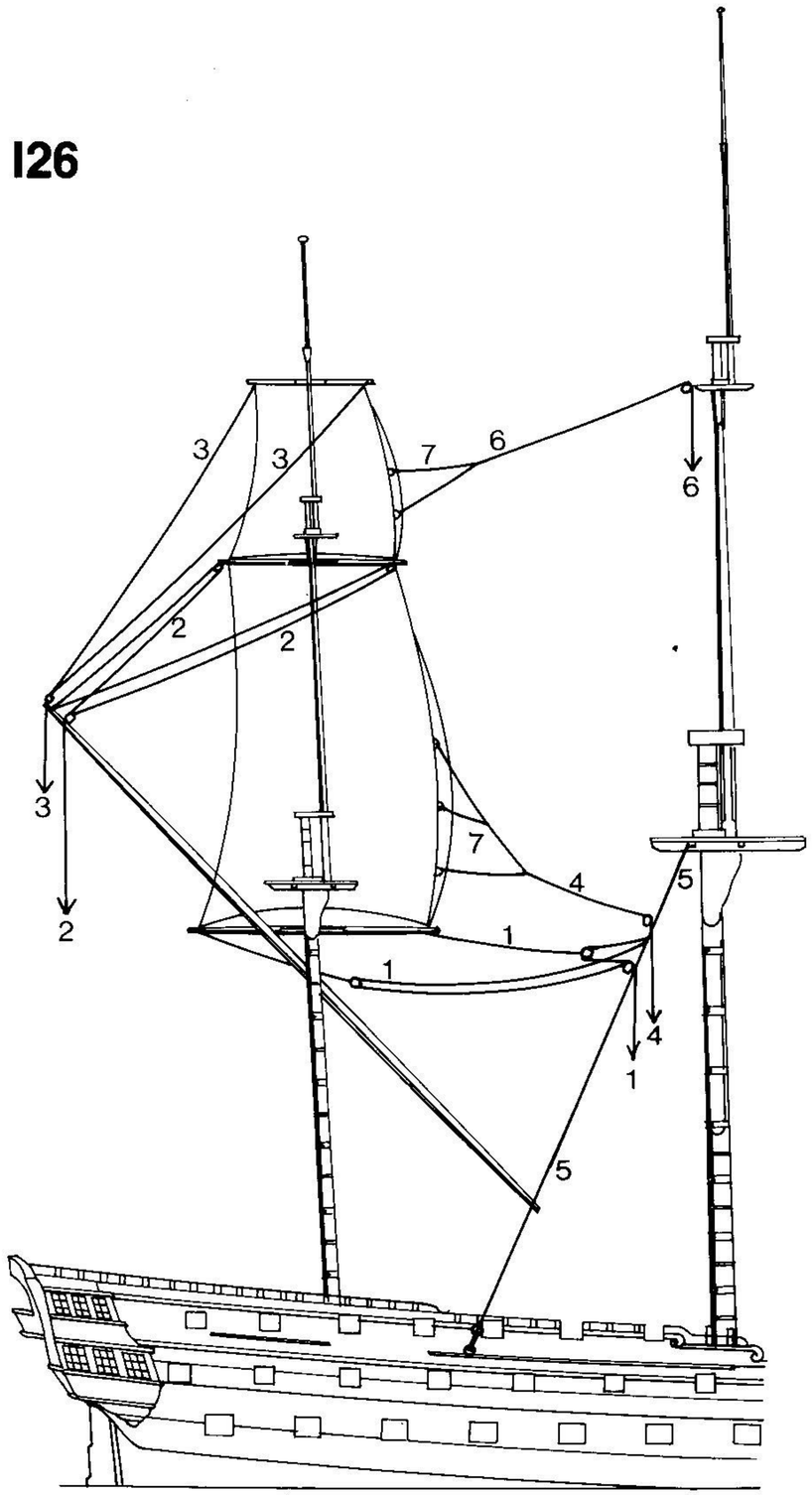


I27 SAILS ON BOWSPRIT (from below. 1/384 scale)

1. Spritsail
2. Sprit topsail
3. Reef points
4. Reef cringles
5. Buntline cringles
6. Clew cringles
7. Water holes

I28 RIGGING ON SPRITSAILS (seen from above. 1/384 scale)

Note: Lines are shown on one side only for clarity. They were in fact fitted on both sides

1. Guy
2. Standing lift of spritsail
3. Running lift of spritsail
4. Topsail clewline
5. Spritsail clewline
6. Lead collar on bowsprit
7. Spritsail topsail lift

I29 DETAILS OF END OF JIBBOOM (no scale)

I29/1 Jibboom fittings

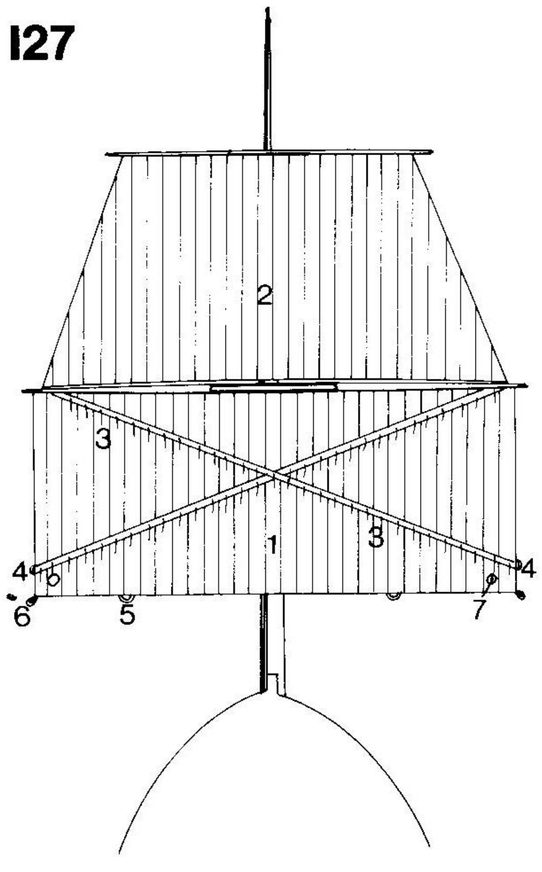
I29/2 Details of traveller

1. Jibboom
2. Spritsail topsail yard
3. Parrel
4. Halyard
5. Single blocks
6. Traveller
7. Jibstay, spliced round thimble of traveller
8. Jib outhauler, spliced to shackle on traveller, and passing through sheave block in end of jibboom.
9. Ring, covered in leather
10. Shackle
11. Thimble

I30 SPRITSAIL BRACES AND SHEETS (1/384 scale)

1. Spritsail sheet
2. Foremost fore shroud
3. Sheave block
4. Fore stay
5. Spritsail braces
6. Spritsail topsail braces

I27



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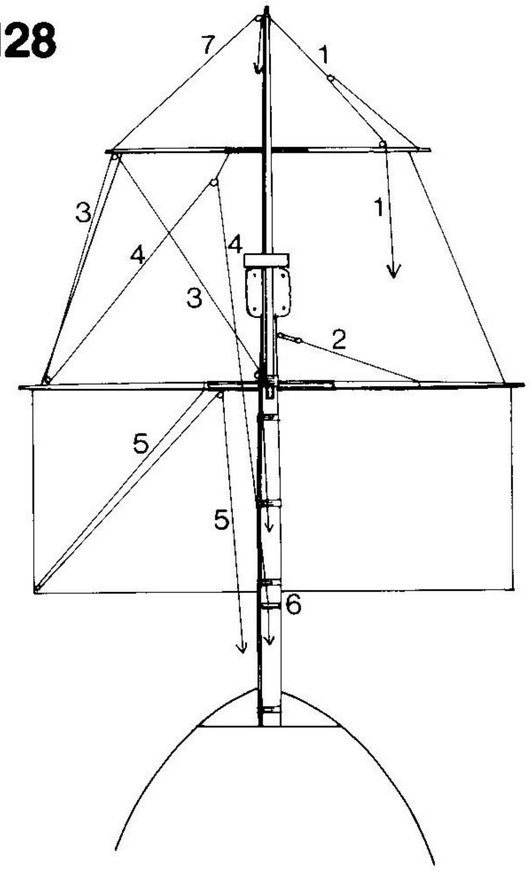
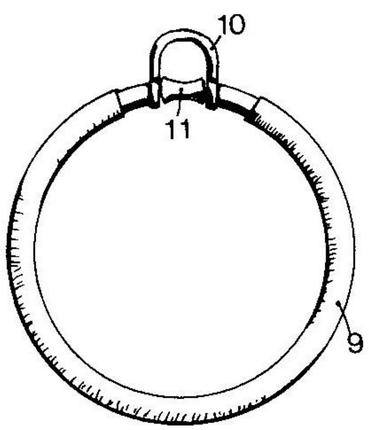
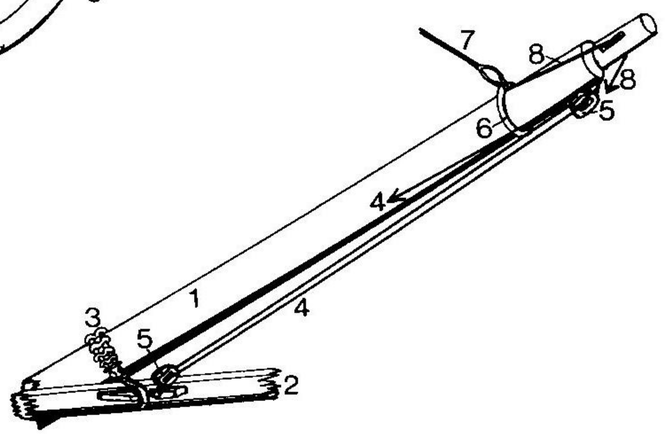


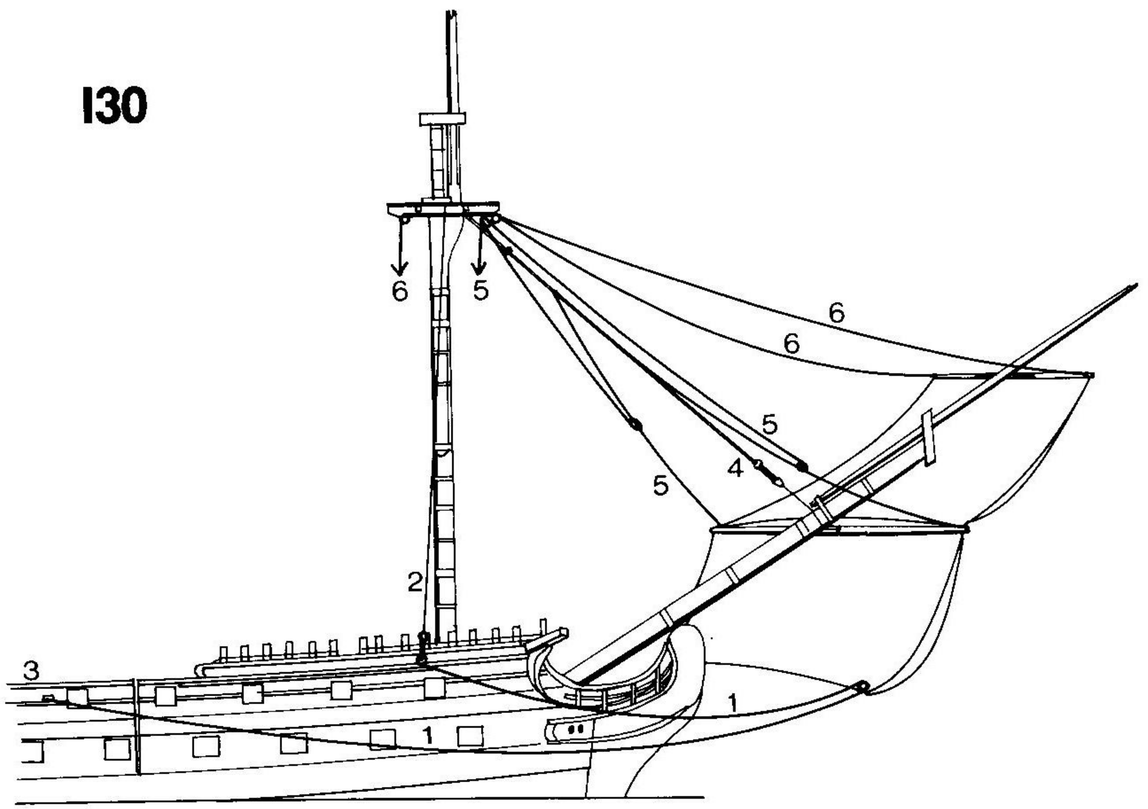


I29/2



I29/1

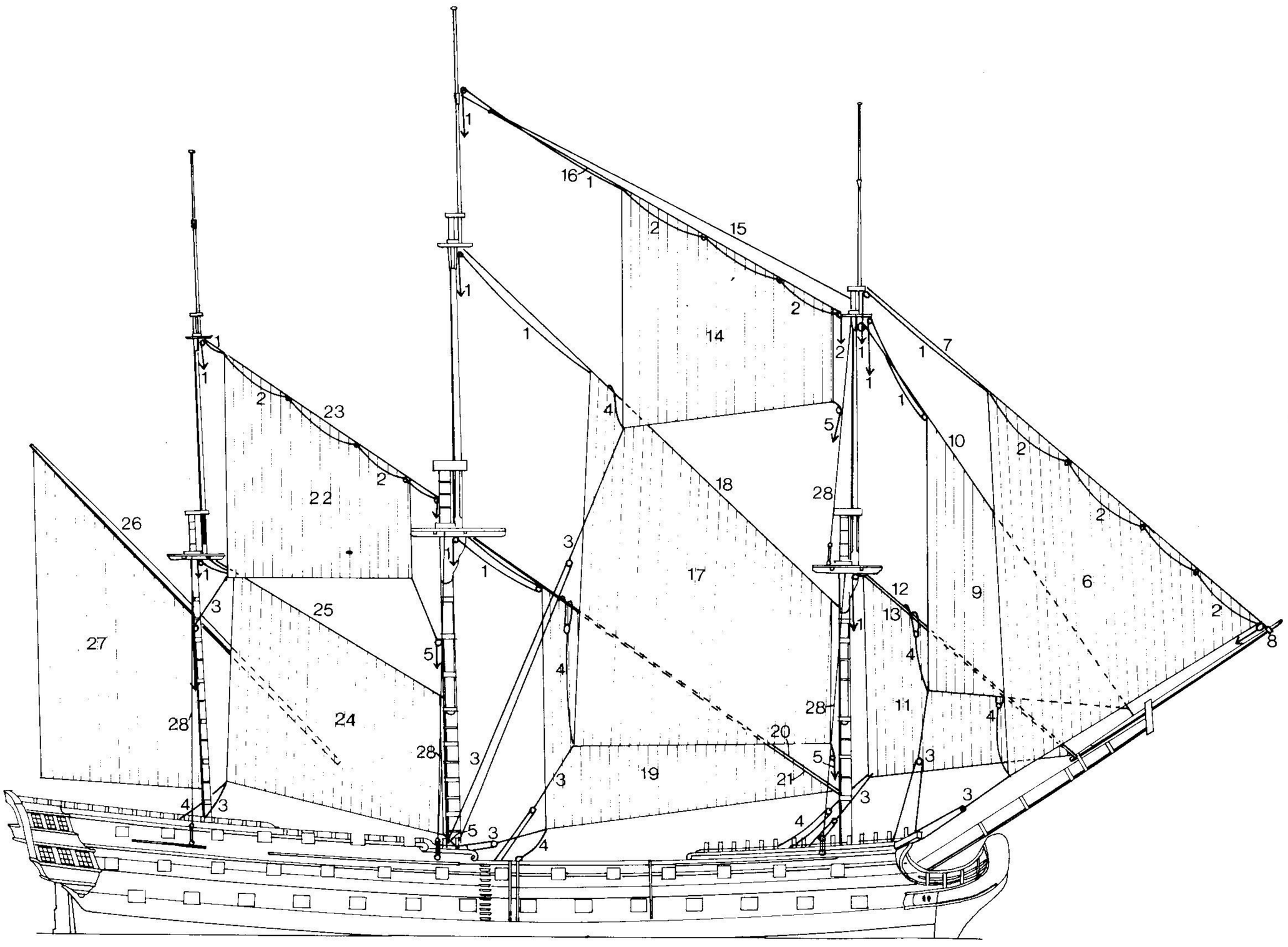
I30



I31 FORE AND AFT SAILS (1/384 scale)

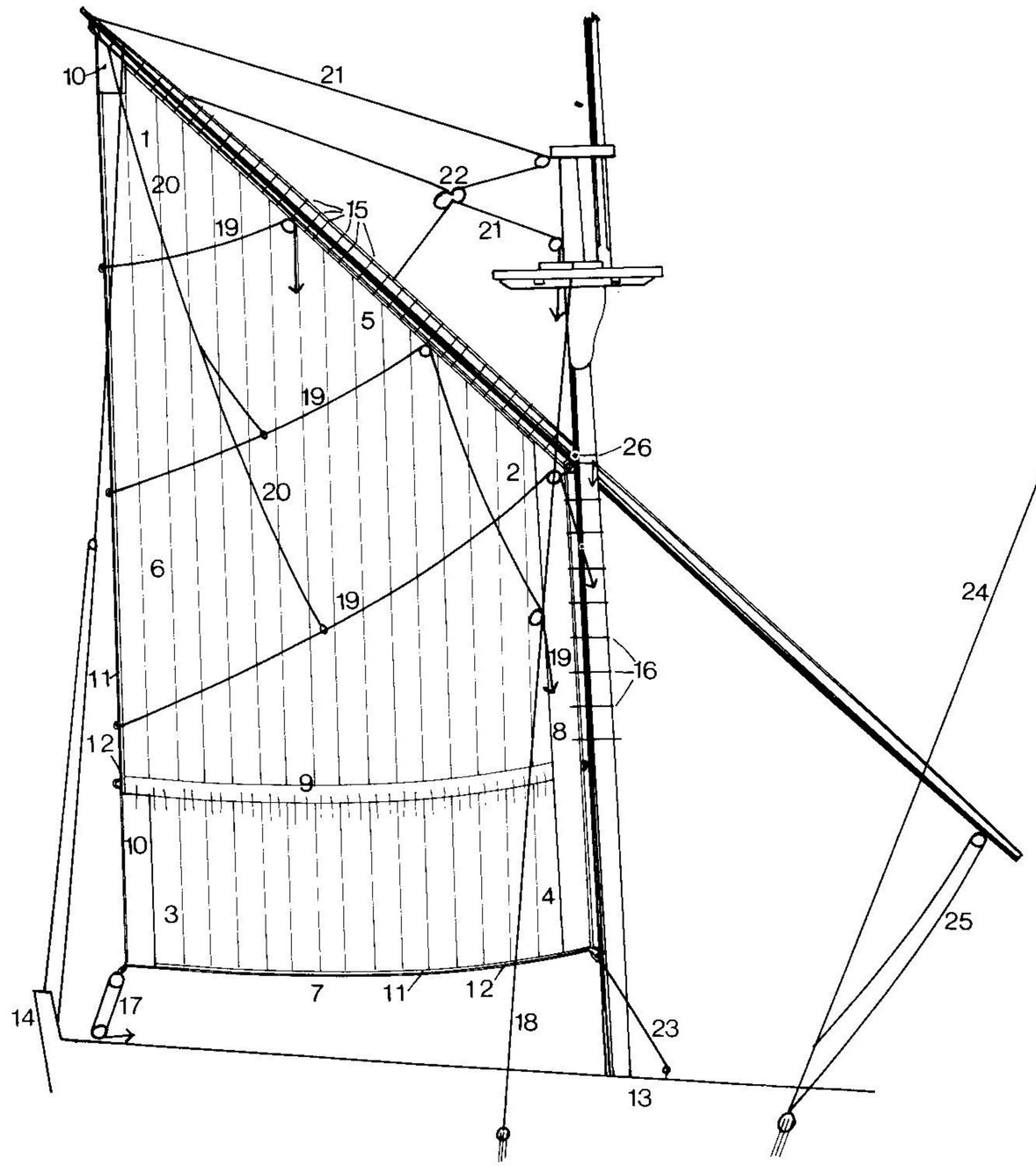
Note: The middle staysail is here omitted, for clarity and because it was only fitted after 1773. Its dimensions are given in the table of sail dimensions.

1. Halyards
2. Downhaulers (here shown only on selected sails, but in fact carried on all staysails
3. Sheets
4. Lee sheets
5. Tacks (here shown only on the quadrilateral sails, but also fitted on the forward corner of each triangular sail, and on the top forward corner of the quadrilateral sails)
6. Jibsail
7. Jibsail stay
8. Jib traveller
9. Fore topsail
10. Fore topmast stay
11. For staysail
12. Fore stay
13. Fore staysail stay
14. Main topgallant staysail
15. Main topgallant stay
16. Main topgallant staysail stay
17. Main top staysail
18. Main top preventer stay
19. Main staysail
20. Main stay
21. Main staysail stay
22. Mizzen top staysail
23. Main topmast stay
24. Mizzen staysail
25. Mizzen staysail stay
26. Mizzen yard
27. Mizzen course
28. Shrouds used to secure blocks affecting staysail rigging



MIZZEN COURSE, AND RIGGING OF MIZZEN YARD (1/192 scale)

1. Peak
2. Throat
3. Clew
4. Tack
5. Head
6. Leech
7. Foot
8. Luff
9. Reef band
10. Linings
11. Tabling
12. Bolt ropes
13. Deck
14. Taffrail
15. Head ropes
16. Luff lacing
17. Sheet
18. Mizzen shroud
19. Brails
20. Fancy line
21. Lifts
22. Fiddle block
23. Tack line
24. After main shroud
25. Bowline
26. Truss



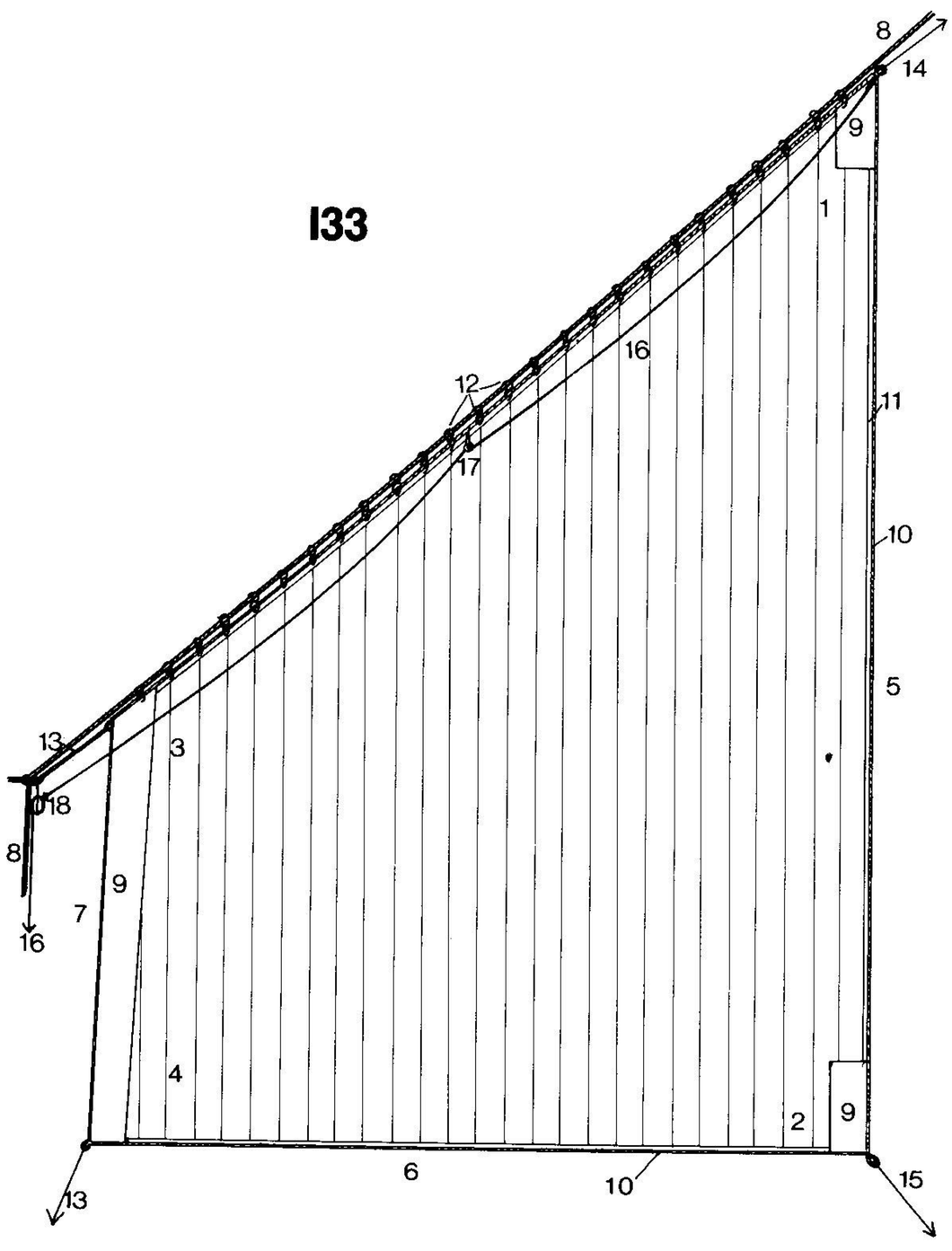
I33 MAIN TOP STAYSAIL (1/192 scale)

1. Peak
2. Clew
3. Nock tack
4. Tack
5. Leech
6. Foot
7. Bunt
8. Main top preventer stay
9. Lining (port side only)
10. Bolt ropes
11. Tabling
12. Robbands
13. Tack lines
14. Halyard
15. Sheet
16. Downhauler
17. Hank
18. Block

I34 MAIN STUNSAILS (fore stunsails similar. 1/384 scale)

1. Lower stunsail boom
2. Main stunsail boom
3. Main stunsail yard
4. Topsail stunsail boom
5. Top stunsail yard
6. Main stunsail
7. Topsail stunsail
8. Topgallant stunsail (fitted after 1770)
9. Guys (one leading forward, one aft)
10. Lifts
11. Inner halyard
12. Outer halyard
13. Sheets (one leading forward, one aft)
14. Halyards

I33



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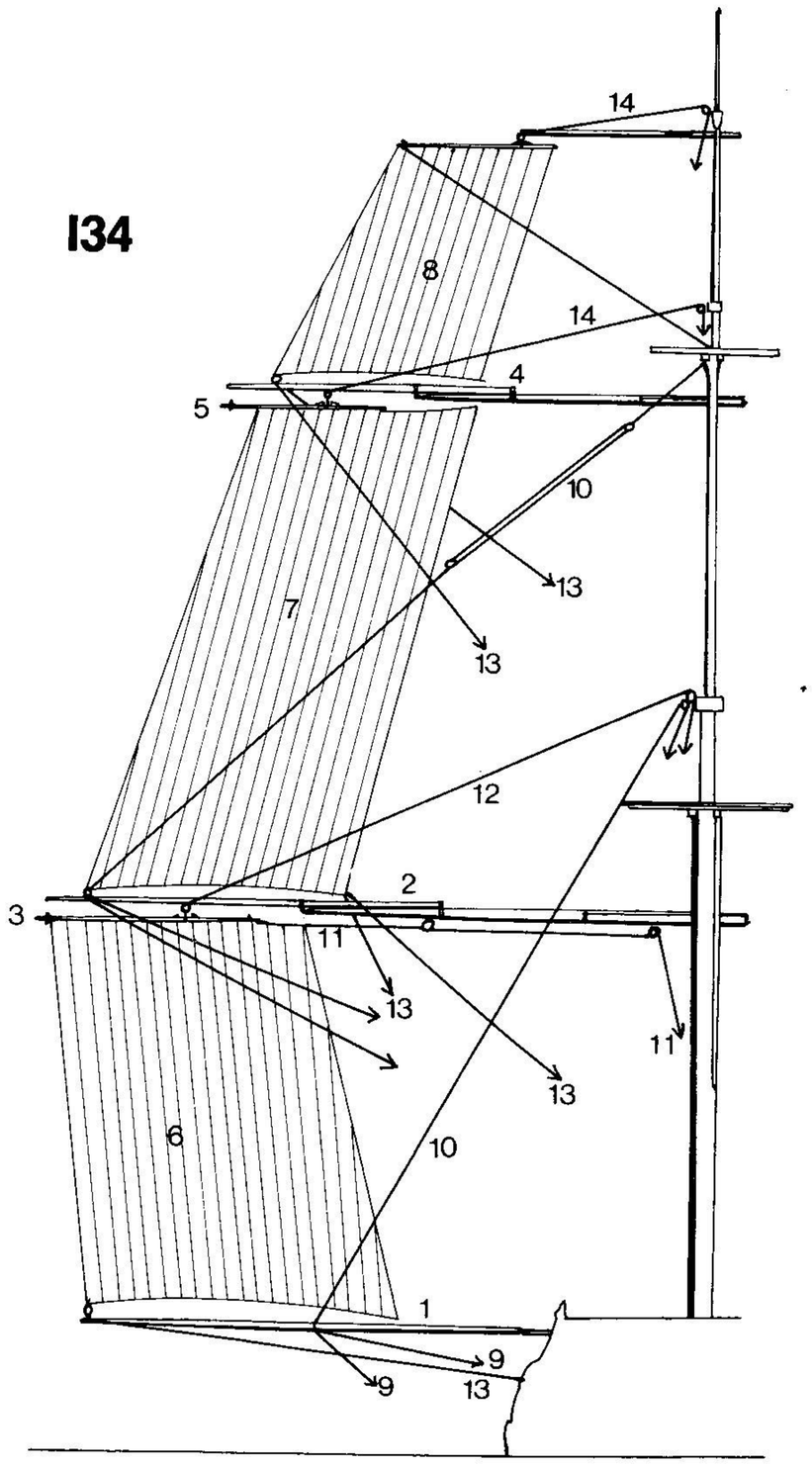


J Armament

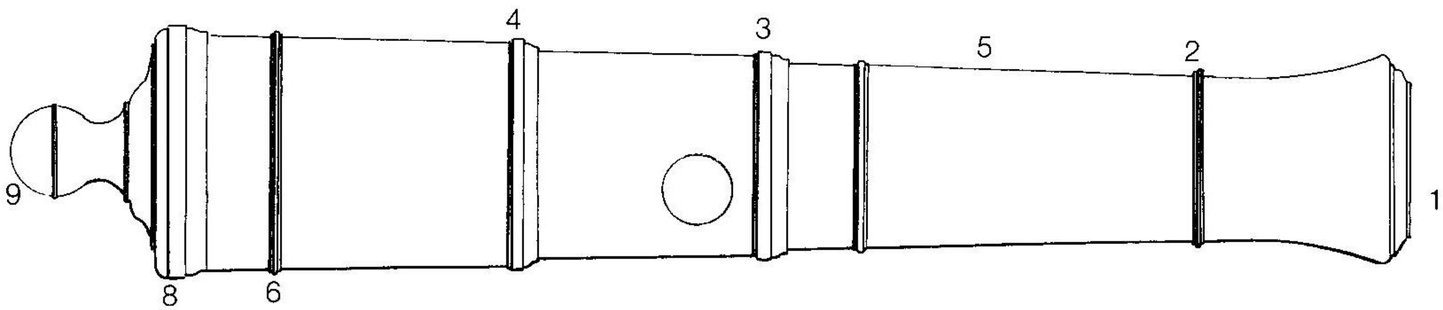
J1 DETAILS OF 32-POUNDER CANNON (1/24 scale)

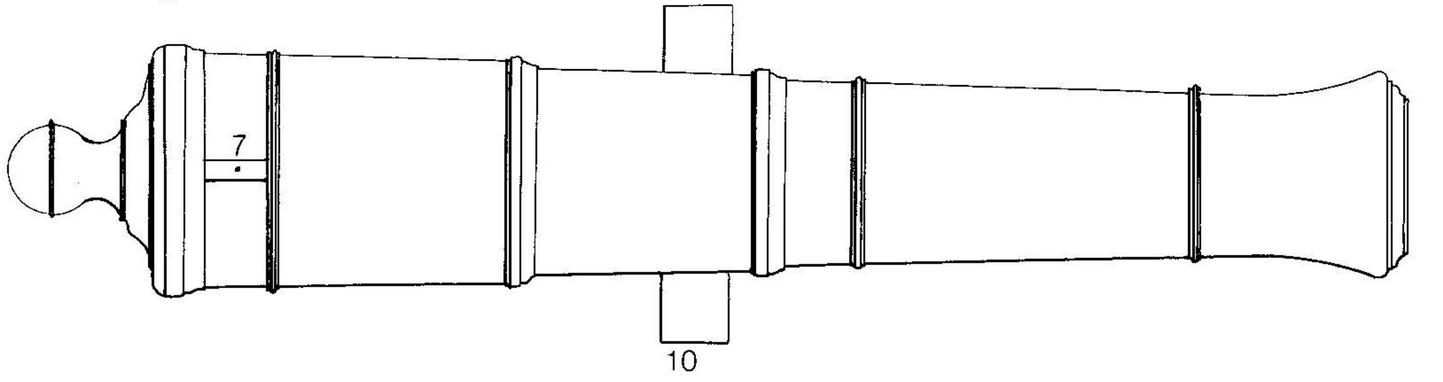
J1/1 Side elevation

J1/2 Plan view

1. Muzzle
2. Muzzle astragal
3. Second reinforce ring
4. First reinforce ring
5. Chase
6. Vent field astragal
7. Vent
8. Base ring
9. Cascable
10. Trunnion

J1/1





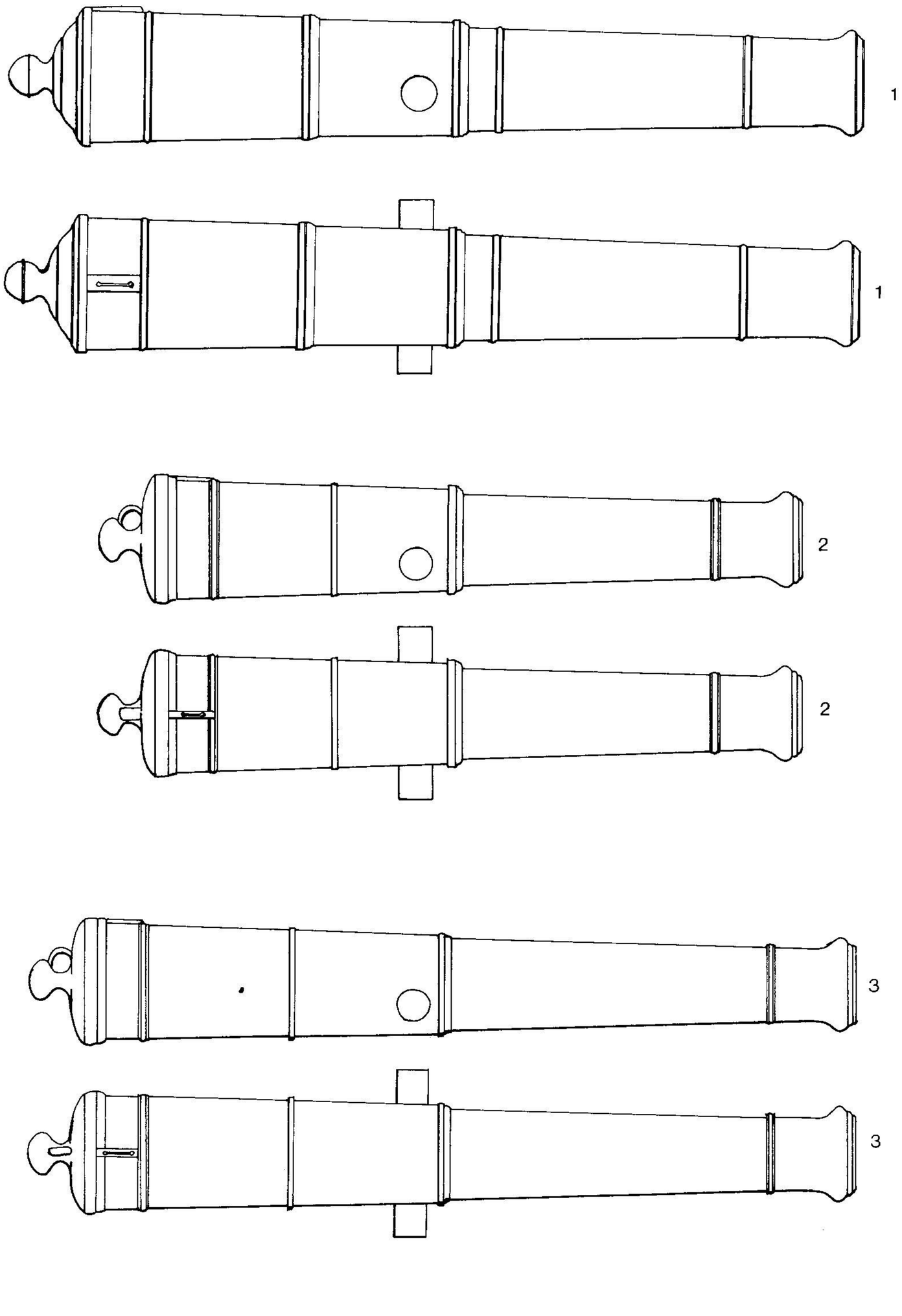
J1/2

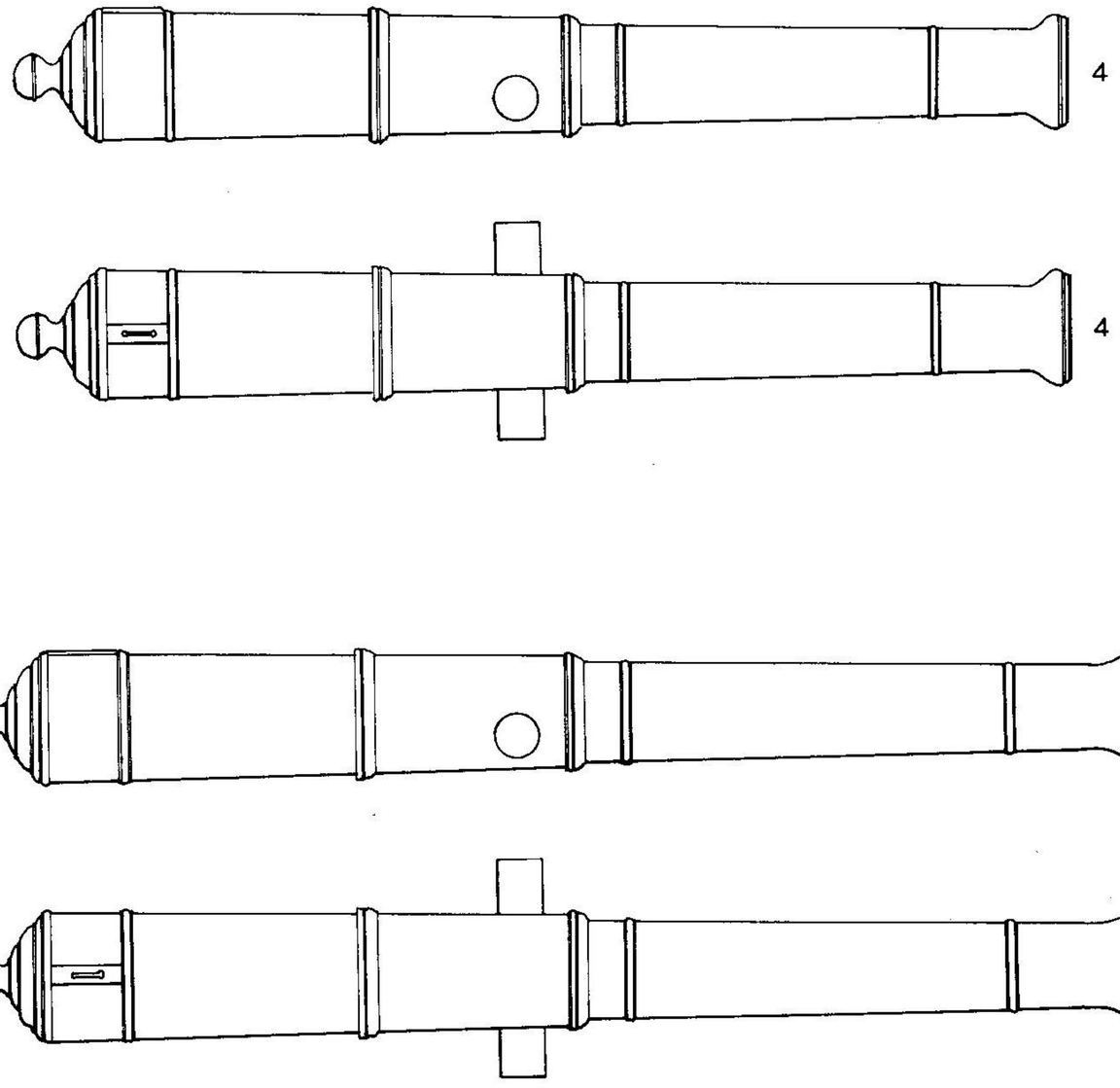
J Armament

J2 SMALLER GUNS (1/24 scale)

1. 18-pounder
2. 12-pounder, 7½ feet, as carried in 1812
3. 12-pounder, 9 feet, as carried in 1812
4. 9-pounder, 7½ feet, as carried on the quarterdeck in 1761
5. 9-pounder, 8½ feet, as carried on the forecastle in 1761

J2



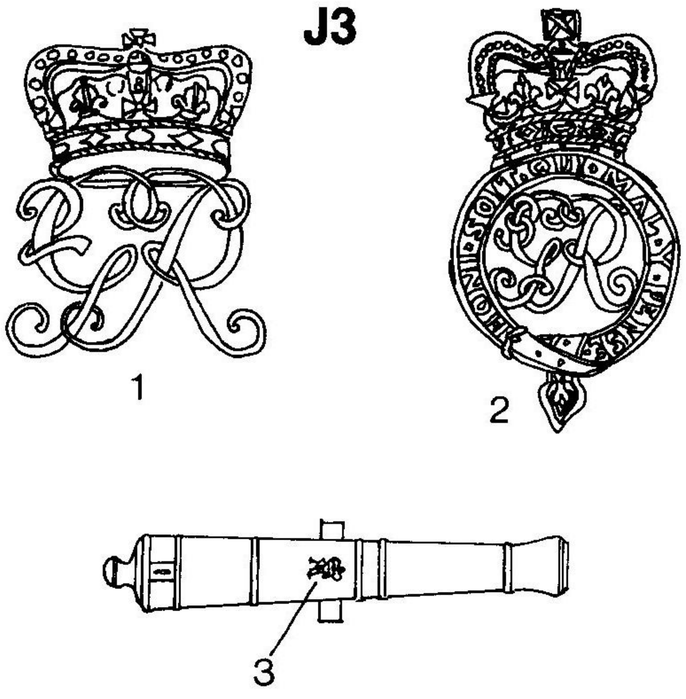


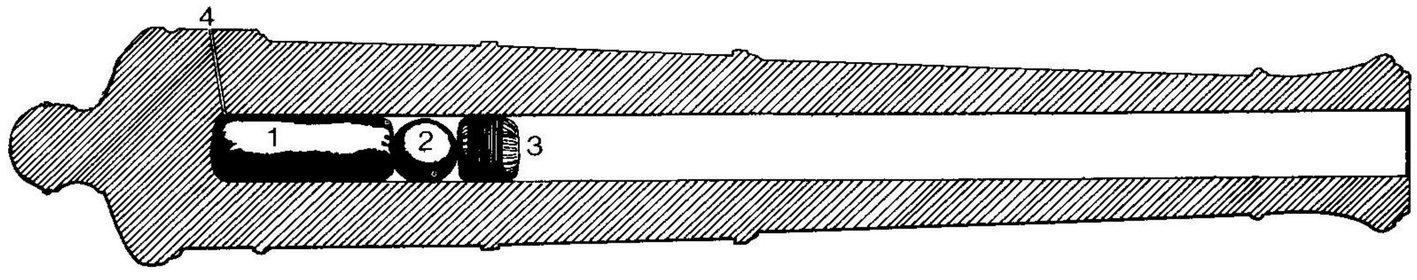
J3 EXAMPLES OF ROYAL MONOGRAMS ON GUNS (no scale)

1. About 1740
2. About 1798
3. Position of monogram on gun

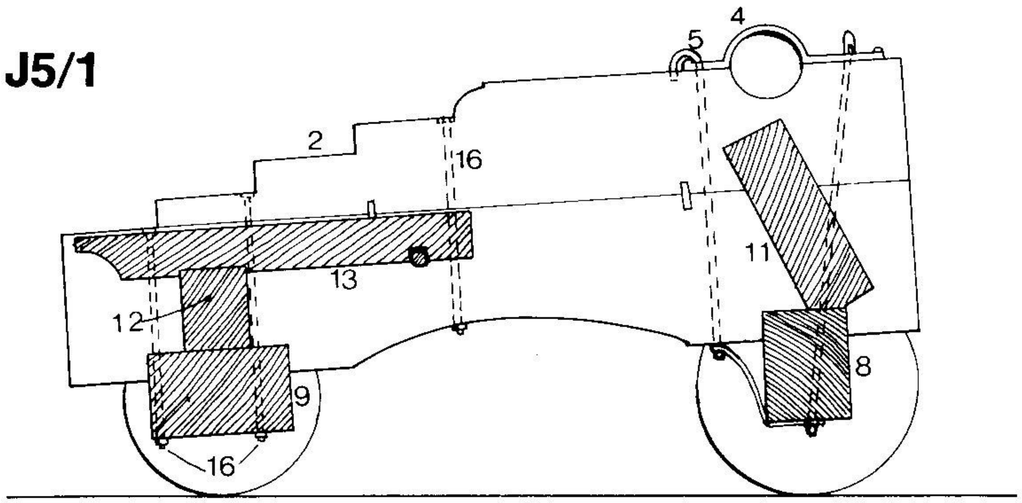
J4 CROSS SECTION OF 32-POUNDER (1/24 scale)

1. Charge of powder, in paper cartridge
2. Ball
3. Wad
4. Vent

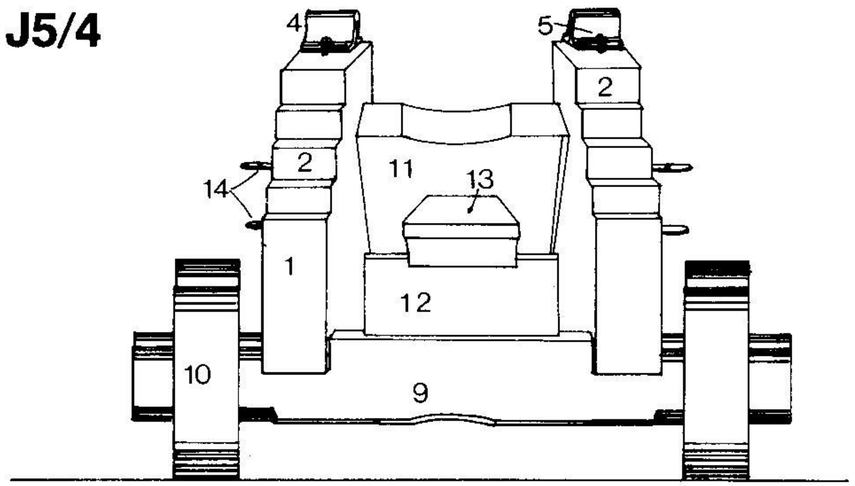




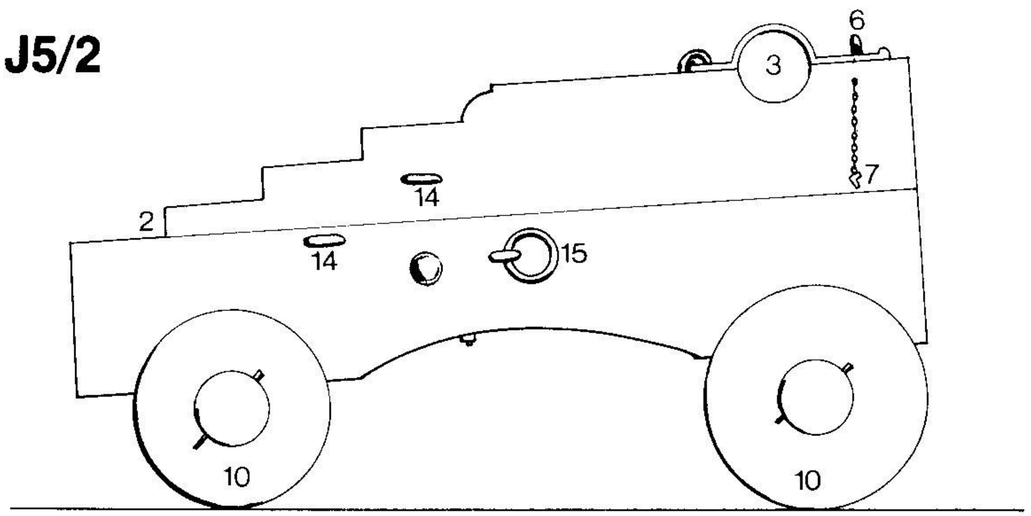
J5/1



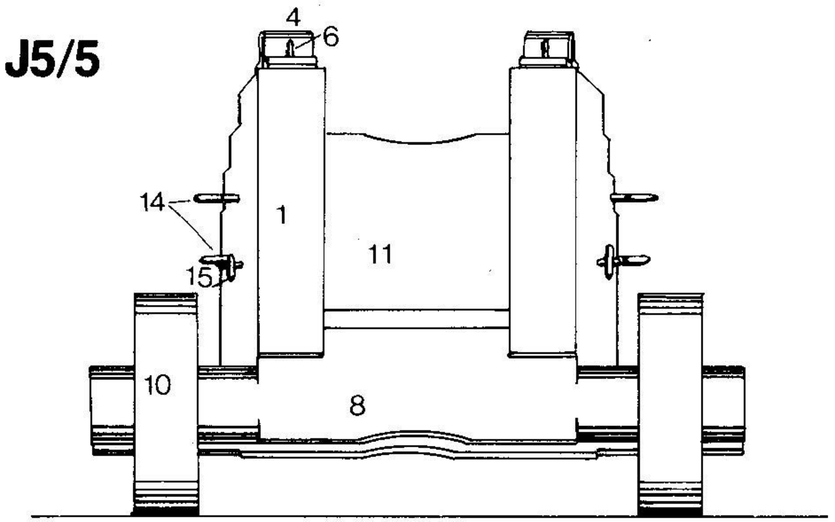
J5/4



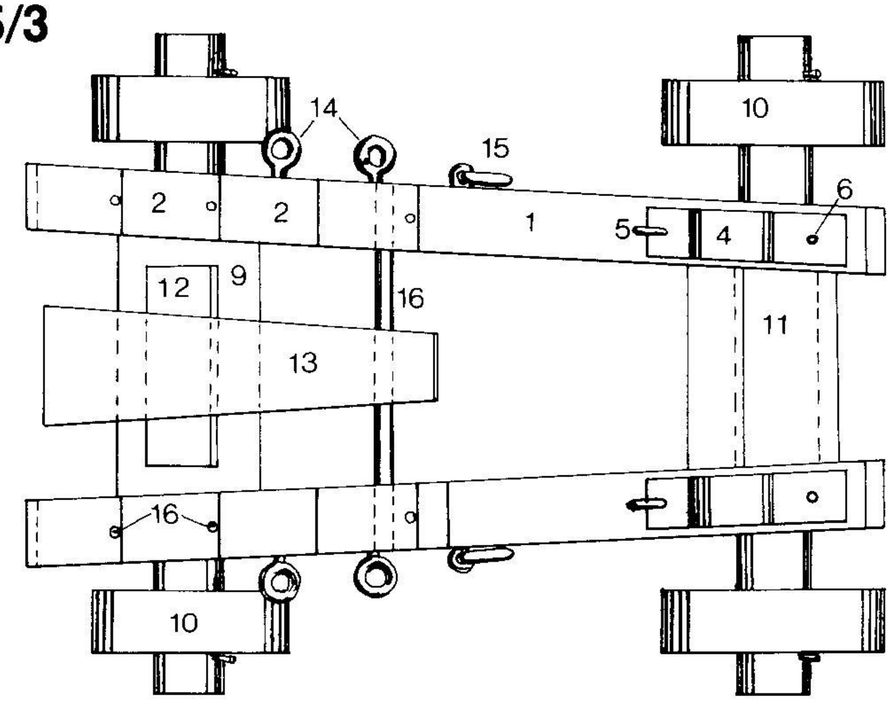
J5/2



J5/5



J5/3



J5 DETAILS OF 32-POUNDER GUN CARRIAGE

J5/1 Longitudinal section

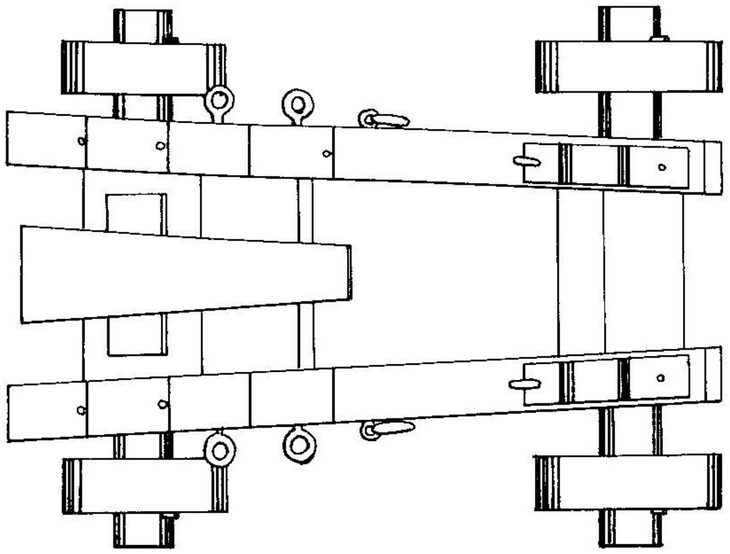
J5/2 Side elevation

J5/3 Plan

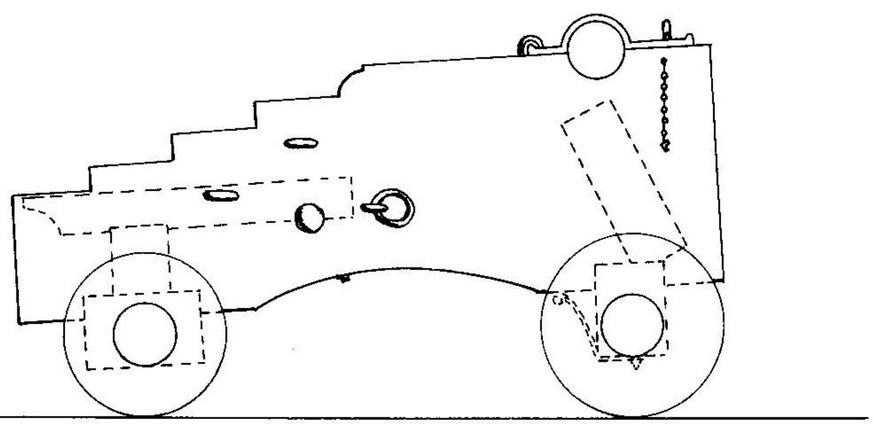
J5/4 Rear view

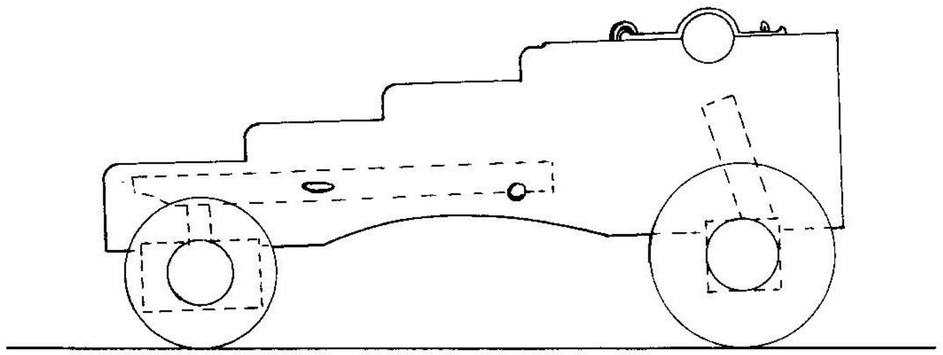
J5/5 Front view

1. Sides or brackets
2. Steps
3. Trunnion hole
4. Cap-square
5. Eyebolt
6. Joint bolt
7. Key
8. Fore axletree
9. Hind axletree
10. Trucks
11. Transom
12. Bolster
13. Stool bed
14. Loops
15. Breeching ring
16. Bolts

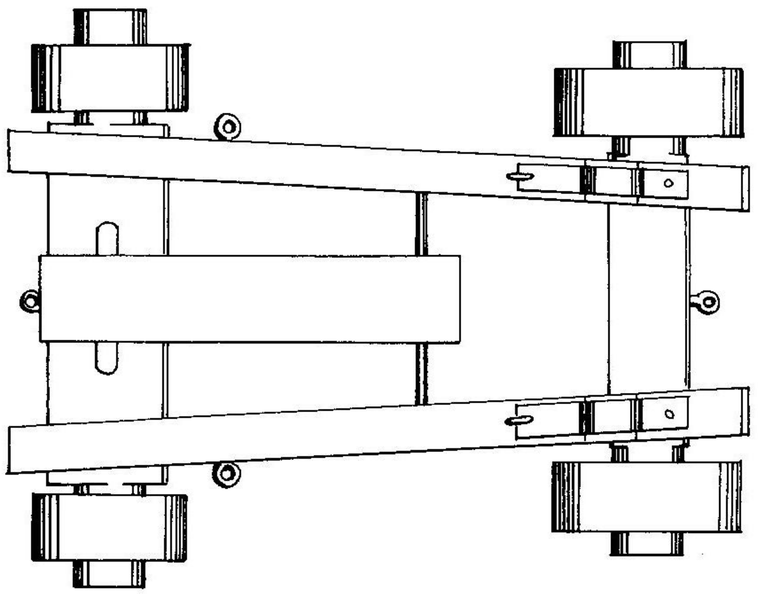


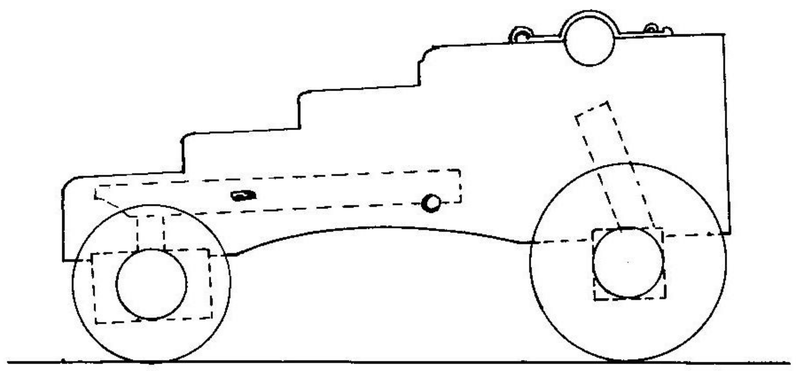
J6/1



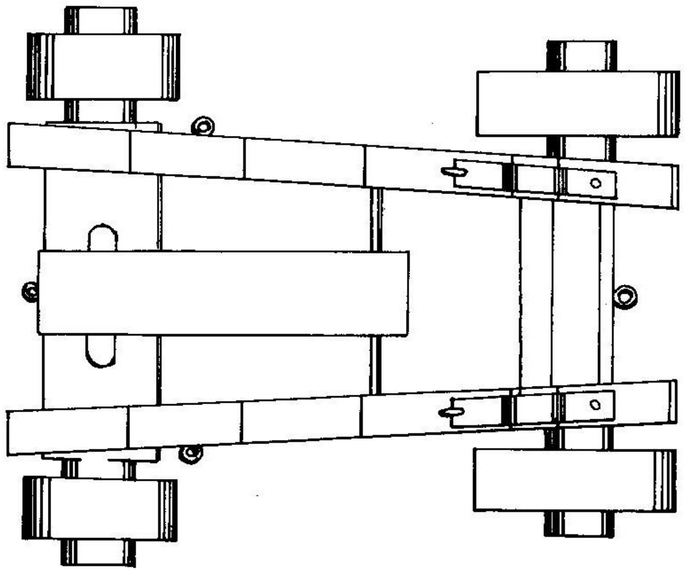


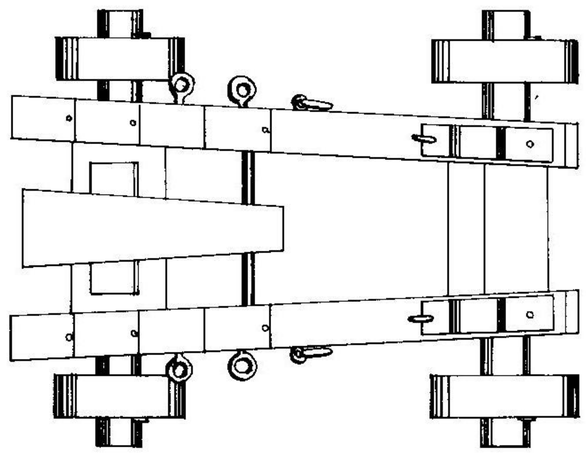
J6/2



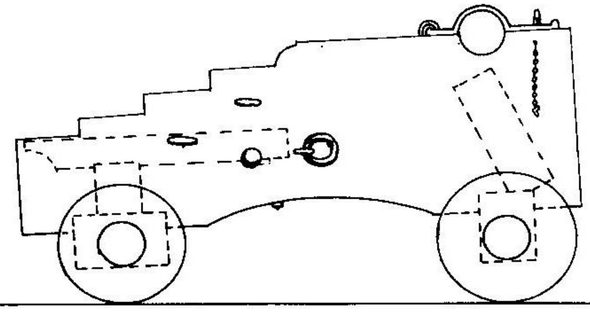


J6/3





J6/4



J6 **GUN CARRIAGES (plan and side elevation. 1/24 scale)**

J6/1 **18-pounder**

J6/2 **Long 12-pounder**

J6/3 **Short 12-pounder**

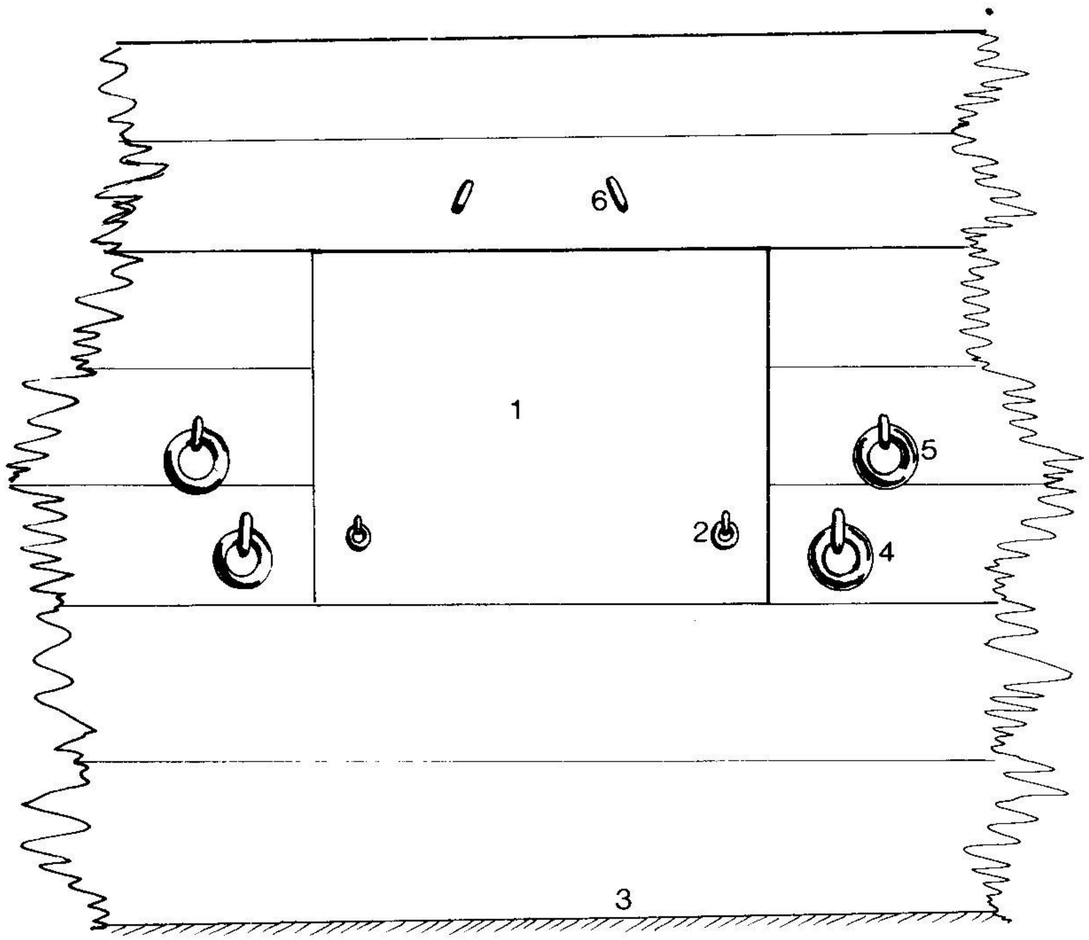
J6/4 **9-pounder**

J Armament

J7 GUN TACKLE (no scale)
1. Breeching tackle
2. Gun tackle
3. Blocks
4. Ringbolts
5. Eyebolts for muzzle lashing
6. Eyebolt for train tackle

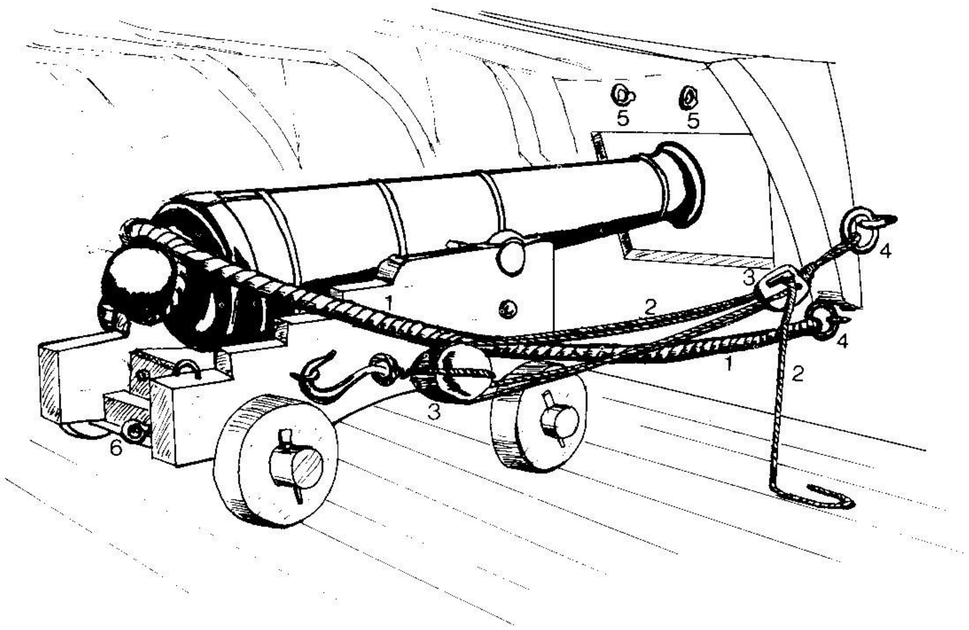
J8 INSIDE OF GUNPORT (1/24 scale)
1. Port lid
2. Ringbolts for tackle to hold port closed
3. Lower deck
4. 6in ringbolts for train tackle
5. 6in ringbolts for breeching rope
6. 2½in eyebolts for muzzle lashing

J9 DETAILS OF GUNPORTS (1/24 scale)
1. Port lid
2. Stops
3. Hinges
4. Topping lift
5. Eyebolts
6. Hole in side for topping lift

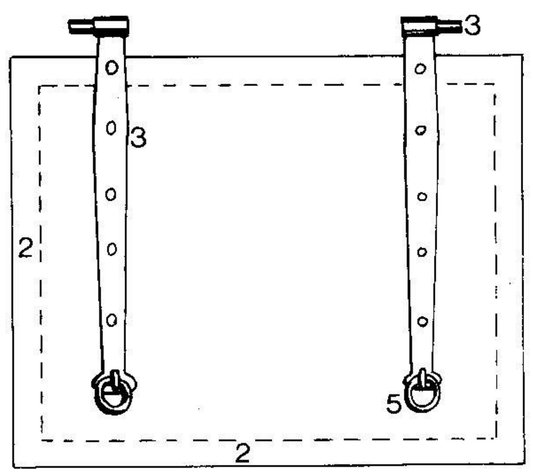


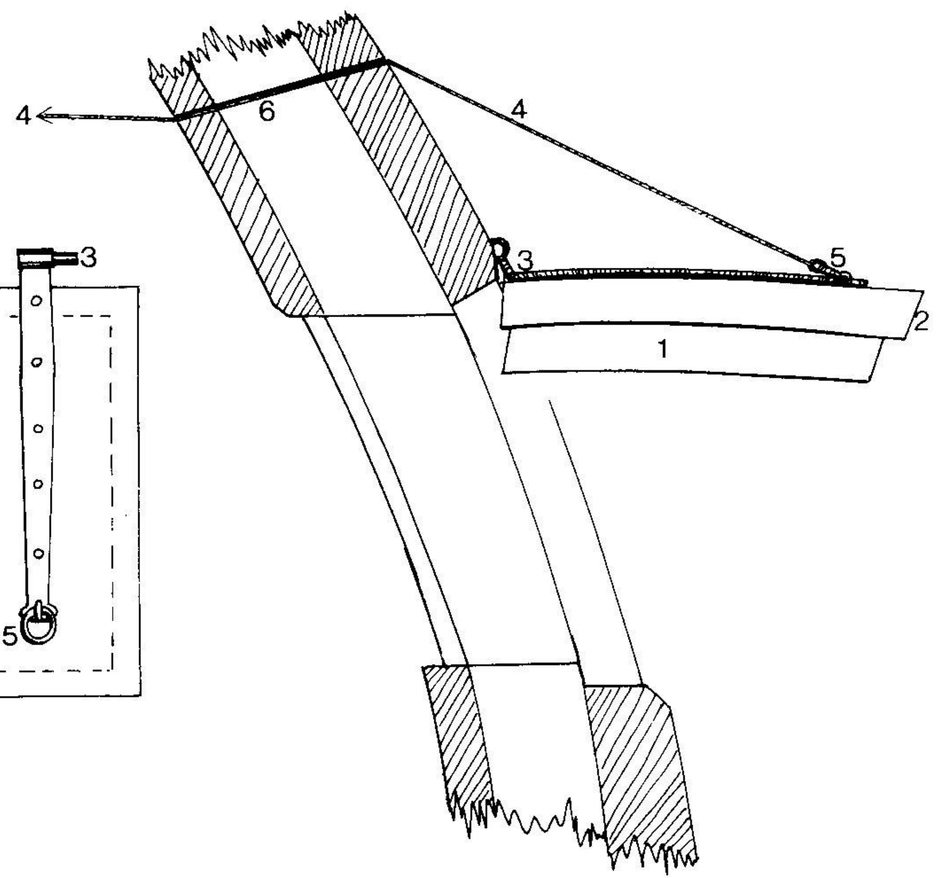
J8

J7



J9





J10 **GUNPORT TACKLE (1/96 scale)**

1. Port lid
2. Upper deck beam
3. Hole in side for topping lift
4. Block, where the two topping lifts from the two hinges meet
5. Hook
6. Lanyard
7. Blocks
8. Fall
9. Cleat

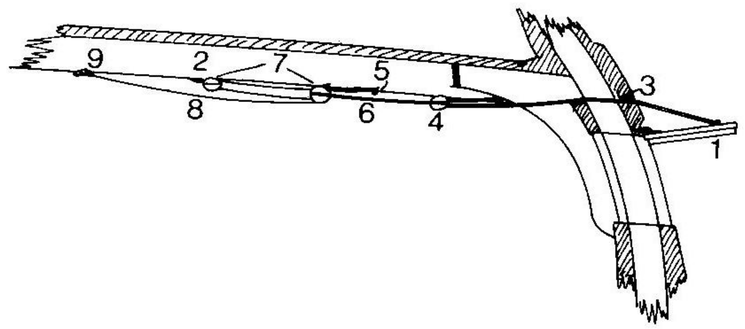
J11 **GUN LASHED IN HEAVY WEATHER (1/48 scale)**

1. Breeching tackle
2. Gun tackle
3. Frapping
4. Muzzle lashing

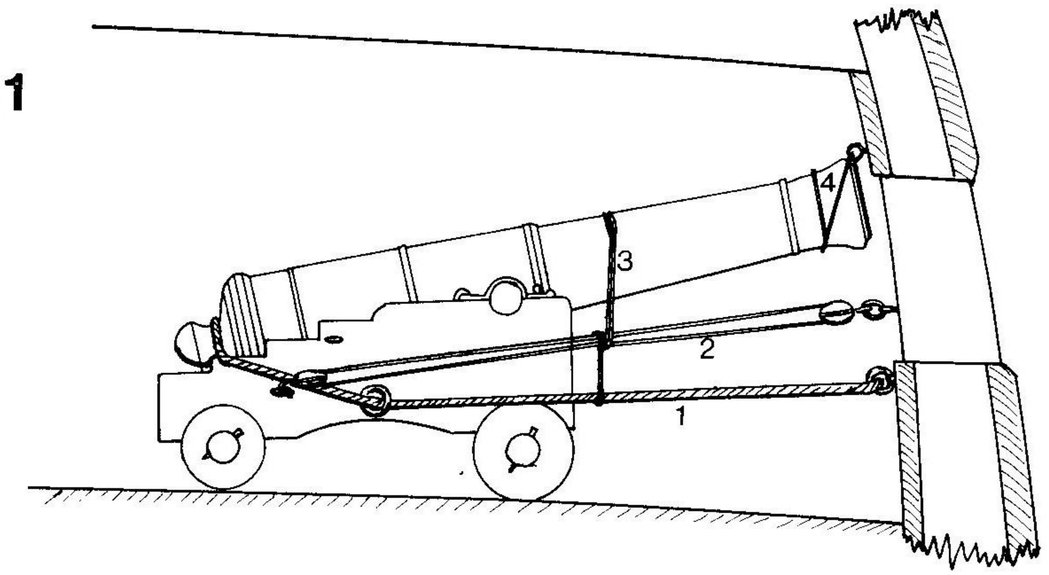
J12 **TRAIN TACKLE (1/48 scale)**

1. Gun carriage (stool bed omitted for clarity)
2. Blocks
3. Tackle
4. Ringbold, approximately 6 feet from the centre-line of the deck

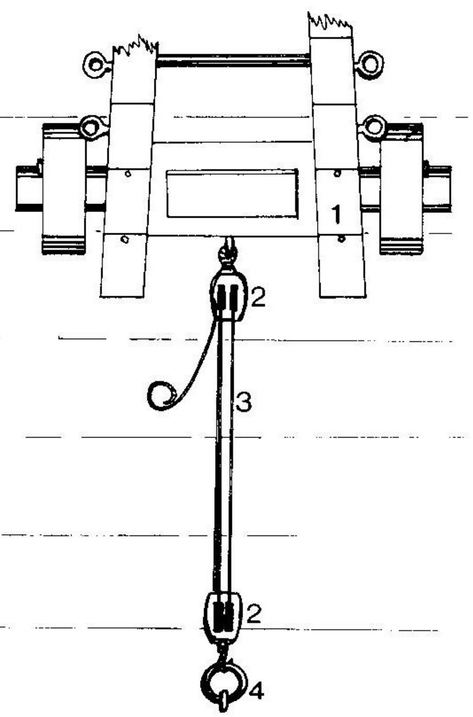
J10



J11



J12



J13 EARLY 12-POUNDER CARRONADE MOUNTING (about 1780. 1/24 scale)

J13/1 Front view

J13/2 Side elevation

J13/3 Plan of slide

2. Pivot
3. Pin
4. Carriage
5. Gun
6. Bolster, mounted outside hull
7. Rail of poop

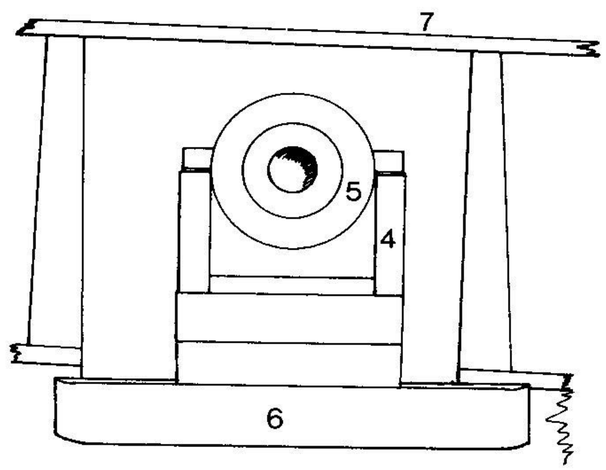
J14 TYPICAL 18-POUNDER CARRONADE AND MOUNTING (about 1795. 1/24 scale)

J14/1 Side elevation

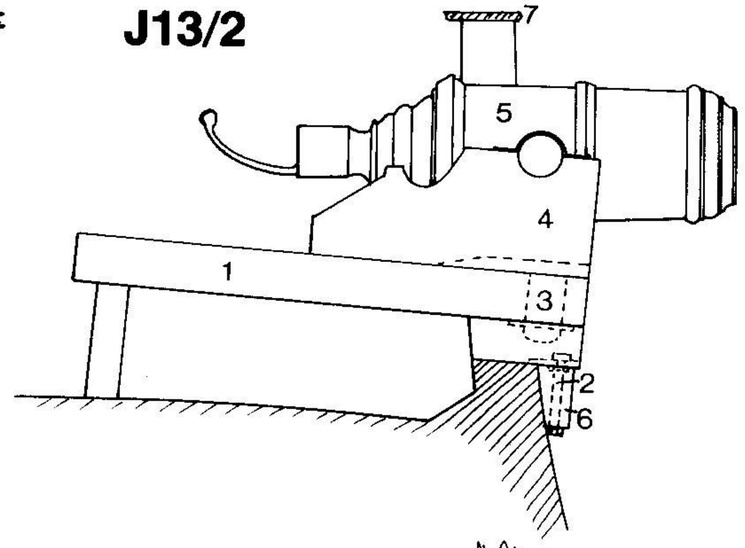
J14/2 Plan view

1. Carriage
2. Slide
3. Pivot
4. Ring bolts
5. Wheels
6. Screw

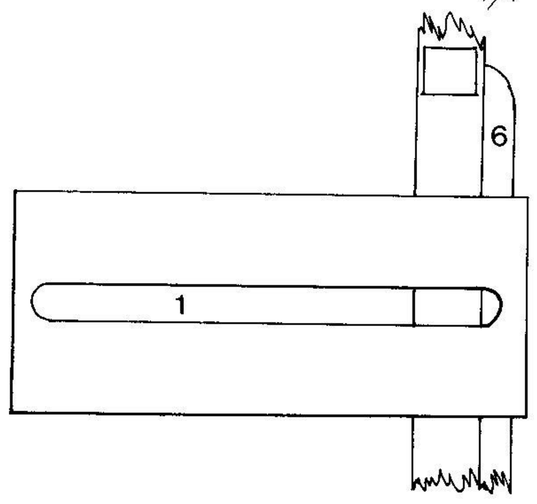
J13/1



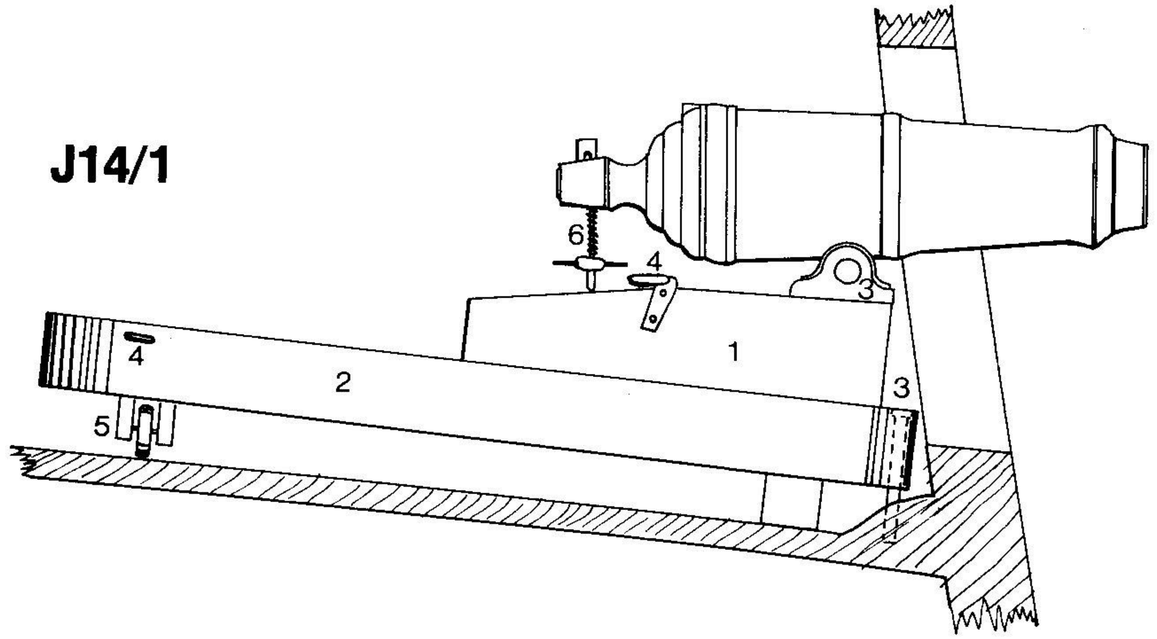
J13/2



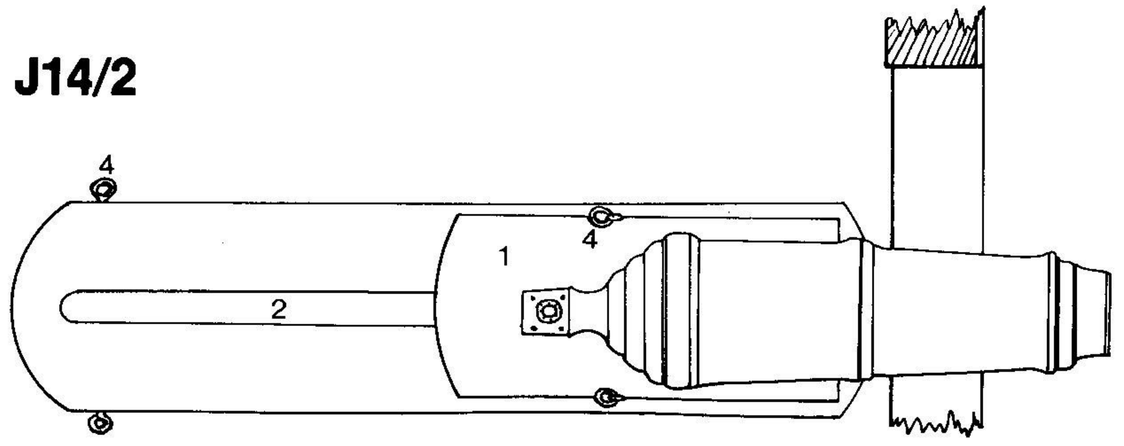
J13/3



J14/1



J14/2



J15 32-POUNDER CARRONADE (as carried in 1812. 1/24 scale)

1. Breech sight
2. Dispart sight
3. Elevating screw
4. Trucks

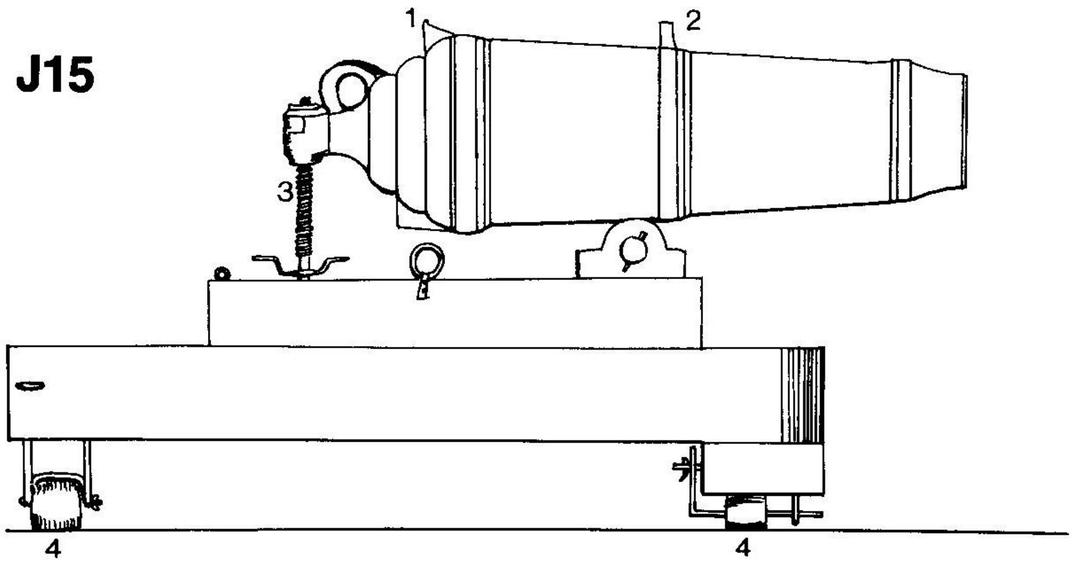
J16 MAIN MAGAZINE (1/96 scale)

J16/1 Longitudinal section

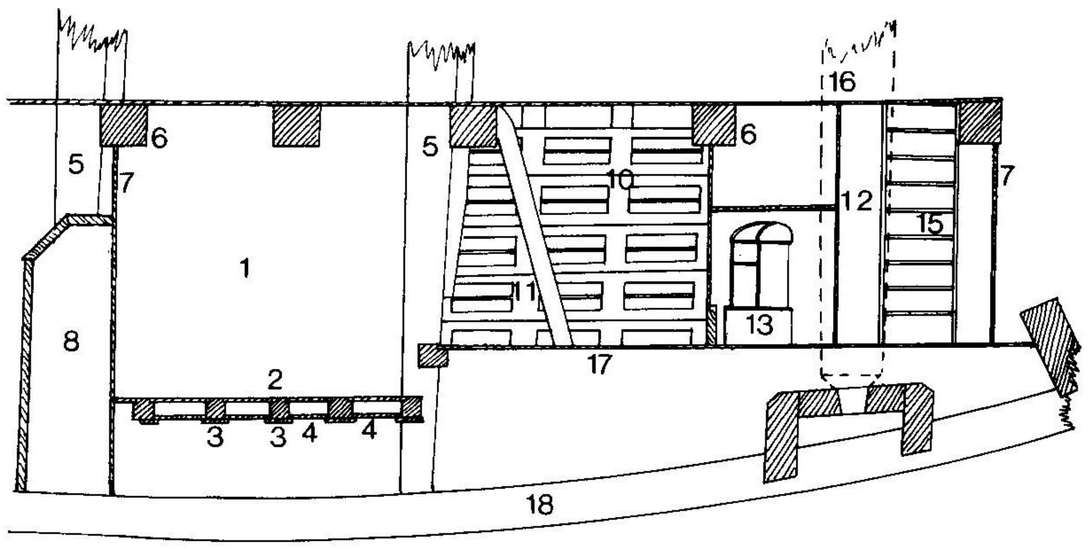
J16/2 Plan view

1. Magazine, for stowage for powder barrels
2. Pallating flat
3. Beams
4. Double layer, to prevent powder leaking into bilges
5. Riding bitts
6. Orlop deck beams
7. Bulkheads
8. Shot locker
9. Fore powder room
10. Racks for filled cartridges
11. Ladder to magazine
12. Light room
13. Lanterns
14. Glass, to allow light into magazine
15. Ladder to light room
16. Fore mast
17. Planking
18. Kelson

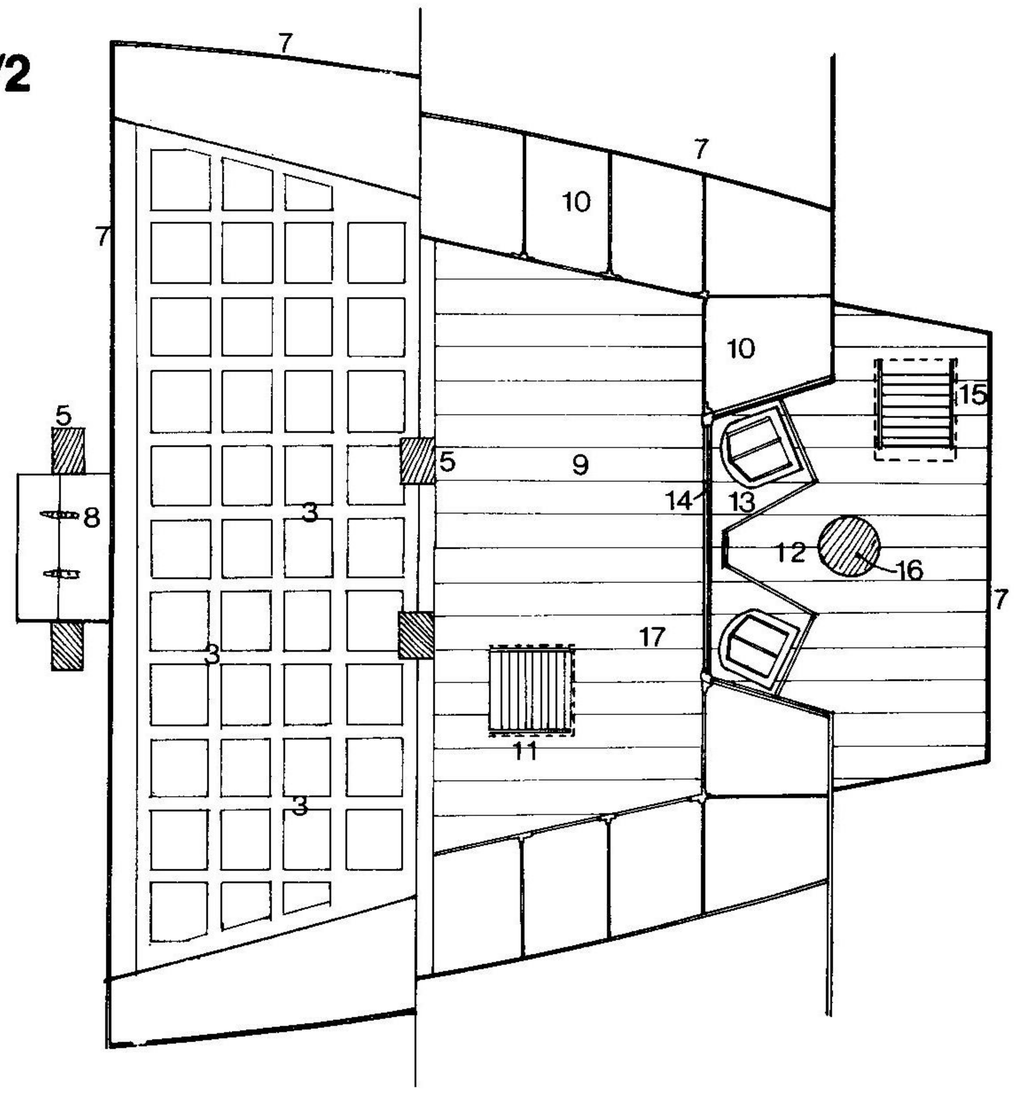
J15



J16/1



J16/2



J Armament

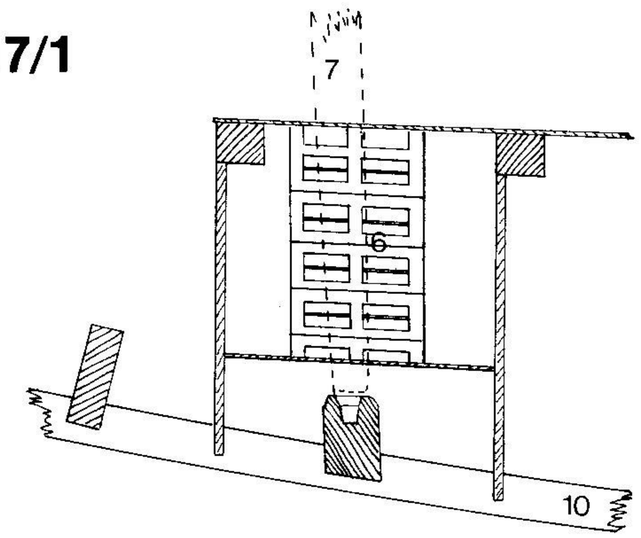
J17 AFT POWDER ROOM (1/96 scale)

J17/1 Longitudinal section

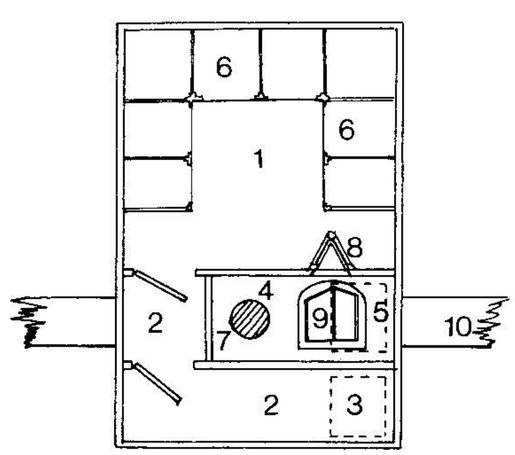
J17/2 Plan view

1. Powder room
2. Passage to powder room
3. Scuttle to powder room (on orlop deck)
4. Light room
5. Scuttle (on orlop deck)
6. Racks for filled cartridges
7. Mizzen mast
8. Glass
9. Lantern
10. Kelson

J17/1



J17/2



Frontispiece

1. The framed model of the *Bellona*. On this side most of the wales have been fitted, though the ribbands, which hold the frames together until the planks are put on, are still in place.
National Maritime Museum

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